

# The failure of early demonstration agriculture on 19<sup>th</sup> Century model/pattern farms: lessons for contemporary demonstration.

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## **Abstract**

**Purpose:** Demonstration farming has been an important part of agricultural extension since the first decades of the 20th Century. While Seaman Knapp is often credited with developing demonstration farming, his son acknowledged that the concept has much earlier origins in the 19th Century development of model/pattern farms. However, little is known of these early origins or why early demonstration agriculture failed. This paper addresses this gap.

**Design/methodology/approach:** The methodology involves analysis of out of copy-right historical journal articles, letters, pamphlets, and books recently made available by online services such as Google Books.

**Findings:** The study details how the concept of demonstration farming was developed by agricultural societies of the 18th Century but was not implemented until the early 19th Century with the advent of model/pattern farms. Demonstration activities were run by a variety of different types of private and public farm organisations who sought to improve agriculture through emulation. Enthusiasm for model farms died out by the end of the 19<sup>th</sup> Century but the failure of model farm demonstration leaves us with lessons for demonstration farming today.

**Theoretical implications:** The study provides new knowledge on the conceptual and historical development of demonstration farming and why it failed to influence change.

**Practical implications:** The study identifies factors that might contribute to the failure of demonstration activities.

**Originality/value:** This is the first study to explore in detail demonstration farming on 19th Century model farms and, methodologically, outlines how free on-line digitised literature can be used to investigate early agricultural education activities.

## **1. Introduction**

Demonstration farms have become an important part of efforts to improve agricultural practices and have consequently been established across the world – from the most neoliberal agricultural systems such as New Zealand and Australia, to those that remain heavily state directed such as Norway and the EU. The earliest origins of demonstration farming lie in the common practice of copying successful neighbouring farmers. English literature references to peer-to-peer information transfer go back to at least the 16<sup>th</sup> Century, when Plat (1594, p41) observed that innovations were not widely available for “public view” but were spread by their authors “within their own precincts.” Later, Maxwell (1757, p370) writing on the improvement of an estate in Scotland notes that the tenant farmers copied farmers whose “skill is generally judged by his riches”. This practice continues today, with farmers emulating each other to improve their management practices and obtain cues to initiating fieldwork (Burton, 2004). At one stage informal imitation through “looking over the hedge” became formalised as part of demonstration farming (Cheesbrough, 1966), and it is towards understanding how this formalisation occurred in the 18<sup>th</sup> and 19<sup>th</sup> Centuries that this paper is directed.

What is meant by a “demonstration farm”? The term does not appear in the early agricultural literature but was, in fact, first used in the early-1900s by the US Department of Agriculture to denote a farm where departmental demonstration activities were undertaken and, later, any farm “wholly worked according to the department’s instructions” (True, 1928). Dr. Seaman Knapp, widely credited with developing the demonstration farm concept, described the aim of demonstration farming as,

“to place a practical object lesson before the farm masses, illustrating the best and most profitable methods of producing the standard farm crops, and to secure such active participation in the demonstrations as to prove that the farmers can make a much larger average annual crop and secure a greater return for their toil.” (Knapp, 1909, 160)

By working with farmers on their own farms Knapp contended it was possible to set an example for neighbours to imitate. In this way, information could be taken from experimental stations and put into general usage in a way that had not been achievable through the use of bulletins (B. Knapp, 1916). The fundamental principle of today’s demonstration farming remains the same: to use practical demonstrations to raise the condition of agriculture across

neighbourhoods, regions and countries through emulation. This is the concept of “demonstration” this paper refers to when analysing the historical developments of demonstration farming.

Although some researchers contend that Knapp invented demonstration farming (e.g. Kittrell, 1974) Knapp’s son (Bradford Knapp) credits the development of demonstration in agriculture not to his father, but to the “many institutions and public or semi-public organizations (that) had tried what may be called the “model farm” type of demonstration” (B. Knapp, 1916; 225). B. Knapp observes that while these farms “did a great deal of good” they lacked important elements present in his father’s approach, namely: the farmer had to travel to view the demonstration, the farmer did not do the work himself, the lessons were not targeted at specific farm conditions and the financial means of the average farmer, and no-one was present to assist the farmer with applying the method to his own farm. However, the accuracy of B. Knapp’s observations are difficult to ascertain because, while the issues of education on model farms and model farms themselves have received some attention in the literature (e.g. Wade-Martins, 2002; Jones, 2016) the issue of the development of *demonstration* on model farms has not.

