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Animal improvement in the age of illustration: Visual technologies, breed selection, and cattle husbandry in the nineteenth-century Habsburg monarchy

For many European agronomists of the early nineteenth century, animal husbandry was "the soul of agriculture." This representation rested on the key functions that animals played in the agricultural systems of the time. It also related to the broader conception that agriculture was at the heart of an idealized approach to using natural resources that bound together increased productivity with specific visions of society. In Central Europe, many projects of the agricultural revolution sought to increase the productivity of animals to yield fertilizers, draught work and valuable products like wool, milk or meat. For promoters of such intensified husbandry like Joseph Liechtenstern, what was at stake behind agricultural growth was to elevate the Habsburg monarchy to the 'level of civilization' (*Grad von Kultur*) it ought to attain.[1] Throughout the century, agronomists, landowners, governments, and peasants designed varied plans for what they called 'agricultural improvement' or 'uplift' (*Verbesserung* or *Hebung*). These projects also involved processes of environmental transformation. Beyond the increased use of resources required to rear more cattle, agricultural improvers paid meticulous attention to the animals and how to "improve" them. Over the course of the century, reared cattle became, on average, fatter, stronger, and yielded more milk. This transformation of the bodies of whole populations of domesticated animals is associated with a process of selection that is often presented as the "birth of modern breeds."[2]

Many scholars identify the association of breed selection with the search for increased productivity as a triumph of the Cartesian idea of the "animal-ma-

1 Joseph Freyherr von Liechtenstern, *Allgemeine Bemerkungen über den Zustand der Landwirtschaft in den Ländern des Oestereichischen Erbmonarchie. Mit einer summarischen Übersicht der wesentlischsten Geschäftsgegenstände bey der Verwaltung der Landgüter. Nach der Abhandlung über diesen Gegenstand, in der Skizze einer statistischen Schilderung des östereichischen Staats neu bearbeitet* (Vienna: [no publisher], 1802).

2 See the periodization proposed by Marleen Felius et al., "On the History of Cattle Genetic Resources" *Diversity* 6, no.4 (2014): 705–750. For a general historical overview of the nineteenth century, see Éric Baratay, *Bêtes de somme: Des Animaux au service des hommes*, 2nd ed. (Paris: La Martinière/Seuil, 2011).

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chine." They focus in particular on the emergence of a discipline called "zootechnics," or the discipline of the rational management of animals.[3] To a certain extent, nineteenth-century zootechnicians endorsed an idea of the "animal machine" in their textbooks. This representation rested on a simplified consideration of the cattle as a transformer, capable of turning an input (grass) into valuable outputs (energy, milk, meat etc.).[4] Taking this discourse at face-value, a straightforward narrative has emerged: breeders confused their animals with actual machines and engaged in forms of proto-genetic engineering,[5] eventually leading to the development of "industrial husbandry" in the twenty-first century.[6] This narrative locates the origins of the modernization of animal husbandry in a set of ideas and representations, in which technology came to determine every aspect of the relationship between breeders and animals, and reduced the latter to a form of technology.

In this article, I explore another approach to the history of husbandry, moving away from the idealist narrative of the animal-machine, to focus on reconstructing a specific aspect of the working process of the actors involved in defining cattle breeds in the nineteenth century. As several historical studies have already suggested, examining the empirical practice of these actors reveals aspects of this process that challenge the notion of animals being treated as mere machines, as

3 This term emerged in France in the 1830s, and some agricultural experts tried to import it in the German-speaking context. Although the term was much less used there, I will use "zootechnics" to refer to ideas of animal improvement circulating in the German-speaking area, and "zootechnicians" to designate the experts in cattle because the practices of Austrian and French breeders were similar and even connected (see below on international exhibitions).

4 For an Austrian example, see Joseph von Schreibers, *Die Milchwirthschaft im Innern großer Städte und deren nächster Umgebung* (Prague: J.G. Calve'schen Buchhandlung, 1847), 3. The zootechnicians' representation of the machine was however very different from the Cartesian mechanism. See Nathaniel Wolloch, *The Enlightenment's animals: Changing conceptions of animals in the long eighteenth century* (Amsterdam: Amsterdam University Press, 2019), 173, 207; Benedetta Piazzesi, *Del governo degli animali: Allevamento e biopolitica* (Macerata: Quodlibet studio, 2023), 202–203.

5 Although genetics developed only in the early twentieth century and had little influence on breeding practices until the second half of the century. See Bert Theunissen, "Breeding without Mendelism: Theory and practice of dairy cattle breeding in the Netherlands 1900–1950," *Journal of the History of Biology* 41, no.4 (2008): 637–676; Pierre Cornu, "Génétique animale et modernisation de l'élevage dans la France de l'après-guerre. Essai d'épistémologie historique de la selection," *Revue de synthèse* 145, no.1–2 (2024): 213–260.

6 For example Catherine Larrère and Raphaël Larrère, "Actualité de l'animal-machine," *Les Temps Modernes* 630–631, no.2 (2005): 142–163; Jocelyne Porcher, *Vivre avec les animaux: Une utopie pour le XXI^e siècle* (Paris: Éditions la Découverte/M.A.U.S.S., 2011).

well as technicist narratives.[7] It enables us to ask whether early zootechnicians interpreted their work as a form of engineering, or whether they saw their work, and more broadly their relationships to animals, in other ways. Since this amounts to asking how the actors saw the animals they were working on (or "with"?), I will start this exploration with a particular set of sources often overlooked in the histories of zootechnics: the visual material produced by zootechnicians.

Zootechnicians produced a wide range of visual material, like cattle portraits and maps of breeds. This paper will focus on a set of publications circulated within the Habsburg monarchy between 1850 and 1900, along with archives that enable us to reconstruct how actors used emerging imagery technologies for animal improvement. This visual material could be included in textbooks, journals and herdbooks, or published independently as albums and atlases.[8] Depicting cattle was not something new in itself. European painting had a centuries-old tradition of representing these animals. However, artists depicted cattle more often as symbolic elements of an idealized rural landscape, rather than out of genuine interest in animals.[9] A new tradition of naturalist drawings of cattle had emerged in the late eighteenth and early nineteenth centuries, which aimed to describe the animals for scientific purposes, although this perspective did not necessarily eliminate symbolic discourses from the imagery.[10] In Austria, the imperial family hired, for instance, professional painters to produce a series of watercolors representing the whole animal realm for their natural history collections. Their large collection of naturalist paintings featured nine depictions of cattle, made between 1822 and 1848.[11] In the mid-nineteenth century, a shift occurred, as zootechnicians

7 Barbara Orland, "Turbo-Cows: Producing a competitive animal in the nineteenth and early twentieth centuries," in *Industrialising organisms: Introducing evolutionary history*, ed. Susan Shrepfer and Philip Scranton (New York / London: Routledge, 2004), 167–189; Emily Pawley, "The Point of perfection: Cattle portraiture, bloodlines, and the meaning of breeding, 1760–1860," *Journal of the Early Republic* 36, no.1 (2016): 37–72; Stephanie Triplett, "Bovine reproductions: Animal husbandry and acclimatization in the cattle paintings and prints of Rosa Bonheur," *Art History* 46, no.1 (2023): 12–37.

8 I will indicate in the footnotes when digitized versions of the albums are accessible online.

9 Florian Reynaud, "Les bêtes à cornes et l'art pictural. Une étude iconographique pour servir l'Histoire," *Histoire & Sociétés Rurales* 30, no.2 (2008): 31–66; Wolloch, *Enlightenment's animals*, 184–185.

10 Harriet Ritvo, "Race, breed, and myths of origin: Chillingham cattle as Ancient Britons," *Representations* 39 (1992): 1–22.

