

## **Illuminating Ephemeral Medieval Agricultural History through Manuscript Art**

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(See the final version for illustrations)

*There are objects and practices we would not know existed if we relied only on written texts or archeological evidence to piece together medieval agricultural history. These ephemeral aspects of the agricultural past are sometimes, however, captured in art. This essay explores some of the possible ways to recover fleeting history using medieval illuminations, which are hand-painted illustrations in books most often unrelated to agriculture. Unglamorous technologies, agricultural processes, plant varieties, animal breeds, housing design, and variation of agricultural practice in time and space can all be explored in medieval manuscript art. Medieval illuminations can, under the right conditions, give us new knowledge about agricultural practice rather than serving as simple “illustrations” of agricultural history known from textual sources.*

A stick. It is not often that we think of a wooden stick as something of historical significance, but throughout medieval Europe, it served as a vital agricultural tool. Medieval swineherds relied on acorns to fatten their herds before the onset of winter, so they either beat acorns out of oak trees with the help of sticks, shook the trees, or climbed up into them to knock down the precious fodder. The pigging stick was a central agricultural implement in this process.<sup>1</sup>

The practice of beating the oaks in the Middle Ages is known almost exclusively from artistic evidence; although a few literary works mention it, the process is never described. The artistic depictions are numerous and provide insights into how sticks were used to facilitate pig feeding. I have found only a handful of illustrations in which swine feed on acorns without the herder bringing the nuts to them, stressing the importance of the swineherd in this feeding practice. The Gorleston Psalter has a humorous series of marginal images in which two pigs look longingly at the acorns on a tree in two images but cannot reach them; in another two images, the pigs receive their prize when the swineherd knocks down the acorns (see Figure 1). Obviously, waiting around for acorns to naturally drop was not thought to be particularly fruitful!<sup>2</sup>

<**Figure 1.** Details of Four Marginal Images in the Gorleston Psalter.

Dated between 1310 and 1324. Source: Image © British Library Board, Add. MS 49622, fols. 21v, 79r, 142v, 154r, reproduced with permission.>

Several observations can be made of images of pig feeding in woods. First, in the hundreds of images that I have seen, the swineherd is always shown carrying a stick, except in one case when the swineherd appears to be receiving money for his services. The stick is used for three purposes: as an element for the herder to rest on, as a device to urge the pig(s) to go in a desired direction, and for knocking down acorns. The third of these is by far the most common. The thirteenth-century scholar Bartholomaeus Anglicus even commented on this imagery choice saying that because November is the month for fattening swine, it is illustrated with a rustic beating the oak.<sup>3</sup>

The surviving Romanesque (eleventh through thirteenth centuries) manuscripts depicting the beating of oaks tend to show pigging sticks with a larger clubbed end, a slightly hooked end, or, in the unusual case of one twelfth-century English manuscript, a forked end. Most of them are long, although short sticks do appear and look like they are used as projectiles that are thrown at the tree rather than as a stick for beating it. This would indicate that the sticks were not just chosen at random, but rather as tools for a particular purpose. By the fifteenth century, the stick is almost always very long and straight, sometimes with the larger bulbous end (see Figure 2). Perhaps this change in pigging stick conformation may have to do with trees being pruned at higher levels than before because more livestock grazing was taking place. The swineherd holds the stick back or up in a striking position, hinting that the branches were generally given a fairly hard whack to knock down the acorns. Ethnographic evidence from twentieth-century Spain indicates that, in a similar fashion, modern swineherds use a long pole to which a smaller stick was attached via a rope to knock down acorns from cork trees. No similar combination sticks are shown in medieval images, so this refinement may have come at a later date.<sup>4</sup>

<**Figure 2.** November Calendar Image from the Dunois Hours.

A book of hours made in Paris, c. 1440-1450. Source: Yates Thompson 3, fol. 11r, image in the public domain, digital reproduction courtesy of the British Library.>

In this article, I argue that we can learn a lot about a sticks and historical agricultural practices in Europe by looking at medieval images. There are objects and practices we would not know existed if we relied only on texts or archeological evidence. As far as I know, no stick from an archeological dig has been identified as a pigging stick, since it would probably be cataloged as a plain stick. The pigging stick is an ephemeral object, one that would disappear if we had only historical textual sources. Medieval images can tell us things that documentary and artifact sources alone cannot.