The focus on model farms in the English literature has been placed largely on the “home farms” of the British nobility (such as King George III’s ‘Flemish Farm’ or Lord Bateman’s ‘Uphampton’) which are now widely accepted as having had little influence over the majority of the farming community (Jones, 2016). Instead, they acted as social displays of the landowner’s commitment to agriculture (e.g. McDonald, 1981; Jones, 2016) and, ultimately, grew to embrace predominantly architectural objectives (Wade-Martins, 2002). However, these were not the only types of model farm in existence, and, even in the case of the home farms of the gentry, Everitt (1983, 158) asks:

“Is it possible that the home-farm of the ordinary landed estate, where some limited element of experimentation may have been undertaken, offered the tenant farmer a more practical and familiar source of ideas?”

This paper takes a new look at the development of demonstration in model farms – predominantly the UK, but also drawing examples from Europe and America. It explores the development of demonstration farming from its very early conceptual origins in the second half of the 18<sup>th</sup> Century, to the demise of model farms at the end of the 19<sup>th</sup> Century – focusing on

why demonstration activities on model/pattern farms failed to inspire the farmers of the time. The paper is divided into four sections. Following this short introduction, the paper presents a methodology. The main section then presents an analysis of the evolution of demonstration on model farms, focusing predominantly on the different types of model farm, how and why their approach to demonstration differed, and how this affected the efficacy of their demonstration activities. Finally a discussion/conclusion discusses how the failure of demonstration on model/pattern farms provides lessons for contemporary demonstration farming.

## **2. “Google books” and other online sources – a way to access new understandings of demonstration farm development.**

To understand the early-development of demonstration farming and why it failed to influence behavioural change this study uses a relatively new source of data, namely freely accessible online historical agricultural publications, pamphlets and journals. Of the providers, the best coverage is through Google Books which by 2012 had scanned 30 million out-of-copyright books, most of which are in a searchable text format (Matulionyte, 2016). Other online sites such as The Internet Archive, the Biodiversity Heritage Library and The Hathi Trust Digital Library contain some free-to-access agricultural publications not available through Google Books but are not as comprehensive and texts are not always in a searchable format. Burton & Riley (2018) assessed the comprehensiveness of this online database using Loudon’s (1839) “Bibliography of British Agriculture” and found that 83% of the 218 pre-19<sup>th</sup> Century publications listed were freely available online. Coverage in the 19<sup>th</sup> Century is also thorough. For example, *all* volumes of the Gardener’s Chronicle and Agricultural Gazette published between 1843 and 1873 and 90% of volumes of the Journal of the Royal Agricultural Society from between 1840 and 1898 are freely available online – the vast majority in searchable form.

Agricultural publications were located via the main internet search engines through an extensive search – based initially on bibliographies of key literature. Files were downloaded as PDFs and assembled in a library. In total 427 journal volumes were located with coverage between 1734 and 1898. In addition to these journals, over 400 books, reports, farm diaries, agricultural encyclopaedias, and pamphlets from between 1534 and 1915 were included.

The assembled library was searched for the terms “model farm” and “pattern farm” using Copernic Desktop Search. Once a source was identified and viewed, the name of a specific farm

could be searched for (e.g. Hofwyl) to locate further literature not identified in the initial search. The individual PDFs were then searched using Adobe Reader to locate the articles or chapters where the reference was made and these were reviewed. An important caveat to observe is that the study was conducted using English-language literature only and this makes the analysis somewhat anglo-centric (mostly UK, Ireland, and U.S). However, the English and European agricultural literatures were strongly connected in the 18<sup>th</sup> and 19<sup>th</sup> Centuries with directly translated documents available, agriculturalists making “tours” and reporting on developments in Europe, and governments distributing translated information widely to improve farming amongst the peasantry (Burton & Riley, 2018). Thus coverage of European model farms was possible.