11 These watercolors are still today in the Austrian National Library. Patrick Poch, "Tiermaler im Naturalienkabinett: Die zoologische Bildersammlung Kaiser Ferdinands I.," in *Des Kaisers schönste Tiere: Bilder aus den habsburgischen Sammlungen* [Katalog der Ausstellung im Prunksaal

began to use photography and chromolithography to systematically incorporate similar depictions into studies limited to cattle. These documented in greater detail the diversity within this species.[12] Publishing extensive albums of breeds became an essential component of the work of breed selection. These images served not just as illustrations or a neutral form of visual record-keeping, but tools that helped shape the "improvement" of husbandry in multiple, often ambivalent ways and set up complex relations between diverse actors in husbandry and the animals involved.

The zootechnicians' visual material can serve as a historical source in several ways. First, these images remind us that the work of husbandry improvement relied not only on textbooks, which form the basis of most historical accounts, but also on specific visual material. Their visual analysis brings to the fore some ambiguities in the relationship between improvers and their animals, especially regarding the blurred distinction between animals as productive machines and living organisms. In this way, the images draw our attention to practices of improvement beyond what zootechnicians wrote about, thereby allowing us to de-center our perspective from their narratives.[13]

Second, the conditions under which this imagery was produced and used help us recover the perspectives of other historical actors concerning the place of domestic animals in agricultural improvement projects. The new imagery around cattle expanded the work of improvement beyond just the dual relationship between breeder and animal. It created a space of intervention for zootechnicians as experts, and the Habsburg government also seized the opportunity to intervene in cattle selection.[14] This raises the question of how the visuality of cattle interacted with broader visions of husbandry improvement and the environmental transformations they entailed.[15] From this perspective, we can analyze these visual sources as part of what Sverker Sörlin and Nina Wormbs have called "environing

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der österreichischen Nationalbibliothek], ed. Monika Kiegler-Griensteidl and Patrick Poch (Vienna: Kremayr & Scheriau, 2022), 141–158.

12 Triplett, "Bovine reproductions," 14.

13 Such an approach bears some similarities with Nathaniel Wolloch's call to enlarge the study of eighteenth-century conceptions of animals beyond the philosophical and scientific ones to historiographical and economic conceptions, though this author remains within the field of intellectual history. Wolloch, *Enlightenment's animals*, 13.

14 On the idea that, in modern husbandry, breeders don't make the selective choices on their own, see Pierre Cornu, "L'élevage bovin entre technosciences, marché et politiques publiques: Une mise en perspective historique," *Pour* 231, no.3 (2016): 77–79.

15 According to Gillian Rose, *Visual methodologies: An introduction to the interpretation of visual materials*, 2nd ed. (London: SAGE Publications, 2007), 2: visuality is "the way in which vision is constructed in various ways."

technologies," i.e. tools that enable a process of making the environment occur. With this concept, these authors call attention to two entangled sides of the process of "environing": the shaping of the material world by humans as well as the "conceptual work" to "bring into being understandings of the environment."[16] Visual sources open up possibilities to link the history of agricultural knowledge with the environmental history of agriculture, particularly the evolutionary history of cattle breeds.[17] This possibility has been partly suggested by twenty-first-century zootechnicians, who tend to approach these visual sources as snapshots of how cattle looked at the time of the "birth of modern breeds."[18] However, the images should be approached with caution, since the visual material produced by nineteenth-century zootechnicians presented specific visions about the future of cattle husbandry. Despite the authors' efforts, this visual material did not correspond to the reality of animal husbandry at the time, and its influence on agricultural programs unfolded in complex ways.

The use of the same visual material by actors beyond zootechnicians, and especially by the Habsburg government, suggests more indirect ways in which the creation of knowledge about animals impacted rearing practices. Increased government engagement in the production and circulation of this visual material highlights how the prospect of spreading more productive cattle was connected to broader self-representations of the empire. Zootechnical knowledge played a crucial role in shaping policies to support the improvement of husbandry, while some lasting ambiguities and uncertainties provided local actors with possibilities to advocate for their own interests as well. The environing work of cattle "improvement" unfolded within a larger set of intentions and programs, and the zootechnicians' visual material contributed to broader visions of development, in which socio-economic and political rationales played a role as crucial as that of technology.[19] Focusing on multifaceted empirical practices that were less coherent than the idealist narrative of the "animal-machine" suggests, we can thus propose a less linear and straightforward history of European (agricultural) modernization

16 Sverker Sörlin and Nina Wormbs, "Environing technologies: A theory of making environment," *History and Technology* 34, no.2 (2018): 103–107.

17 Edmund Russell, "Evolutionary history: Prospectus for a new field," *Environmental History* 8, no.2 (2003): 204–228; Joshua Specht, "The Rise, fall, and rebirth of the Texas longhorn: An evolutionary history," *Environmental History* 21, no.2 (2016): 343–363.

18 Bernard Denis, *Les Vaches ont une histoire : Naissance des races bovines* (Paris: Delachaux et Niestlé, 2016).

19 On "visions" of development, see Iris Borowy et al., "Introduction: What is development, why should we be concerned about its history, and why is a new serial publication needed?," in *Yearbook for the history of global development*, Corinna Unger et al., eds., vol.1 (Berlin and Boston: De Gruyter, 2022), 5–8.

and how it reshaped the entanglements between economic developments and environments.

The first section of the article analyses the contexts in which zootechnicians produced visual materials about the breeds, and uncovers the several, and at times ambiguous, meanings that they attached to the animals through this medium. The next section will analyze how zootechnicians progressively redefined the concept of breed, and how this conceptual work interacted with the ongoing evolutionary history of cattle. Finally, the last section will explore how different agricultural actors tried to utilize this form of knowledge to shape the development of improvement programs.

1 Looking for productive cattle, from exhibitions to albums

In the Habsburg monarchy, the publication of the first albums of cattle breeds in the mid-nineteenth century was an outgrowth of efforts to improve husbandry that had begun several decades earlier. Agronomists in the late eighteenth and early nineteenth centuries insisted that animal husbandry was a pivotal component of the agricultural systems of the time, and that any prospect of agricultural growth depended on more productive animals. Landowners, especially the nobility who owned large estates, were particularly interested in such schemes. After the Napoleonic Wars, they also attracted the attention of the Habsburg state, which had a direct fiscal interest in more productive agriculture since the implementation of the land tax in 1817, and more broadly, a political interest in stabilizing the monarchy's economy that had been weakened during the wars. In several provinces of the empire, agronomists, landowners, and their estate managers founded a network of agricultural societies under the distant supervision of the imperial government. Members of these societies, who saw themselves as the political elite of the monarchy, aimed to widely promote the most productive agricultural methods of the time in a "patriotic" spirit.[20] In the 1820s, these societies started to organize yearly cattle exhibitions, first in large cities (Vienna, Prague, Brno,

20 "Geschichtliche Darstellung der Gründung der k.k. Landwirthschafts-Gesellschaft in Wien," *Verhandlungen der kaiserlich-königlichen Landwirthschafts-Gesellschaft in Wien* 1, no.1 (1816): 1–9; Ernst Bruckmüller, "The Agricultural Society of Vienna and its Connections to Southern and Western Europe between 1812 and 1857," *Acta Histriae* 28, no.2 (2020): 279–296. For a more general overview: Peter Jones, *Agricultural enlightenment: Knowledge, technology, and nature, 1750–1840* (Oxford: Oxford University Press, 2015).

Budapest) and, after a few years, in some parts of the countryside, particularly in Lower Austria.