I will concentrate on medieval images that appear alongside written texts in book form. These artistic renderings are individually painted by hand and are often called illuminations because of the frequent use of gold leaf to make the drawings shine. Medieval images appear in other forms as well, including sculpture, stained glass, fresco, and tile, and the same type of analysis could be applied to those artistic genres even though they will not be included here.

As Peter Burke has remarked, images “record acts of eyewitnessing” and can thus be treated as historical evidence. The caveat is that, like all historical documents that agricultural historians typically rely on, images must be subject to source criticism. Caution must be exercised on several fronts. First, we must consider the type of documents in which this art appears. In many cases, these are Christian religious books--Books of Hours that are used for daily prayers, Psalters that list all the biblical psalms, Gospel books, and the like. Many of these books were created for consumption by laypeople in the noble class rather than those directly in the service of the church. Secular works like medieval chivalric romances were also heavily illustrated with scenes involving agriculture. In other words, the majority of the agricultural illustrations do not appear alongside text about agriculture. Their purposes are not to illustrate words directly but rather capture and shape ideas and practices. The didactic, spiritual, and social commentary functions of medieval images have to be kept in mind. The medieval artist rarely sets out to document reality.<sup>5</sup>

Second, we have to consider the artists' knowledge of medieval agriculture. We know the name of a scribe or artist in only extremely rare circumstances, so it is difficult to trace an individual artist's life history. We are often on more firm footing about the monastic scriptorium that created the work and sometimes the patron who commissioned it, which at least gives us some context for the production. There is always a looming question about how much a given artist would actually know about agriculture, but since medieval society was much more rural than our modern twenty-first century one and most monastic communities were heavily involved in agricultural activities, we can assume that most artists would have a fair knowledge of farm work practices and implements.<sup>6</sup>

Third, medieval illustrators sometimes used pattern books and exemplars to model their scenes. Although the original artist who designed an image was capturing agricultural practice as he/she understood it, the copyists might not understand or be familiar with the specific practice at all. We have to be wary of reading too much into the frequency with which a specific image appears. With these caveats in mind, agricultural history research can benefit from including medieval illustrations as historical sources. I will now turn to potential areas in which medieval art may give us new agricultural information.

Although they are not moving images, medieval illuminations can capture practices in action. Written records often record the amount of land under cultivation or pasturage, the quantity of goods produced or sold, and general descriptions of production methods such as "beating the oaks" in the opening example. What documents often do not say is how these methods were accomplished--they are silent about processes involved in seeding, planting, weeding, harvesting, beating, etc. The details of those processes may be accessible through illustrations.

One example is rabbit harvesting from burrows. Rabbits, which were native in southern Europe and then spread by humans during the medieval period to northern Europe, lived as semi-domesticated livestock on marginal land. Although they were treated in some ways as wild animals that could only be hunted under special permission, rabbit warrens were also highly managed colonies that were protected with fences and predator traps. While there is some documentary evidence about rabbit collection practices, images capture these processes more vividly. An illumination in Queen Mary's Psalter (see Figure 3) shows one woman releasing a ferret into the warren and the other holding the net to catch the fleeing rabbits. The image intriguingly shows women engaged in this activity, whereas the documentary evidence list a preponderance of men involved in warren activities. Perhaps the image should make us question the gendering of agricultural practice that the documents alone would seem to indicate.<sup>7</sup>

<**Figure 3.** Two Women Capturing Rabbits from a Warren from the Queen Mary's Psalter. An psalter made in England dated between 1310 and 1320. Source: Image © British Library Board, Royal MS 2 B VII (Queen Mary's Psalter), fol. 155v, reproduced with permission.>

Swine herding as described at the beginning of this article is another example of a process captured in paint. Images are, for example, our only sure record that swineherds sometimes climbed trees to knock the acorns down for their animals. We have several illuminations depicting this activity. One is the Luttrell Psalter, which shows a man sitting up on one of the highest branches using his stick to knock down the topmost acorns for the two

hungry pigs below. Another manuscript from c.1430 shows a man up in a tree reaching the nuts, while his comrades use sticks from the ground for the lower acorns.<sup>8</sup>