### **3. The origins of demonstration farming**

The concept of educating farmers via demonstration emerged with the development of Agricultural Societies in the 18<sup>th</sup> Century – under the guidance of a growing number of public-spirited individuals (Dossie, 1768). ‘The Society of Improvers in the Knowledge of Agriculture in Scotland’ (1723 to 1746) was the first patriotic improvement society in Europe (Bonnyman, 2012). Although comprised largely of landed elites, the Society resolved that gentlemen “should use a familiar style, such as the country farmers might easily understand” (Maxwell, 1743, 8). Agricultural societies spread across the UK and Europe after the mid-18<sup>th</sup> Century often managed, in the beginning at least, not by gentleman farmers but by “people of no great account” (Young, 1784, 64). At this early stage the primary means of developing and transferring knowledge was via the use of premiums – payments to farmers who managed to achieve innovations in areas selected by the Society as requiring improvement (e.g. machinery development, crop production). Developments were recorded and published in the proceedings of the Society and it was this publication that was to be the “principal cause of the diffusion” (Dossie, 1768, 37).

However, it was not very effective. Commentators towards the end of the 18<sup>th</sup> Century observed that most of the premiums went to the same farmers and that these farmers were invariably “far above the rank of common farmers” (Lampart, 1783, 289). During the last two decades of the 18<sup>th</sup> Century the view emerged among many (both in the United Kingdom and the Continent) that the key to diffusing best practice was through the use of practical demonstration by society members or proprietors of landed estates (e.g. Hassall, 1794; Stickney, 1796). There is no

evidence that these suggestions were taken up by the landowners of the time. However, it illustrates how the thinking towards the end of the 18<sup>th</sup> Century was moving away from premiums and “book farming” (see Fisher, 2018) towards establishing practical demonstration fields or farms. It was not, however, until the turn of the century that these new ideas were put into practice through the development of formal “Model” or “Pattern” farms.

The first of these, Hofwyl in Switzerland, was founded in 1800. It consisted of a number of different establishments, namely, an experimental farm, a manufactory and design works for agricultural implements, a school of industry for the poor, a boarding school for the children of nobles, an institute of agriculture with both theoretical and practical lessons, and a normal school (educating teachers). While these formed the core of the educational enterprises, the institute also included a “pattern farm” or “a farm designed to serve as a model” (Capo-D’Istria, 1818, p.55). Hofwyl was rapidly joined in 1806 by the Mögelin pattern/model farm near Berlin (Germany), managed by Albert Thär under the invitation of the King of Prussia. As with Hofwyl, the predominant role of Mögelin was as an educational facility for students of agriculture, however, in his memoir, Thär contends that the land attached to a teaching institution “ought to be a *pattern* for agricultural practice” reflecting the conditions on neighbouring farms (Thär, 1844, 13).

Both Mögelin and Hofwyl became models for the spread of agricultural institutes across Europe in the 19<sup>th</sup> Century (see Barnard, 1872) as well as providing inspiration for American ambitions of pattern farm development (e.g. Watson, 1820). In the early 19<sup>th</sup> Century, the approach exemplified by these farms spread rapidly throughout central Europe. For example, model farms were formed in Graetz in Austria in 1809, Flottbeck in Northern Germany in 1813, Hohenheim in Württemberg in 1818, and Schliessheim in Germany in 1822. Over the next half century Germany, France and Ireland developed a comprehensive network of model farms in the Hofwyl/Mögelin vein.

The Irish example illustrates how demonstration was perceived as playing a significant role on model farms. In regular references in the report of the Commissioners of National Education in Ireland (1854) model farm managers noted the importance of demonstration. For example, reportedly, Dunmanway model farm presented a “good example exhibited to the farmers of the surrounding locality” (289), Ballymoney Model Farm was able to “convince the farmers of this neighbourhood of the advantages to be derived from an improved system of agriculture” (333),

while the model farm at Ballyougrly was able to extend agricultural improvement to the small and working farms throughout the neighbourhood – whereas the example set by gentleman farmers “does not produce that effect on the smaller landholders that is desirable” (450).

In the United States pattern/model farms also captured the imagination of agriculturalists. One of the first mentions of establishing pattern farms can be found in the 1794 establishment documents for the “Philadelphia Society for Promoting Agriculture” (republished in – Philadelphia Society, 1815, xxii). The initial description of the pattern farm shows strong similarities with the later Hofwyl and Mögelin examples, with emphasis on testing inventions, adapting new technologies, cultivating new plant species, and so on. Although no specific mention is made of demonstration, the intention of the farm was to implement “the best systems now known” while people would visit the farm to gain knowledge “from a short inspection”. The Society, however, was not able to obtain funding and in a later address Mease (1818) redefined the objectives, dropping the concept of a school and focusing on demonstrating good husbandry as well as documenting the management practices (for inspection by farmers).