For the agronomists and noble landlords who organized them, the exhibitions had two aims. First, they tried to promote more intensive practices related to animal husbandry, such as the abandonment of common grazing and the adoption of stable feeding. In this respect, the exhibitions sought to teach improved practices to allegedly ignorant and backwards peasants, often in a very paternalistic manner.[21] Second, the organizers used the exhibitions as an opportunity to gather knowledge on the livestock that was already present in the empire. Confronted with the diversity of the exhibited cattle, agronomists soon acknowledged that they had limited knowledge about what animals were available for the purpose of improvement. Seeing and classifying the animals during exhibitions thus became an essential part of the knowledge regime that should sustain the improvement process.[22] With the development of new imagery technologies like chromolithography and photography, agronomists aimed to complement their direct observation of the animals with illustrated publications. As the veterinarian Georg Eckel explained to his colleagues of the Viennese Agricultural Society in 1848, in the "era of illustration," the "sensually tangible" (visual representations) had become "a need of our time" at the expense of "the ideal" (purely abstract knowledge).[23] The Agricultural Society started to work on an album with a Viennese printer, but this first project ultimately failed due to the latter's death.[24]

The first albums published in the 1850s were linked to two large cattle exhibitions, the Concours universel agricole in Paris of 1856 and the fiftieth anniversary of the Viennese Agricultural Society in 1857. In both cases, the organizers of the exhibitions photographed what they considered to be the most "beautiful" animals, which were chosen from among the prize-winning animals of the contest. The albums served as temporal extensions of the exhibitions. The French

21 Anton Freyherr von Bartenstein, "Vorschlag des Gesellschafts-Ausschusses zu öffentlichen Ausstellungen von veredeltem Horn- und Schafvieh," *Verhandlungen der kaiserlich-königlichen Landwirtschafts-Gesellschaft in Wien* 3, no.1 (1822): 16–28.

22 Sophie Corbillé and Emmanuelle Fantin, "Les Animaux dans les expositions universelles au XIX^{e} siècle : monstration, ordonnancement et requalification du vivant. Paris et Londres, 1851–1889," *Culture & Musées. Muséologie et recherches sur la culture*, no.35 (2020): 215–220.

23 Franz Georg Eckel, "Antrag des beständigen Ausschusses zur Herausgabe einer bildlichen Darstellung und Beschreibung der in Niederösterreich vorkommenden Rindvieh-Racen auf Kosten der Gesellschaft," *Verhandlungen der kaiserlich-königlichen Landwirtschafts-Gesellschaft in Wien und Aufsätze vermischten ökonomischen Inhaltes. Zweite Folge* 5, no.1 (1848): 48–53.

24 Files No. 86, Box 115 and No. 400, Box 125, Landwirtschaftsgesellschaft (Agricultural Society, LWG), Landwirtschaft (Agriculture, LW), Allgemeines Verwaltungsarchiv (General Administrative Archive, AVA), Österreichisches Staatsarchiv (Austrian State Archives, OeStA), Vienna, Austria.

and Austrian governments respectively published the images as either a photographic album or a lithographic album, which was five times cheaper.[25] The Viennese album was even colorized through chromolithography. According to the editors of both albums, the photographic technique ensured accurate representation of the outlines of the animals, while professional painters present at the Austrian exhibition assured an accurate rendition of the colors. Overall, the representations were supposed to be "true to nature."[26]

The decision to show the animals in profile, which remained a consistent element throughout the century in all cattle albums, was also essential for creating a sense of scientific objectivity. Zootechnicians considered this angle to be the best suited for showcasing the unique physical characteristics of each type, since it displayed a larger portion of the body.[27] By choosing this perspective, they also departed from other existing modes of representing cattle in the agricultural press, like the engravings showing the back of the animals according to the Guénon-system, a popular technique developed by a French cattle trader to select dairy cows.[28] Moreover, profile images visually structured the image around the lines of the animal's body, organizing the picture in rectangular shapes. In this way, the animal was shown in a kind of squared grid and the image lacked any sense of perspective (Figure 1).[29] When brought together in a format of unprece-

25 *Abbildungen österreichischer Rindvieh-Racen, herausgegeben im Auftrage des k.k. Ministeriums des Innern* (Vienna: k.k. Hof- und Staats-Druckerey, 1859); Émile Baudement, *Les Races bovines au concours universel agricole de Paris en 1856. Études zootechniques publiées par ordre de s. exc. le ministre de l'agriculture, du commerce et des travaux publics* (Paris: Imprimerie impériale, 1862), accessed July 15, 2025, https://gallica.bnf.fr/ark:/12148/bpt6k318130c/f9.planchecontact.

26 *Abbildungen österreichischer Rindvieh-Racen*, vi.

27 Julius Ritter von von Blaas and Ferdinand Kaltenegger, *Album der Rinder-Racen der österreichischen Alpenländer. Nach Original-Aufnahmen* (Vienna: k.k. Hofbuchhandlung Wilhelm Frick, 1894), accessed July 15, 2025, https://sammlung.volkskundemuseum.at/bibliothek/content/titleinfo/109094.

28 Compare with the engravings in "Concours Agricole Universel – Espèces Bovines," *L'Illustration, Journal Universel*, June 14, 1856, 392–393, accessed July 15, 2025, https://gallica.bnf.fr/ark:/12148/bd6t513855115/f5.item. On the Guénon-system and its critiques from mid-nineteenth-century zootechnicians: Fabien Knittel, "Le système Guénon : Une innovation technique pour l'amélioration de la sélection des vaches laitières (années 1830–années 1900)," *Technologie et innovation* 6, no.4 (2021): 1–9.

29 On photography and "mechanical objectivity," see also Triplett, "Bovine Reproductions," 26–28.

dented size, the representations enabled the viewer to "recognize with certainty" the attributes of different kinds of animals.[30]

Figure 1: "Bull. Bernese Breed [*Race*]. 3 ½ years old. Property of H.[is] i.[mperial] Highness archduke Albrecht. In-breeding of the archducal swissery [dairy farm] in Wieselburg [/Moson] in Hungary." (Source: *Abbildungen österreichischer Rindvieh-Racen, herausgegeben im Auftrage des k.k. Ministeriums des Innern*, Vienna, k.k. Hof- und Staatsdruckerei, 1859, plate XXI [Österreichische Nationalbibliothek].)

Despite the images' claim to objectivity, the albums' classifications of cattle into breeds were ambiguous on several counts. On the one hand, we can compare these images to the tables used by juries of agricultural exhibitions to reconstruct the zootechnicians' gaze on animals in the mid-nineteenth century. In that respect, the primary factor in the definition of the 'beautiful cattle' (*das schöne Vieh*) was a set of external characteristics. Breeders were supposed to pay great attention to the general shape and proportions of the body, as well as to a series of details about the legs, tail, breast, neck, head, horns, color, and even the look and "temper" of the animal.[31] The album images suggested that these external characteristics could be extended to a group of animals more generally to define a "type." The lithographs from the albums were thus more than simple portraits of outstanding individuals, like those circulating simultaneously in agricultural

30 As the Habsburg administration argued when advertising the subscriptions to the Viennese album: File No. 8657/1724, Box 6, 498 Središnje agronomsko društvo Zadar (Central Agronomic Society in Zadar, 498 SADZ), Držani Arhiv u Zadru (Croatian State Archive in Zadar, HR-DAZD).
31 File No.176, Appendix No. 12 and No. 13, Box 22, LWG, LW, AVA, OeStA.

newspapers and analyzed by Emily Pawley.[32] In the design of the album, the animal's individuality was progressively pushed to the background to benefit the larger entity it was supposed to embody almost perfectly: the breed. However, this way of looking at the album made it easy to forget that the depicted animals were the prize-winners of a contest, i. e. the animals who could already be considered "improved" versions of their counterparts. In other words, and as zootechnicians' repeated complaints in agricultural journals also suggest, most animals in the herds of Austrian breeders probably looked different from the ones depicted in the album.