Methods of cultivating plants are typically not detailed in written records in the medieval period, although some medieval agricultural treatises make an attempt to describe day-to-day work processes. Plants that are not primary grain crops are often left out of these textual sources. Collections of images like those in *Tacuinum sanitatis*, a treatise on health written in the tenth century by the Arab scholar Ibn Butlan, are particularly useful for understanding cultivation techniques. The text itself discusses the properties of foods, herbs, additives, and activities in terms of medieval medical humor theory (hot/cold, wet/dry, etc.). The treatise was copied in Western Europe as illustrated texts for the first time at the end of the fourteenth century. The images do not focus on the medical theory, but rather on how the item is acquired, so they reflect contemporary agricultural practice of northern Italy rather than tenth-century Baghdad. For example, the drawing of sage (*salvia* in Latin) shows that the sage is growing inside of a woven fence, perhaps to keep the stalks from flopping over or to keep pests out (see Figure 4). Since other herbs in the illustrated series are not shown in such enclosures, the structure must have been a notable element of sage cultivation in northern Italy. Other illuminations in the same book show how trellising was set up and how crops were harvested.<sup>9</sup>

<**Figure 4.** Depiction of Sage Harvesting. In a treatise on health and wellbeing, *Tacuinum sanitatis*, dated c. 1390–1400. Source: Österreichische Nationalbibliothek, Cod. Ser. N. 2644, fol. 37v, image in the public domain.>

Identification of species under cultivation is also sometimes possible using medieval illustrations even when written records are silent. Through a study of the images in the surviving copies of *Tacuinum sanitatis*, scholars have been able to identify the species of cucumbers, melons, gourds, and eggplant depicted. The analysis showed that these manuscripts have some of the earliest Western images of cucumber, casaba melon, and eggplant in an extant market type. This type of analysis could certainly be extended to cultivars shown in marginal images and miniature scenes, as well as medicinal tracts.<sup>10</sup>

Even before the rise of commercial agriculture in the early modern age, farmers, herders, and gardeners bred animals and cultivated plants for specific traits. This created a wealth of divergent regional breeds even in the Middle Ages. Documentary and archeological evidence rarely enlightens us about breed choice since most identification is made on species or purpose levels (a cow, a dairy cow, a bull, etc.) rather than identifying the physical traits that we associate with breeds (a Devon red, a Welsh black, etc.). Images can be helpful for identifying when and where specific breeds and/or physical traits existed. We can see, for example, that most domestic pigs drawn before 1500 have bristles, which means that specific trait had not yet been bred out. Medieval pigs were typically a single color (white, gray, or black), but saddleback animals appear in drawings from Italy and southern Germany, indicating regional variety (see Figure 5).<sup>11</sup>

<**Figure 5.** Illustration of Castrated Animals. In a treatise on health and wellbeing, *Tacuinum sanitatis*, dated c. 1390–1400. The artist has shown color variations indicative of different breeds. Source: Österreichische Nationalbibliothek, Cod. Ser. N. 2644, fol. 71r, image in the public domain.>

The structures that served as a home to these creatures are seldom described in words beyond stall or cage in historical documents. Details about animal housing, just as animal

breeds and specific cultivars, often go unremarked. In the urban setting, we know extremely little about animal enclosures, although we know that animals were kept within town walls. Two illustrations accompanying the texts about eggs and chicken meat in *Tacuinum sanitatis* give us a rare glimpse into urban chicken keeping. In one image, the chickens are being fed in the garden on grain. They have a rectangular-shaped wicker house with a small door opening made of wood. There are air holes in the wood frame around the door. In a second image, those same types of holes appear in the door to an elevated coop inside of a house (see Figure 6). The chickens are coming down a wooden ladder, which leads to the elevated section. Holes have been cut into the wall to ventilate the coop and wires cover the ventilation holes to prevent escape. Without this image, the architectural design of urban chicken coops might be unrecoverable.