In other countries too, the hope that neighbouring farmers would learn by observation was frequently expressed. In Germany – the directors of the Hohenheim institute disclaimed “the idea of its being a model farm in the usually accepted sense of that term” but contended “it is intended to demonstrate improvements” (French, 1866, 163). Spreading knowledge to others via demonstration was also an objective for the 71 French model farm schools in operation in 1851 which were intended “to furnish a good example of tillage to the farmers of the district” and, to ensure this, if the farm was not at least as profitable as neighbourhood farms government patronage would be withdrawn (Barnard, 1872).

However, despite these hopes, demonstration via these educational institutes was not generally successful in improving local farming practices. Three main problems with the system were noted.

First, the institutes had substantially greater access to resources than neighbouring farmers. For example, Stephen de Vere observed for Rathkeale Farm in Ireland that neighbouring farmers had not “derived much advantage from seeing before their eyes operations upon the model farm” because they did not have the capital to allow them to copy the improvements (Commissioners of National Education. 1870, 873). Even the British Agricultural College at

Cirencester was “looked upon with suspicion by the [local] farmers of the Cotswold Hills” as farmers were of the opinion that the type of farming demonstrated on the farm “does not pay” Caird (1852, 39) – something that Caird attributed to the additional costs required for the experimental and educational work.

Second, perceived ulterior motives of the funders sometimes made farmers suspicious of the practices demonstrated. This was particularly the case in Ireland where farmers often saw model farms not as examples to follow but as a tool for the progression of colonialism (see below) – and one that served only to promote the self-interest of the English landlords (Baldwin & Brogan, 1874).

Third, practical farmers with generations of experience on their farms were sceptical as to whether a farm worked by students and professional managers could teach them anything. For example, Stephens (1850, 124) observed:

“I do not comprehend what such a model farm is—for a farm, which is laboured by pupils can show a model of farming to no one; and any farming practised by a body of men having the management of a school, will be greatly eclipsed by that of many a single farmer, and it, therefore, in justice to farmers, cannot be recommended as a model”

This also illustrates how the management’s responsibility for both the farm and the educational institute led some to question whether they were sufficiently focused on practical agriculture. Hilgard (1873, 29) observed that the key criteria necessary for the farm to be held up as a model to other farmers was that it was “lucrative in its financial results” but that, to do this, “all considerations of an educational character must be subordinated to the business requirements.” The farm attached to the agricultural institute at Hohenheim was noted by Wallis (1874, 112) as not being able to set an example as “too many matters have to be undertaken for educational ends to make the whole area serve as a model for others to follow.”

In addition to demonstration activities on model and pattern farms, private landowners in Europe also engaged in demonstration agriculture. According to an advertisement (anon, 1842a, 11) the objective of Lord Ducie’s “Whitfield Example Farm” established in the late 1830s was to contribute to the



“improvement of the practice of the farmers in the neighbourhood. In order to effect this, the farm is open to the visits of any one; every operation performed on it is open to the inspection of all; and reports of its condition, and of the various steps in its progress towards an improved state of cultivation, are to be put forth at intervals.”

There was some debate at the time about the real purpose of these landlord operated model farms in the UK. Some portrayed them as grand patriotic gestures to the country and local farming communities (e.g. Daubeny, 1842), but others observed that the large quantities of capital invested in land improvements also dramatically increased the value of the property (e.g. Anon, 1849). Others still contended that these farms were not intended to set examples for tenant and neighbouring farmers at all, but rather to educate neighbouring landlords on estate development. Cultor (1842, 255), for example, suggests that the objective of Whitfield Example farm was not “as a beacon to guide every practitioner”, but as a means of illustrating that cultivating land could be as good an investment as other securities.