On the other hand, beneath their identification as a "type," the animals depicted in the 1850s still appeared as individuals as well. Especially in the Viennese album, short notes indicated many contingent details about the estates from which they came. The authors of these notes, probably the breeders themselves, used a language of kinship to refer to the animals' grandparents, brothers and sisters. Some Austrian exhibitors won prizes in both the Parisian and Viennese exhibitions, which allows us to identify animals depicted in both albums as siblings.[33] This attention to genealogy corresponded to larger debates among zootechnicians about the "heredity" of physical characters, which were considered attributes of particular "blood lines."[34] In that respect, the genealogical notes of the Viennese album paved the way for the publication of the first herd books in the 1860s and 1870s. By then, genealogy information became a necessary complement for breeders looking for animals capable of maintaining productive capacities over several generations. Although zootechnicians studied animal bodies in increasingly geometrical and arithmetic terms, their main way of improving cattle was to selectively pair animals for reproduction.[35] Whereas the mere appearance of an animal could deceive a breeder concerned about its future offspring, zootechnicians considered genealogical records a warrant of quality.[36]

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32 Pawley, "The Point of perfection."

33 For example the bull from Zillertal in *Abbildungen österreichischer Rindvieh-Racen*, 11, and the cow in Baudement, *Les Races bovines*, plate xlix; or the Pinzgauer cattle in *Abbildungen der österreichischen Rindvieh-Racen*, 2, and in Baudement, *Les Races bovines*, plate xlv

34 Roger J. Wood and Vítězslav Orel, "Scientific Breeding in Central Europe during the Early Nineteenth Century: Background to Mendel's Later Work," *Journal of the History of Biology* 38, no.2 (2005): 245–252; Bernard Marty, 'L'Hérédité pour les zootechniciens français de la seconde moitié du XIX^{e} siècle', *Bulletin d'histoire et d'épistémologie des sciences de la vie* 13, no.1 (2006): 57–87.

35 Éric Baratay, *Le Point de vue animal : Une autre version de l'histoire*, L'Univers Historique (Paris: Seuil, 2012), 75–92.

36 Hugo Hitschmann, "Heerdbücher," in *Allgemeine land- und forstwirtschaftliche Zeitung, 14. Jahrgang* (Vienna: Carl Gerold's Sohn, 1864), 401–405; "Ein Heerdbuch für Nieder-Oesterreich,"

Such representations, close to the language of human nobility, helped zootechnicians frame the idea of improvement as one of 'ennoblement' (*Veredlung*).[37] Within both German- and French-speaking contexts, they also framed the selection of animals in a specific temporality spanning over several generations, and through notions of race.[38]

Finally, producing the images enabled zootechnicians to strengthen the idea of an intrinsic link between the animals and their environment. The latter could not be displayed at the exhibition, where zootechnicians photographed animals in front of a curtain.[39] But in the album, each breed was referred to by a name denoting its regional origin. The transformation of photographs into lithographs enabled editors to reintroduce the environment surrounding the animals. This operation also involved the erasure of herdsmen who held the animals for the photograph. Cattle from Alpine regions were presented against high mountains and steep pastures, while a Hungarian ox was usually staged on a plain. The details of these environments were intentionally minimal They were rather meant to be suggestive of the animals' *Heimat* (home). The outline of a typical draw well and high grass were enough to represent the Hungarian plain.

This practice led to apparent contradictions between images and explanatory notes. Although the "Bernese" cattle from Figure 1 were represented on an alpine pasture, the notes indicated that the animal came from an estate in the Hungarian plain and spent most of its time in a cowshed. This rearing practice followed the mainstream agronomic recommendations of the time, which promoted new patterns of land use favoring the replacement of pastures with fodder crops and the feeding of animals all year long in large cowsheds. Zootechnicians usually praised the development of stable feeding, but they represented it only marginally in their albums of breeds. If the representation of the Bernese bull on an Alpine pasture instead of its Hungarian cowshed could seem paradoxical at first sight, it made more sense in relation to the album's larger narrative about the possibility of settling breeds in new locations. The 1859 Viennese album presented "Swiss" cattle as originally "foreign" to the "Austrian" empire. However, the authors emphasized that several decades of imports had shown that these animals were

in *Allgemeine land- und forstwirtschaftliche Zeitung, 15. Jahrgang* (Vienna: Carl Gerold's Sohn, 1865), 97–99.

37 Joseph von Hazzi, *Ueber die Veredelung des landwirthschaftlichen Viehstandes zugleich die Grundlage des Wohles und Reichtums einer Nation* (Munich: Joseph Lindauer'sche Buchhandlung, 1824).

38 In the nineteenth century, the English concept of "breed" corresponded most of the time to the French *race* and the German *Rasse.*

39 See the photographs reproduced in Denis, *Les Vaches ont une histoire.*

able to settle in the monarchy and become fully part of its animal population. The author of the introduction to the album used the term *sich einbürgern.* This was probably not meant in the literal sense of 'becoming citizens,' but such language denotes that zootechnicians could consider the question of animal circulation in terms analogous to the circulation of human populations.

The analogical proximity between human and cattle populations was even more present in the visual language of maps. The editor of the Parisian album, Émile Baudement, commissioned five maps representing the origins of cattle breeds. Baudement used geological maps as a source of inspiration, as if the cattle had emerged from the ground of their native region. However, as he admitted in his introduction, the result was not satisfying since, unlike geological layers, cattle breeds "migrated" and "mingled" with each other.[40] In these same years, Austrian cartographers and statisticians developed a new cartographic language suited to the visualization of statistical data, particularly regarding human populations.[41] As Jason Hansen has emphasized, advances in chromolithography provided new technical possibilities that enabled them to reframe the concepts of nationalities in a territorialized way.[42] The most famous instance of this development was Karl von Czörnig's ethnographic map of Austria, which presented the distribution and overlaps of nationalities within the empire's territory (as defined by their language). Czörnig's map aimed overall to stage the Habsburg Empire as a multi-national polity capable of integrating the different peoples of Central Europe, though nationalist politicians would eventually use the same tool for the opposite purpose. Similarly, in the case of cattle in the 1870s, zootechnicians started to produce similar maps using the same techniques to visualize statistical data from animal censuses. Such maps were meant to display the "homes" of cattle breeds, as well as the regions where they had subsequently (been) more or less successfully settled.[43] From this perspective, the issue of husbandry improvement became akin to population management.[44]

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40 Baudement, *Les Races bovines*, lxxiv.

41 Ingrid Kretschmer, Johannes Dörflinger, and Franz Wawrick, *Österreichische Kartographie. Von den Anfängen im 15. Jahrhundert bis zum 21. Jahrhundert*, Wiener Schriften zur Geographie und Kartographie 15 (Vienna: Institut für Geographie und Regionalforschung der Universität Wien. Kartographie und Geoinformation, 2004), 188–193.

42 Jason D. Hansen, *Mapping the Germans: Statistical science, cartography, and the visualization of the German nation, 1848–1914* (Oxford: Oxford University Press, 2015).

43 *Cultur-Atlas von Nieder-Oesterreich nach den neuesten statistischen Erhebung. Aus Anlass der Wiener Weltausstellung* (Vienna: Verlag der k.k. Landwirtschafts-Gesellschaft in Wien, 1873),

The mid-nineteenth-century albums were ambiguous tools that encompassed several contrasting visions of the animals. They demonstrate that the management of cattle escaped the scope of the metaphor of the "animal-machine" in many ways. The albums suggest that zootechnicians could assign very different meanings to their work with animals. They might see themselves as working with individuals that belonged to a particular "bloodline," which carried connotations of nobility, working with generic breeds belonging to a particular environment, or also working with racialized populations of diverse animals that could acclimatize to new homes. The visual material produced by zootechnicians crystallized these multiple aspects and shaped the definition of cattle breeds, at both the levels of scientific conceptualization and material selection.