<**Figure 6.** Harvesting Chicken Eggs from an Indoor Chicken Coop. In a treatise on health and wellbeing, *Tacuinum sanitatis*, dated c. 1390–1400. Source: Österreichische Nationalbibliothek, Cod. Ser. N. 2644, fol. 65v, image in the public domain.>

Unremarkable, everyday technologies like chicken coops can leave few textual or physical records. A wooden stick for knocking acorns out of trees is not an exceptional instrument worthy of remark in literature, an object of great value which would be appraised in a will, or a complex specialized tool that would be readily identified in habitation layers. It leaves few traces other than images. Ropes tied to the back legs of pigs in order to control them are likewise found in illustrations but not in medieval written records.<sup>12</sup>

The same applies for other agricultural implements. Andrea Matthies has analyzed the development of the European wheelbarrow, which makes its first known appearance in the thirteenth century in England. Although very few written records exist documenting wheelbarrows and those that do employ confusing terminology, medieval manuscripts contain illuminations that reveal the design and use of wheelbarrows. From artistic sources, Matthies was able to show that the western wheelbarrow from the beginning was designed as a stretcher with a wheel taking the place of a person on one side (see Figure 7)--a radically different solution than Chinese wheelbarrows which existed much earlier but place the wheel in the middle to lighten the burden to the carrier.<sup>13</sup>

<**Figure 7.** A Devil Takes Away Lost Souls in a Wheelbarrow. From an English Book of Hours from the mid-fourteenth century. Source: Yates Thompson 13, fol. 139v, image in the public domain, digital reproduction courtesy of the British Library.>

Just as images of the wheelbarrow can give us an indication of when it began being used in Western Europe, other activities and their changes over time and space might be traceable in the artistic record. One genre of medieval illumination is particularly suitable for such an analysis: the medieval calendar. Medieval calendars mark out the year in terms of spiritual celebration and are often the first section of Psalters and Books of Hours. The calendar includes the name of the month, each day in traditional Roman form (using calends, ides, and nones), and church festivals and saint's feasts. The calendar was a cyclical marker to keep track of religious observation and could be used indefinitely by turning back to the first page in January. To assist in using the calendar, calendars often began with an illumination representing a labor for each month, most of which are agricultural. Although the choice of monthly subject in medieval manuscripts exhibits general consistency, subtle

variations were acceptable with changes in circumstance. These departures would be expected as climate and agricultural custom changed.<sup>14</sup>

Looking at a specific illustrator's choice of subject for different months and the ways in which those are shown may give some insights into local agricultural practice. For example, sheep shearing is extremely uncommon in medieval calendars before the fifteenth century. So when sheep shearing appears as the illustration for June in a calendar from 1140 made at St. Albans Abbey in England, we must conclude that the artist was breaking from standard iconography for a reason. Although the steep rise in English sheep farming comes a century later, this artist must have been familiar enough with sheep shearing to choose it as the month's labor, which may be an indicator of the spread of sheep husbandry in the St. Alban's area.<sup>15</sup>

Calendars may also indicate changing practices. In a sixteenth-century manuscript (see Figure 8), the pigs are being fed in a stall, whereas earlier manuscripts always showed the pigs feeding in wood pasture. Archeological evidence from dental wear points to pigs being fed more often from stalls through the Middle Ages. The artist's choice of showing pig feeding as a stall-event rather than a woodland activity is a reflection of that change.<sup>16</sup>

<**Figure 8.** Threshing and Pig Feeding in a Calendar Image for November. From an early sixteenth century Flemish manuscript. Source: MS Ludwig IX 18, fol. 6v, J. Paul Getty Museum, Los Angeles, Calif. Digital image courtesy of the Getty's Open Content Program.>

As the above examples reveal, medieval illuminations can capture otherwise-ephemeral agricultural history. Art can include details about processes, designs, breeds, species, and tools that are typically not discussed in the written record and not recoverable in archeological digs. As I noted earlier, we must not use medieval images indiscriminately as historical sources. The artist had not intended agricultural historians to recreate past practice based on their drawings. He had, however, depicted agricultural practice as he saw it or even as he believed his patron or God saw it. While larger programs of images may have been established by tradition, such as the feeding of pigs in November in most calendars, the details of how activities are shown reflect the artist's own experience, knowledge, and situation. This is what makes medieval illuminations potentially valuable to agricultural historians. Medieval images capture moments of the fleeting and the unremarkable, which makes them all the more remarkable.