Development of private demonstration farms on estates could, perversely, also make agricultural improvement more difficult for neighbouring tenant farmers. In an Irish example, D. (1845, 255) records an observation by a Mr. Lover of model farming around “the lodge” of the landowner of the estate surrounded by “poverty-struck and starving peasantry, with wretched hovels, naked children, and rude unprofitable tillage” and contended that

“the astounding lesson seemed to say: Here is an object for imitation; look at yonder wheat; see that clover, and the meadow beyond it. They could all do likewise. Their land is the same, the climate is the same, the rent the same; but yet ignorance and obstinacy are incurable.”

However, Lover observed the same labourers obliged by the landowner to bring the fields to “perfection” on the model farm were also managing the surrounding farms. This left them little time to work on their own farms – while the payment for labour was insufficient to cover their rent, let alone the cost of making improvements along the same lines.

Wealthy private individuals had additional problems convincing common farmers to change their practices. Farms deemed suitable for the construction of a model farm were often located on the most fertile land (e.g. Sardinia – Anon, 1839) and, where this was not the case, the

investments made on land improvements were so substantial that neighbouring farmers were entirely unable to imitate. For example, observations that Whitfield Example Farm had subsequently produced “double the amount of produce which was raised on the same extent of land by farmers in the neighbourhood” were rejected by one observer as being simply the result of “his land being new, and his purse being heavy” (anon, 1842b, 97) and evidence began to mount that Whitfield Example farm had little beneficial influence on farming on the unimproved parts of the estate (anon, 1850). The Duke of Bedford’s farm at Woburn – termed by some a model farm and intended to “arouse the torpor-stricken agriculturalists of his day” (Duke of Bedford, 1897, 28) – held practical agricultural demonstration days (e.g. Woburn Sheep Shearing) that were more notable for their elaborate dinners and high society guest list than any effort to transfer knowledge to tenant or common farmers.

In Ireland, demonstration agriculture was seen as a means of subduing rebelliousness, raising revenue, and supplying England with butter and meat. In a publication “Instruct, Employ, Don’t Hang Them: or, Ireland Tranquilized without Soldiers and Enriched without English Capital” Kennedy (1835, 66) suggests the construction of a network of model farms such that “every child and every farmer in Ireland is within two miles of a school and a model farm.” Subsequently, a model farm was established on the Crown Estate at King William’s Town to promote efficient use of the improvements (in particular reclaiming and draining land) to tenant’s farms. A report to the Crown by Griffith (1841, p.4) observes that the demonstration was so successful that tenants had little time to work on the model farm – and that the occupants of neighbouring estates were “now rapidly following this example.” However, five years later, a land surveyor (Mr. Wiggins) noted that tenant farmers had not only not been “disposed to imitate” the new drainage systems on the Crown Estate, but, in fact they “had not continued or increased them, nor even kept them open, nor did they spread the earth dug out” (Foster, 1846, 565). In effect, they had done nothing.

Plans were also made to use model farms as a direct colonial tool. Courtney (1838, 16) outlined a proposal to establish the “Irish South Australian Emigration Company” to remove to South Australia “such a portion of the cottier tenantry of Ireland as may render it practicable to introduce into that country the improved modes of husbandry prevalent in Great Britain.” As part of this plan the company intended to set up a model farm in Australia to demonstrate to the “settlers” how to farm. Farmers were aware of these intentions. Cattle show demonstrations were seen by the local population not as something to emulate, but as “promoting the successful

production of cattle at the expense and removal from the country of people” and consequently, despite the establishment of agricultural societies and model farms across Ireland, common farmers rarely attempted to emulate the agriculture on show (G., 1859, 813). Pattern farms were also used to subdue native North American populations where they were “to set the Indians a pattern in agriculture, and induce them to turn their attention to cultivating the soil” (Negus, 1870, 18) as well as to promote “cultural assimilation” (Bess, 2015).

Although the concept of demonstration farming in the UK originated amongst members of the Agricultural Societies, Societies struggled to obtain the funding to implement farms of their own. Societies such as the Lancaster Agricultural Society, the Yorkshire Agricultural Society, and the Wester Ross Farming Society put forward proposals for the development of model farms across the UK (D'Agassiz, 1840; Howard, 1840). These proposals showed a much stronger demonstration focus than those led by gentleman farmers, partly driven by the Societies' belief that the farm should be managed with a “sole view to profit” (Howard, 1840, 173). For example, for the “model and experimental farm” proposed by the Wester Ross Farming Society was to follow,