2 Evolving animals, from breed definition to cattle selection

Zootechnicians intended their albums to advance a larger scientific debate about the definition of cattle breeds that had started with the improvement projects of the 1820s. Their original aim was to bring some coherence to the rather chaotic classification of animals within the species. However, this research yielded a vision of the animals that, ambiguously, emphasized both heredity and evolution, as well as original home and migratory circulation, and only imperfectly reflected transformations that were already ongoing on the ground.

In the early nineteenth century, breeders used relatively broad geographic names to refer to breeds such as the "Swiss" or "Styrian" cattle. Moreover, the terminology related to 'breeds' or 'races' (*Raçe*, *Stamm*, *Schlag*) of cattle was very loosely defined and varied from one user to the next.[45] In exhibitions and albums, zootechnicians referred to increasingly refined types of cattle with more accurately pinpointed geographical homes. Maps played an important role in visually associating one breed with a territory on a very small scale. The "Styrian" cattle dis-

plates 20 and 21; Joseph Ritter Lorenz von Liburnau, ed., *Atlas der Urproduction Oesterreichs in 25 Blättern mit erläuternden Texte* (Vienna: R. v. Waldheim, 1878), plate xxi; Franz Zoepf, *Rinder des Oberen Donauthales in Ober- und Niederoesterreich. Zweites Heft. Niederoesterreich*, Die Oesterreichischen Rinder-Racen (Vienna: Wilhelm Frick, 1884), also included a map representing the spread of breeds with arrows.

44 Sara Wilmot, "Breeding farm animals and humans," in *Reproduction: Antiquity to the present day*, ed. Nick Hopwood, Rebecca Flemming and Lauren Kassell (Cambridge: Cambridge University Press, 2018), 405–406.

45 File No. 61, Box 39, LWG, LW, AVA, OeStA.

appeared, while the albums fixed the type of Mürztaler, Mariahofer, Murbodner, or South Styrian cows, which could be easily differentiated through their external characteristics. This standardization of the breed's look had a normative effect, particularly regarding colors. It operated at the expense of some individual animals that had formerly been considered representative of a breed. In the case of Mürztaler cows, for instance, records from rural exhibitions in the 1830s show that they displayed a wide variety of colors, ranging from white to different shades of grey. By the 1850s, the Mürztaler cattle were presented in albums as predominantly, if not uniquely, "badger" grey.[46] As the geographical names became more precise, the lists of breeds originating from the Habsburg monarchy became longer as well. The visual representation of territorialized breeds raised challenges for the zootechnicians, starting with the question of which cattle present in the empire's countryside were worthy to be categorized as a breed strictly speaking, and how the different groups of cattle should be organized in relation to each other.

As the work of zootechnicians went on, the concept of breed was more strictly defined in order to make clearer distinctions between actual cattle met on the ground and the idealized types represented in the albums. An album published in 1894 even invited "practitioners" to compare the look of their herds with its images.[47] By the end of the century, zootechnicians reserved the term *Rasse* to describe animals that transmitted their external characteristics in a constant way over generations. In contrast, they defined a different category, the mere "*Landschläge*" (local varieties), for animals that did not meet this definition. According to a survey published in the 1870s, which was one of the first surveys to count cattle on the basis of breeds, the *Landschläge* accounted for a majority of the empire's livestock (ca. 54 %).[48] Although such local animals lacked rigorously constant characteristics, some of them could be improved through crossbreeding with animals that belonged to a breed in the more narrow sense of the term. Between the *Rasse* and the *Landschlag*, zootechnicians described some animals as

46 See for example the reports of the countryside exhibitions of 1838 in Files No. 652, No. 653, No. 656, No. 672, Box 72, LWG, LW, AVA, OeStA in which "badger grey" Mürztaler cows account for only two thirds of the exhibited animals. The Mürztaler bull depicted by Leopold Brunner for the imperial collection of watercolors was also white and black. "*Mürzthaler Stier*," 1849, watercolor, Kunstsammlung Kaiser Ferdinand I. von Österreich (Art Collection of Emperor Ferdinand I of Austria), Österreichische Nationalbibliothek (Austrian National Library), Pk 509, SUPPL1, 18.

47 Von Blaas and Kaltenegger, *Album der Rinder-Racen der österreichischen Alpenländer.*

48 Lorenz von Liburnau, *Atlas der Urproduction Oesterreichs.* On the issue of identifying "breeds," see also Tadej Pavkovic's study on Carniola: "Razvoj pasem in pasemskega razvrščanja goveda na Kranjskem v 19. Stoletju," *Filozofski vestnik* (forthcoming).

intermediary forms or "breeds" in the making. This was, for example, the case of the "Stockerauer" cattle, which were described for the first time in the 1850s and eventually entered a photographic album of the 1873 Vienna world exhibition.[49] This group of animals, originating from Lower Austria, was described as the result of the crossing of local cows with Mürztaler bulls imported from Styria. These overlapping categories considerably blurred the distinctions between the different categories of animals. Joseph Lorenz distinguished, for instance, eighteen "fixed types to be considered as breeds" from eight *Landschläge*, to which he further added five "foreign" breeds that had "influenced" the local varieties. As the author himself admitted, the concept of breed was still relatively vague.[50] His classification and groupings of breeds were indeed different from the classifications proposed in other publications of the time, highlighting the instability of the category. Martin Wilckens, a professor at the Universität für Bodenkultur in Vienna, emphasized that the categorization was further complicated, if not falsified, by the efforts of individual breeders to have their local cattle recognized as a full breed to enhance their market value.[51]

As the Stockerauer cattle's status of breed "in the making" emphasizes, the instability of breed classifications can also be explained by the fact that zootechnical surveys documented groups of animals that were not stationary, but in a process of evolution. In the 1870s, a complementary type of cattle depiction emerged to support theories that modern domestic cattle had descended from wild cattle. According to Wilckens, one of its proponents, this evolutionary theory was best proved by anatomical comparisons of the cattle's skull.[52] His handbook on the natural history of domestic cattle included ten classical depictions of breeds in profile, and a more systematic presentation of cattle faces for the thirty-three varieties that he described. The images were once again created during exhibitions. Cattle faces (or skulls) emerged in the 1870s as the standard second picture to de-

49 *Notes sur l'élevage du bétail des espèces bovine, ovine et porcine de l'Empire d'Autriche. Publié par ordre du ministère autrichien de l'intérieur* (Paris: Firmin Didot frères, fils et cie., 1856); Heinrich Schnaebeli, *Album der oesterreichischen Melkviehracen ausgestellt von den betreffenden landwirthschaftlichen Gesellschaften auf dem Weltausstellungsplatze in Wien* (Berlin: H. Schnaebeli, 1873), accessed July 15, 2025, https://opendata.uni-halle.de/handle/1981185920/33587.