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1. Dolly Jørgensen, "Pigs and Pollards: Medieval Insights for UK Wood Pasture Restoration," *Sustainability* 5 (Jan. 2013): 387-99.

2. Images without a swineherd include BNF Latin 18014, fol. 5v, Calendrier: Octobre, Bibliothèque nationale de France, <http://visualiseur.bnf.fr/Visualiseur?Destination=Mandragore&O=7825900&E=1&I=73460&M=imageule> (accessed Nov. 25, 2014); Book of Hours (MS M.276), fol. 23r, Corsair: The Online Research Resource of The Pierpont Morgan Library, [http://utu.morganlibrary.org/medren/single\\_image2.cfm?imagenamem276.023r.jpg&page=ICA0001](http://utu.morganlibrary.org/medren/single_image2.cfm?imagenamem276.023r.jpg&page=ICA0001)

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50565 (accessed Nov. 25, 2014); Gradual, Sequentiary, and Sacramentary (MS M.711), Corsair, [http://utu.morganlibrary.org/medren/Manuscript\\_images.cfm?ACC\\_NO=M.711&StartRow=1](http://utu.morganlibrary.org/medren/Manuscript_images.cfm?ACC_NO=M.711&StartRow=1) (accessed Nov. 25, 2014). Gorleston Psalter, British Library Add. 49622, London, United Kingdom.

3. The image of taking money for services is Pierpont Morgan Library, MS S.7 fol.11v, Corsair, [http://utu.morganlibrary.org/medren/single\\_image2.cfm?imagenam=s7.011v.jpg&page=ICA000158604](http://utu.morganlibrary.org/medren/single_image2.cfm?imagenam=s7.011v.jpg&page=ICA000158604) (accessed Jan. 8, 2015). Images of a swineherd leaning on his rod include Hours of Henry VIII, MS H.8 fol. 6r, Corsair, [http://utu.morganlibrary.org/medren/single\\_image2.cfm?imagenam=h8.006r.jpg&page=ICA000113520](http://utu.morganlibrary.org/medren/single_image2.cfm?imagenam=h8.006r.jpg&page=ICA000113520) (accessed Nov. 25, 2014); Book of Hours (MS M.85), fol. 11r, Corsair, [http://utu.morganlibrary.org/medren/single\\_image2.cfm?imagenam=m85.011r.jpg&page=ICA000135668](http://utu.morganlibrary.org/medren/single_image2.cfm?imagenam=m85.011r.jpg&page=ICA000135668) (accessed Nov. 25, 2014); Book of Hours (MS S.7), fol. 11r, Corsair, [http://utu.morganlibrary.org/medren/single\\_image2.cfm?imagenam=s7.011r.jpg&page=ICA000158603](http://utu.morganlibrary.org/medren/single_image2.cfm?imagenam=s7.011r.jpg&page=ICA000158603) (accessed Nov. 25, 2014); Thomas III de Saluces, *Le Chevalier errant*, Place du marché, Français 12559, fol. 167r, Bibliothèque nationale de France, <http://classes.bnf.fr/ema/grands/059.htm> (accessed Nov. 25, 2014). Using a stick to herd a pig in the right direction occurs as part of urban scenes, such as Book of Hours (MS S.7), fol. 12r, Corsair, [http://utu.morganlibrary.org/medren/single\\_image2.cfm?imagenam=s7.012r.jpg&page=ICA000158605](http://utu.morganlibrary.org/medren/single_image2.cfm?imagenam=s7.012r.jpg&page=ICA000158605) (accessed Nov. 25, 2014); Saint Denis devant Fescennius, Français 2092, fol. 18v, Bibliothèque nationale de France, <http://visualiseur.bnf.fr/Visualiseur?Destination=Mandragore&O=07839062&E=1&I=40837&M=imageseule> (accessed Nov. 25, 2014); Marco Polo, *Le Livre des merveilles*, Français 2810 fol. 7r, <http://gallica.bnf.fr/ark:/12148/btv1b52000858n/f21.image> (accessed Nov. 25, 2014). Bartholomaeus Anglicus, *De Proprietatibus Rerum* (Nuremberg: Anton Koberger, 1483), IX.