“The most approved and most economical, but at the same time most profitable system of agriculture ... Each field crop and experiment shall be ticketed, to enable visitors to inspect the various operations going forward, without attendants; a plan of the farm, stating the crops in each field, shall be at all times in the bailiff's house, as well as the books, detailing former years' operations, for the inspection of visitors.” (D'Agassiz, 1840, 416)

However, when these societies attempted to obtain funds they met at best indifference and occasionally determined opposition. Rejection of the Wester Ross Farming Society's petition to the Highland and Agricultural Society was on the basis that the farms were primarily experimental and would therefore not be able to exhibit profitability, that self-interest was sufficient to encourage farmers to adopt the most approved systems, and that a farm managed under “the constant direction of a skilful agriculturalist” would always prove superior to one managed by a board of directors. The response also showed a dislike for public initiatives, noting that the support of agricultural institutes throughout Europe with government assistance was not necessary in Great Britain because its “most improved state” meant that “less artificial stimulus is necessary to foster discovery and improvements in the arts” (Anon, 1841, 503).

They were not alone in this view. The Australian Horticultural and Agricultural Society observed that model farms in England “had not succeeded” because

“there were hundreds of them all over the country; every member of an Agricultural Society in England, every agriculturist to a large extent, who had sufficient wealth, carried on experiments and had his own model farm” (Anon, 1858, 49).

These “model farms” were not formal model farms, but it was relatively common for writers to identify farms that were exceedingly well managed and encourage farmers to emulate their practices. In the U.S. a distrust in government led many to argue that private farmers were best positioned to demonstrate to their neighbours (e.g. French, 1866, 149) and, as a result, numerous informal “pattern farms” were identified in the farming literature. For example, Veritas (1858, 469) “confidently predicts” of Joseth Hall’s farm in Main that “his will be the model farm of the eastern part of Maine”, while Redmond (1853, p.40) observes how Richard Peters’ stock farm “is rapidly becoming the model farm of upper Georgia”. Some farmers willingly adopted a demonstration role. The Sturtevant Brothers writing in the *Scientific Farmer* discuss their coming Waushakum Farm field-meeting which was open to all interested “friends of the *Scientific Farmer*” and where “efforts will be made to have the occasion informal and familiar, full of farmer-talk one with another.” In return for opening up their farm to inspection, the Sturtevant Brothers hoped to receive criticism, exchange knowledge and learn “from the varied experience of those who come” (Sturtevant, 1878, p.97).

#### **4. Discussion and Conclusion**

Formal model farms were finally killed off by the great agricultural depression at the end of the 19<sup>th</sup> Century (Wade-Martins, 2002), but, with a lack of evidence of efficacy, the belief in the ability of educational institutes, governments and estates to influence neighbouring farmers by demonstration had begun to decline decades previously (see Commissioners of National Education, 1870; Fream, 1891). The above analysis has revealed some of the reasons for this decline. While these events took place over a century ago, through the examination of the fundamental causes of this failure it is possible to outline some important lessons for contemporary agriculture.

Firstly, demonstration activities need to be held on farmland of a similar quality to neighbouring farms. One problem encountered by many historical model farms was that they were established with little concern for the conditions of the majority common and tenant farmers. This meant that either they were set up on land that was already better than the surrounding land (e.g. Anon, 1839), or immediately sought to improve the condition of the land through heavy investment in drainage, buildings, and fencing – investments that neighbouring farmers could not possibly hope to emulate (Anon, 1842b). A model farm showing the latest agricultural developments surrounded by a sea of impoverished peasantry (e.g. Ireland) demonstrated very little of worth to the surrounding farmers.

Secondly, income (profitability) from agricultural demonstration needs to be demonstrably independent from other sources of income. A key reason for not emulating private demonstration farm activities was that the organisations either received income from elsewhere or cross-subsidised the demonstration activities with other farm resources such as fees from educational activities, sales of machinery, or free labour provided by students (e.g. Hofwyl and Mögelin).

Thirdly, the motivation for demonstration needs to be clearly to support the interests of potential adopters. The example of the Irish model farms illustrates how the suspicion of ulterior motives (in this case colonisation and land clearances) compromises any attempt to encourage emulation. Trust played a key role in predicting the success of model farms of the time and mistrust would have lasting consequences (see Jones, 2019).