50 Lorenz von Liburnau, *Atlas der Urproduction Oesterreichs*, 10 and plate xxi.

51 *Martin Wilckens, Die Rinderrassen Mittel-Europas. Grundzüge einer Naturgeschichte des Hausrindes* (Vienna: Wilhelm Braumüller, 1876), accessed July 15, 2025, https://digital.onb.ac.at/OnbViewer/viewer.faces?doc=ABO_%2BZ219237703, 8–9. Lorenz's and Wilckens' lists of breeds could for example be compared with their colleagues' lists in Zoepf, *Rinder Niederösterreichs* or von Blaas and Kaltenegger, *Album der Rinder-Racen der österreichischen Alpenländer.*

52 Wilckens took inspiration from the work of the Swiss paleontologist Ludwig Rütimeyer. See *Die Rinderrassen Mittel-Europas*, 6–7 and chapter 1.

scribe the breeds and make the distinctions clear by relating the image of current cattle to the skulls of one of the four (allegedly) original ancestors of the species. This method provided an additional base for discussions around the classification of cattle breeds but never solved the problem in a definitive manner.[53]

Naturalists and zootechnicians used this imagery to make visible a long-term evolution of cattle breeds that was linked to the process of domestication. Wilckens opened his book by taking issue with the theory that cattle had been "created" as domesticated animals. He used the anatomical evidence of skulls and faces to demonstrate that the process of evolution had started at a time prior to the written historical record. But Wilckens' ultimate interest was in understanding the transformations of cattle in the present to offer breeders a guide to choose the breeds they would allow to reproduce. For that matter, he also identified climate, soil and "culture" (which he also called 'artificial breeding' – *künstliche Züchtung*) as the origins of the differentiations between the main "races" of cattle.[54] If the classification of breeds was a social construction of nineteenth-century zootechnicians, the latter saw these breeds as a combined product of natural forces on the one hand, embodied in physiological laws and climatic influences, and of human interventions on the other hand. Whereas the metaphor of the machine seemed to attribute the development of cattle breeds to human ingenuity, zootechnicians admitted that they operated within possibilities limited by "natural" constraints.[55] According to Ferdinand Kaltenegger, the author of a reference survey of Alpine cattle breeds, breeds were as much the product of a "natural history" as that of a "*Culturgeschichte.*"[56] Crucially, this "cultural history" of cattle was not merely a history of human artifices. As Kaltenegger saw it, it was inseparable from histories of animal and human migrations, especially during prehistoric times and the Early Middle Ages (known in German as the *Völkerwanderung*). According to him, drawing on zootechnical measurements as well as on historical texts and archaeological remains, contemporary cattle breeds were the descendants of several encounters of moving people and animals.

In the eyes of zootechnicians, the evolution of cattle was not necessarily a long-term process; it could unfold very quickly as well. As surveyors conducted their studies, they found themselves confronted with short-term transformations of cattle breeds, often linked to recent imports of animals. In his book published in

53 Ferdinand Kaltenegger, *Die geschichtliche Entwicklung der Rinderracen in den österreichischen Alpenländern. Landesculturhistorische Skizze* (Prag: J.G. Calve'sche Buchhandlung, 1881), 2.

54 Wilckens, *Die Rinderrassen Mittel-Europas*, 14–23.

55 Baudement, *Les Races bovines*, iv–vi.

56 Kaltenegger, *Die geschichtliche Entwicklung der Rinderracen*, 28. See also page 4 on the relation between histories of human and animal migrations.

1876, Wilckens reported how recently imported cattle breeds had failed to settle in the province of Bukovina. The animals imported from the Western provinces of the empire would quickly "take bodily forms similar to the native steppe-breeds," something Wilckens attributed to climatic influences.[57] A few years later, in 1878, the Ministry of Agriculture commissioned August Günther to study husbandry in Bukovina. As part of his report, Günther produced a series of pencil drawings of the breeds in profile and face, which testifies to how such images had become a visual norm. Nevertheless, when the report was finally reviewed prior to its possible publication in 1893, members of the Bukovinian Agricultural Society judged Günther's report "totally outdated." Among other critiques, they emphasized that the "grey steppe-cattle" depicted by Günther was becoming very rare following major shifts in the local husbandry. In 1882, the Austrian government had decreed a border closure against imports of cattle from Russia and Romania. Bukovinian breeders had seized the occasion to import "foreign" breeds and cross them with the "*Landschlag*." A sector of cattle fattening relying on more intensive techniques, such as stable feeding, had emerged, which involved other types of animals than the traditional grey cattle. According to a local veterinarian, Bukovinian husbandry found itself "in the moment when a new *Landschlag* is just taking shape."[58] This process entailed both the rise of desirable breeds like the Bernese or the Mürztaler and the progressive disappearance of the less productive *Landschläge.*

* * *

Zootechnical studies were part of a range of tools used by zootechnicians to create more accurate knowledge about the animals "indigenous" to the monarchy's territory or that could acclimatize there. The illustrated albums enabled their authors to collectively develop a classification of individual animals within groups and make local breeds visible in a literal sense. But this classification also entailed several tensions tied to the ongoing transformations of husbandry, particularly the tension between the idea of "native" and "circulating" breeds, and the tension between the search for the "heredity" and the evolution implied by the project of

57 Wilckens, *Die Rinderrassen Mittel-Europas*, 18.

58 B3 (drawings) and No. 11420/1521, Annexes, Landeskultur (Land improvement, LK), Ackerbauministerium (Ministry of Agriculture, AM), LW, AVA, OeStA. See also Emil Baier, "Die Rindviehzucht in der Bukowina," in *Geschichte der österreichischen Land- und Forstwirtschaft und ihrer Industrien 1848–1898. Zweiter Band* (Vienna: Commissionsverlag Moritz Perles, 1899), 661–670.

improvement.[59] Visual materials were an essential part of the studies that tried to make sense of and rationalize these ongoing and complex dynamics. They shaped an understanding of improved cattle breeds as the combined result of a physiological evolution following the laws of nature on the one hand and a process tied to human history and agricultural progress on the other hand. The classification of animals into breeds and the transformations of animals were two simultaneous processes. In that respect, zootechnicians' efforts to document cattle and to create a shared definition of breeds also enabled other actors to shape programs for agricultural development. The albums helped the zootechnicians and, more crucially, the Habsburg government to advance the project of improvement from a shared horizon of expectations to a more standardized and regular plan for action.

3 Breed promotion and the design of improvement programs

The work to produce visual material about cattle breeds opened up space for more actors to intervene in matters of husbandry than the sole breeder and his animals, and to introduce their own agendas into the realm of animal improvement. For many of their authors and editors, the purpose of the illustrated albums of breeds went beyond simply creating more accurate knowledge for its own sake.

Particularly for the Habsburg government that funded or published many of these studies, the illustrated albums were meant to facilitate the circulation of the most productive animals. The use of a technology of reproducible images, especially lithography (at the time more easily reproducible and cheaper than photography), was key to this function. Whereas the traditional naturalist paintings had a very limited reception in Vienna, reproduction technologies enabled the government and agricultural associations to promote the albums at local levels of representation across all the provinces.[60] The diplomatic services ensured the diffusion of the albums in other European states with the hope of supporting the monarchy's cattle exports, or for use in negotiating trade agreements.[61] In addition to

59 On this point, see more particularly Rebecca J. H. Woods, *The Herds shot round the world: Native breeds and the British Empire, 1800–1900* (Chapel Hill: The University of North Carolina Press, 2017).

60 For the example of the Lower Austrian Agricultural Society: File 767, Box 173, LWG, LW, AVA, OeStA. For the example of the Habsburg Governorate in Dalmatia: Files No. 8657/1724, No. 11139/2333 and No. 12148/2523, Box 6, 498 SADZ, HR-DAZD.

61 File No. 6371–581, Folder 7, Box 192, LK, AM, LW, AVA, OeStA; File No. 1228–120, Folder 7, Box 210, LK, AM, LW, AVA, OeStA.

their association with a home region, the cattle breeds acquired an "Austrian" identity, which in the context of the 1850s referred to the empire as a whole, and was supposed to enhance their value in international markets – or at least government agents hoped.[62] As the introduction to the Viennese album of 1857 emphasized, this "Austrian" identity also acquired a political dimension as it demonstrated the empire's ability to keep pace with the other European countries in the movement towards agricultural progress.[63] The albums functioned as a catalog of breeds available for improvement, presenting the empire's animal assets in a luxurious manner. The government subsidized the purchase of such albums by agricultural schools within the monarchy, as well as similar images printed on wall tables for use in primary schools.[64] However, as the president of the Agricultural Society of Vorarlberg Count Carl Belrupt-Tissac put it, with a touch of frustration, the ministries in Vienna seemed to consider illustrated albums of Austrian breeds and maps primarily as a "business card" of the empire aimed at neighboring states.[65] In this way, the albums served a dual purpose in supporting a governmental agenda. Politically, they aimed to present Austria as a modern empire that ruled over improved animal populations. Economically, the goal was to stimulate market demand, which would enhance the value and distribution of the most productive breeds.

Although such a marketing perspective was central to governmental communication around the albums, these catalogs were not solely intended for use by individual breeders who could afford to buy increasingly famous and expensive reproducers belonging to a "pure breed" in the narrow sense of the term. The Ministry of Agriculture and the agricultural societies used the albums and maps produced by zootechnicians to formulate larger agricultural policies on what they believed to be a "scientific" basis.[66] Breeds thus became the basic category underpinning such programs. From the 1850s, these institutions tried to ex-

62 See for example the instructions sent by the Ministry of Interior to provincial agricultural societies in preparation for the Paris exhibition in 1856: File No. 4701, Folder 1856, Box 316, Cultur (Culture) 1856–1857, Statthalterei Tirol und Vorarlberg (Lieutenancy of Tyrol and Voralberg), Tiroler Landesarchiv (Tyrolean State Archives, TLA), Innsbruck, Austria.

63 *Abbildungen österreichischer Rindvieh-Racen*, vi–x.

64 Such as the ones published by the publisher Hartinger & Sohn. File No. 5302, Folder 1867, Box 01, Collection F23 Landeskultur (Land Improvement), 1.2.1.3 Landstände und Landesausschuss (Diet and Executive Board, LSt. u. LA.), Niederösterreichisches Landesarchiv (Lower Austrian State Archives, NÖLA), Sankt Pölten, Austria.

65 File No. 2314/706, Folder 7a, Box 57, LK, AM, LW, AVA, OeStA.

66 In charge of the supervision of the husbandry policy within the ministry of Agriculture, Joseph Lorenz spoke about it as a *"wissenschaftliche Hebung"* (scientific uplift): File No. 6853/2381, Folder 7a, Box 19, LK, AM, LW, AVA, OeStA.

pand the process of husbandry improvement to make small landholdings of peasants economically viable following the agrarian reforms of 1848.[67] In the 1860s and 1870s, rural exhibitions formed the foundation of a public subsidy program aimed at helping rural municipalities purchase reproducing bulls of specific breeds. This program was supposed to settle locally improved breeds over several generations of animals through careful selection of the reproducers. This sparked intense discussions about how to choose the breeds most suitable for a given locality, especially since many of these animals had to be imported from other parts of the empire or from abroad. While the Viennese government provided the funds, the selection of subsidized bulls fell to the members of the agricultural societies, and first and foremost to their central boards. In Lower Austria, the central board of the association selected mainly Mürztaler, Allgäuer and Montafoner cattle based on their dairy abilities. They expected that peasants would either adopt the new breeds or at least improve their local cattle through crossbreeding. In 1873, facing increased difficulties in purchasing enough bulls from abroad, agricultural societies created 'nurseries' (*Pepinèren*) to ease access to selected breeds and accelerate the growth of improved cattle populations.[68]

Count Belrupt-Tissac's ironic critiques of governmental uses of the cattle "business card" highlights that the shaping of the improvement programs could not simply derive from top-down decisions of the Viennese authorities but should also consider the interests of local breeders. Through his critique, expressed in a series of reports to the Ministry of Agriculture, the Count aimed to demand more autonomy for provincial authorities regarding the use of governmental subsidies, in order to ensure that they indeed benefited the smaller landowners.[69] In practice, provincial actors also managed to use the zootechnical studies to support their own interests. After a few years of experimentation and some disappointing reports about the Mürztaler bulls, the central board of the Lower Austrian Agricultural Society announced in 1876 that it would restrict its subsidies to Montafoner and Allgäuer cattle.[70] But some local agricultural associations opposed this

67 Ferdinand Kaltenegger, "2. Die Rindviehzucht. a) In Tirol-Vorarlberg, Salzburg, Kärnten, Steiermark, Ober- und Nieder-Österreich," in *Geschichte der österreichischen Land- und Forstwirtschaft und ihrer Industrien 1848–1898*, vol. 2 (Vienna: Commissionsverlag Moritz Perles, 1899), 595–598.

68 File No. 590, Box 297, LWG, LW, AVA, OeStA.

69 File No. 2314/706, Folder 7a, Box 57, LK, AM, LW, AVA, OeStA; File No. 10523/1278, Folder 7a14, Box 124, LK, AM, LW, AVA, OeStA.

70 File No. 384, Box 297, LWG, LW, AVA, OeStA; File F13, Box 36, Rosenau 1/47–3: landwirtschaftlicher Bezirksverein Zwettl (Zwettl Agricultural Association), Special Holdings, Haus-, Hof- und Staatsarchiv (House, Court and State Archives, HHSA), OeStA.

choice. The Society for Agriculture and Forestry of Zwettl, in the district of Ober-Manhartsberg, sent petitions arguing that this region already possessed its own native breed, the Gföhler. The petitioners, led by notables who were at the same time key figures in the local branches of the Viennese Agricultural Society, gathered around 400 signatures from diverse groups of local actors, ranging from landowning notabilities to small peasants, butchers and cattle traders. They insisted that the unique characteristics of their animals required a specific orientation of the breeding of Gfohler as meat and work animals. As a result, they advocated for a distinct subsidy program that promoted different kinds of bulls compared to those used for dairy breeds.[71]

The ability of local breeders to publicize their animals was essential in contributing to the definition of which kind of animals should be subsidized as legitimate breeds. The Gföhler cattle was itself a product of earlier improvement efforts starting in the 1830s, when Viennese agronomists visited the first local exhibitions and found to their desperation that local cattle looked like "Pygmies" and could be mistaken for dogs.[72] In the following years, zootechnicians visiting local exhibitions reported a progressive increase in the sizes and strength of the cattle, which they attributed to changes in feeding practices and to a more cautious selection of reproducers.[73] From the 1850s, the (improved) Gföhler found its way to larger exhibitions, including the 1873 universal exhibition in Vienna and into the ensuing photographic album that featured the first depiction of the Gföhler breed.[74] Repeatedly taking the animals to the exhibitions and featuring them in the album enabled breeders to legitimize the breed in the long term. The breed's newfound fame for its distinctive qualities and look, particularly its colors that distinguished it from the grey Montafoner and Allgäuer, helped the breeders from Ober Manhartsberg to contest the improvement decisions made in Vienna. The increased visibility of the Gföhler as a proper breed also helped the breeders

71 File No. 430 to 433, Box 307, LWG, LW, AVA, OeStA.

72 Ferdinand Graf von Colloredo-Mansfeld, "Vortrag an die allgemeine Versammlung der k.k. Landwirtschafts-Gesellschaft in Wien am 17. April 1837, über die im letztvergangenen Herbste statt gefundenen Rindviehausstellungen und Preisvertheilungen," *Verhandlungen der kaiserlich-königlichen Landwirtschafts-Gesellschaft in Wien und Aufsätze vermischten ökonomischen Inhaltes. Neue Folge* 6, no.2 (1837): 73–74.