Fourthly, demonstrators need to associate with and seek to understand the people they are demonstrating to. Gentleman farmers of the kind who managed model farms in the 19<sup>th</sup> Century did not mix with common farmers, something that Marshall (1795, 199) described as one of “the great stumbling-blocks of gentlemen farmers”. One of the important features of Knapp’s demonstration farming that differed from the model farms of the previous century was that the demonstrators worked closely with the farmers.

Fifthly, the innovations demonstrated need to be affordable to ordinary farmers. Historically, lack of affordability was a key reason for not attempting emulation. For example, many “model farms” of the mid-19<sup>th</sup> Century demonstrated steam cultivation through steam ploughing (e.g. Lawson and Hunter, 1874) or other steam-powered systems such as Mechi’s system for

distributing manure to the fields. However, steam equipment was expensive to purchase and maintain leading Dyer (1893, 829) to observe that Mechi's system was "charming on a model farm" but "the expense of the plant necessary to carry out the idea was obviously out of all proportion to its utility."

Demonstration activities today are much more focused on the needs of individual farmers than those practiced on historical model farms, with a strong emphasis placed on experience-based learning as a means of promoting innovation uptake – seeing and discussing issues of relevance to local farmers on working farms (Bailey et al., 2006). However, other structural factors may also have made it easier for demonstration farming to succeed. Over the centuries much of the poorer farmland has been drained and improved, literacy amongst farming populations is far greater, communities practicing traditional methods are fewer (e.g. Barthel et al., 2013), farmers are able to access private capital to develop their farms, and technologically advanced and scientifically based agriculture supported by government funded education/extension is now the norm rather than the exception. Governments even occasionally provide assistance to farmers by providing support subsidies for adopting demonstrated activities (e.g. sustainable agriculture demonstrations – Štastná et al., 2019). In this relatively level playing field 'common' farmers in Europe and other economically developed countries are no longer constrained like the farmers of the 19<sup>th</sup> Century – most of the barriers that would have prevented emulation for resource reasons have either been significantly reduced or are entirely absent.

However, the situation for the Global South may be different. Some studies have suggested that demonstration farms have failed for similar reasons to those encountered in the historical cases. For example, Maatoug (1981) observed that "extension demonstration farms" in Sudan (supported by United States aid programs) were, in fact operating as "model farms" in that they demonstrated only ideal recommended practices without comparison with traditional approaches. Consequently, the farmers targeted by the demonstration farm were reluctant to adopt innovations. In Iraq, Danok et al. (1978) observed that the Nai demonstration farm's effectiveness in spreading new technology was reduced by the fact that it was unable to produce a profit – a problem identical to that of demonstration farms of the mid-19<sup>th</sup> Century. While today's demonstration farming in the Global South is more focused on building on the collective knowledge and practices of local communities (for example, in the establishment of "collective demonstration farms" – Mazid et al., 2016), the case of historical demonstration farming

provides a salutary lesson for attempts to impose top-down systems of education and extension in situations where ordinary farmers' activities are severely constrained.

A final observation concerns the methodology of the paper and the relevance of the source for future researchers of agricultural education and extension. As illustrated above, the digitised open-source publications that have been available for the last two decades represent a rich and publically accessible source of historical knowledge. Whereas in the past studying the development of agricultural education would have required either the use of secondary sources or the dedication of an entire scholarly career, the availability of comprehensive and searchable libraries of agricultural journals, books, and leaflets means that those with a expertise in contemporary agricultural education are now able to combine this with historical knowledge from the original sources. This fusion of historical and contemporary knowledge has been used recently to identify "extinct" traditional hay meadow management systems (Burton & Riley, 2018) and, by examining historical substitution transitions, to understand how contemporary agriculture could be effected by a transition to biosynthetic protein (Burton, 2019). Of course, historical approaches are not relevant in all cases, but where socio-technological changes occur over a longer period (such as transitions) or contemporary data is limited (in the case of hay meadows, missing entirely) these sources can prove extremely useful for developing an understanding of underlying causes and/or processes. The possibility for non-historians to extend the knowledge of educational/extension development back into the 19<sup>th</sup> Century on specific areas of interest, the compatibility of the sources with today's online research practices, and the accessibility for free from any part of the world makes them a valuable source of information and knowledge for the future.

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