73 Ferdinand Graf von Colloredo-Mansfeld, "Bericht über die Viehausstellungen in Wien und auf dem Lande im Jahre 1841," *Verhandlungen der kaiserlich-königlichen Landwirtschafts-Gesellschaft in Wien und Aufsätze vermischten ökonomischen Inhaltes. Neue Folge* 11, no.2 (1842): 7–15; Ferdinand Graf von Colloredo-Mansfeld, 'Bericht über die Viehausstellungen in Wien und auf dem Lande im Jahre 1842," *Verhandlungen der kaiserlich-königlichen Landwirtschafts-Gesellschaft in Wien und Aufsätze vermischten ökonomischen Inhaltes. Neue Folge* 12, no.1 (1843): 8–13.

74 Schnaebeli, *Album der oesterreichischen Melkviehracen.*

from Ober Manhartsberg to have distinct animals accepted on the list of subsidized breeds in 1878. Their opinions eventually entered the large survey of Austrian cattle breeds published by the Ministry of Agriculture in 1884.[75] This example shows that the standardization of cattle breeds was not solely dictated from above: if sufficiently organized, local actors could leverage these tools to make the designers of agricultural policies endorse their own interests.

In the following years, the program of subsidies was refined following a similar trend of increasingly accurate territorialization. In 1877, the Ministry of Agriculture asked each provincial agricultural society to delineate 'breeding districts' (*Zuchtgebiete*), which associated a specific "orientation" of production (meat, milk, work, or simply pure-bred offspring for the neighboring districts) with specific breeds. These districts served as the basis for revising the distribution of subsidies.[76] This territorial segmentation was a systematization of practices which several provincial agricultural societies had engaged with before. The Lower Austrian central committee split the province into districts, depending on the existing production orientations aimed to encourage. This delimitation overlapped with the 1873 maps, which represented the statistical characteristics of cattle husbandry of Lower Austria, and provided a legible visualization of each district's orientation.[77] For each district, Lower Austrian zootechnicians provided a fixed list of breeds that were to be promoted. These breeds were all included in the albums of "Austrian" breeds and indicated on the existing maps.[78] In some cases, like in Upper Austria, the delimitation of these districts explicitly involved abandoning some local varieties in the long run to the benefit of a few select breeds.[79]

* * *

The zootechnicians' studies of cattle breeds occurred simultaneously with breed subvention programs. The visual material produced by zootechnicians was both an outgrowth of the work of improvement and a contributor to shaping its further

75 Zoepf, *Rinder Niederösterreichs*, 67–69 and 129–130.

76 "Erlass des Ackerbauministeriums an sämmtliche Landwirtschaftsgesellschaften, den Landesculturrath in Prag und die Statthalerei in Zadar," 1877, File No. 6594/1142, Box 332, Kultur, Statthlaterei Tirol und Vorarlberg, TLA.

77 See the map and explanations published in *Niederösterreichisches Heerdbuch für Rinder. Verzeichniss von Individuen und Stämmen edler Thiere* (Vienna: Selbstverlag der k.k. Landwirtschafts-Gesellschaft, 1873).

78 File No. 14058/2595, Box 01 (1868–1880), Collection F48 Veterinärwesen und Viehseuchen (Veterinary Service and Livestock Diseases), 1.2.1.3, LSt. u. LA, NÖLA.

79 See the proposal by Franz Zoepf in File No. 2768/292, Folder 7a10, Box 210, LK, AM, LW, AVA, OeStA which entailed a map that probably served as a basis for the one he published (with some modifications) in 1881 as part of the general survey sponsored by the ministry.

developments, especially by opening or closing possibilities regarding which breeds should reproduce or not. This last point draws our attention to another aspect of the work of zootechnicians: their work of improvement was a selection process that mainly took place during the reproduction stage of animals. More than a work of engineering *on* the body of individual animals, the work of zootechnics involved working *with* animal populations, which they tried to settle in given districts and favored or excluded from reproduction processes.

Conclusion

Cattle illustrations worked as multi-faceted environing technologies and played a crucial yet complex role in shaping the outcome of husbandry improvement projects. On a basic level, visual materials played an important role in creating knowledge about cattle and classifying the animals into breeds. This new classification primarily rested on the external characteristics of animals, which were supposed to stand for both their productive capacities and their ability to transmit these capacities to future generations. Alongside the emphasis on heredity, however, the surveys of different cattle breeds brought to the fore complex dynamics in their evolution. The conceptual definition of breeds did not take place prior to the implementation of improvement programs. Rather, the conceptual definition and the material selection of breeds were two simultaneous processes. Zootechnicians did not document "natural" or static breeds, but ongoing processes of transformations tied to human developments, and especially to processes of circulation. In that sense, the work of zootechnicians did not align with the modern "naturalist" distinction between nature and society.[80] Their practices, as documented by visual sources, encompassed more hybrid approaches to conceptualizing and dealing with cattle. Moreover, the visual material produced by zootechnicians embedded the process of breed selection within the geographies of the Habsburg Empire. This contributed to several dynamics taking place at different scales: a refinement of the definition of breeds towards more local geographical scales, mobilities of animals shaped by administrative boundaries and government policies, and a particular understanding of cattle as members of the empire in the form of "Austrian" breeds to be managed as a population. Finally, the uses of imagery technologies in the context of nineteenth-century Austria broadened the set of relationships that shaped the process of improvement. Beyond the breeder and

80 To borrow Philippe Descola's characterization of modern Europe in *Par-delà nature et culture* (Paris: Gallimard, 2005).

the animal, breeding experts and governmental agents seized the opportunity to intervene in the transformation of husbandry practices. This process of improvement did not affect all the animals in an equal way. It entailed the encouragement of productive "breeds" and the extinction of mere "*Landschläge*."

An approach to cattle selection that focuses on the entangled practices of several actors highlights that the work of nineteenth-century zootechnicians was largely experimental and ambiguous. Expanding on this perspective sheds light on less straightforward narratives about the entanglements between technology, environments and development than the usual history of European agricultural modernization often suggests. Whereas the idealist narrative of the animal-machine implied that husbandry improvement was a straightforward application of Cartesian mechanism, the classification of cattle into breeds was never a fully coherent system. Nevertheless, this did not prevent zootechnicians and agricultural improvers more generally from proceeding with their selection. Furthermore, "improvement" was far from the result of a simple application of a technicist ideology. The case analyzed here suggests that imagery technologies helped to rationalize a largely empirical process that was already underway and to expand it on a larger scale. These technologies contributed to intertwining the practice of husbandry with broader economic and political networks, making the work of "improvement" a hybrid phenomenon of growing complexity. While animal reproduction, which remained the key moment in the breed selection process, still seemed very "low-tech" until the mid-twentieth century, this did not prevent some breeds from declining or emerging already in the mid-nineteenth century. Later technological developments in the twentieth century, like artificial insemination, might have reinforced some of these dynamics.[81] The tighter control over reproduction enabled by such technologies could even reverse the evolutionary trajectory of some groups of animals. Many thriving Austrian breeds from the nineteenth century are today considered "rare" or "endangered" and are subjected to conservation programs.[82] While technologies of knowledge and reproduction have an important influence on the fate of domesticated animals, their role did not play out with the same significance in the nineteenth and twentieth centuries, and the ambitions of "improvement" programs, and especially their shifting socio-economic rationales, appear as equally strong factors in this evolution.

81 Wilmot, "Breeding farm animals and humans," 409–412 ; Cornu, "Génétique animale et modernisation de l'élevage dans la France de l'après-guerre."

82 Martin Haller, *Alte Haus- und Nutztierrassen neu entdeckt* (Graz / Stuttgart: Leopold Stocker Verlag, 2015).