4. The forked end is described in Hunterian Psalter, MS Hunter 229 (U.3.2), fol. 6r, Item Details, Special Collections, University of Glasgow, [http://special.lib.gla.ac.uk/manuscripts/search/detail\\_c.cfm?ID=34725](http://special.lib.gla.ac.uk/manuscripts/search/detail_c.cfm?ID=34725) (accessed Nov. 25, 2014). L. F. Salzman, "Some Notes on Shepherds' Staves," *Agricultural History Review* 5:2 (1957): 91-94, discusses a "hockey-stick" configuration for shepherd staves that would appear to also be present for some pigging sticks. Twentieth-century ethnographic evidence comes from Spain, which has a history of woodland pig feeding since at least the Middle Ages. James J. Parsons, "The Acorn-Hog Economy of the Oak Woodlands of Southwestern Spain," *Geographical Review* 52 (Apr. 1962): 211-35.

5. Peter Bruke, *Eyewitnessing: The Uses of Images as Historical Evidence* (2001; repr., Ithaca: Cornell University Press, 2008), 14. The same holds true for object artifacts. See, John T. Schlebecker, "The Use of Objects in Historical Research," *Agricultural History* 51 (Jan. 1977): 200-208; Debra A. Reid, "Tangible Agricultural History: An Artifact's-Eye View of the Field," *Agricultural History* 86 (Summer 2012): 57-76. Michael Camille, *Mirror in Parchment: The Luttrell Psalter and the Making of Medieval England* (Chicago: University of Chicago Press, 1998), has argued that the images of the Luttrell Psalter, which include many famous agricultural scenes, both reflect and produce reality in dialogue. In his view, the images are primarily commentary about the social classes. Jonathan Alexander has also looked at the social commentary aspects of the images in "Labeur and Paresse: Ideological Representations of Medieval Peasant Labor," *Art Bulletin* 72 (Sept. 1990): 436-52.

6. For an example of using pre-modern artistic sources in understanding historical agricultural practice, see, Jules Janick, "Art as a Source of Information on Horticultural Technology" in *Proceedings of the XXVII International Horticultural Congress on Global Horticulture: Diversity and Harmony*, ed. Jules Janick (Seoul: International Society for Horticultural Science, 2007), 69-88.

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Using medieval art in technology history has also been fruitful. See, Andrea L. Matthies, "Medieval Treadwheels: Artists' Views of Building Construction," *Technology and Culture* 33 (July 1992): 510-47.

7. For discussion of the rabbit's spread in Europe, see, Petra J. E. M. van Dam, "Status Loss due to Ecological Success. Landscape Change and the Spread of the Rabbit," *Innovation* 14:2 (2001): 157-70; Mark Bailey, "The Rabbit and the Medieval East Anglian Economy," *Agricultural History Review* 36:1 (1988): 1-20.

8. It has been argued that the Old English poem *Christ* by Cynewulf refers to the practice, but this is far from certain. Herbert Meritt, "Beating the Oaks: An Interpretation of Christ 678-9," *American Journal of Philology* 66:1 (1945): 1-12; The Luttrell Psalter, British Library Add. MS 42130, fol. 59v, Online Gallery: Virtual Images Only, British Library, <http://www.bl.uk/onlinegallery/ttp/luttrell/accessible/pages7and8.html#content>; Book of Hours (MS M.64), fol. 11r, Corsair, [http://utu.morganlibrary.org/medren/single\\_image2.cfm?imagenamem64.011r.jpg&page=ICA000133393](http://utu.morganlibrary.org/medren/single_image2.cfm?imagenamem64.011r.jpg&page=ICA000133393) (accessed Nov. 25, 2014).

9. The Roman treatise *Opus agriculturae*, which circulated widely in the Middle Ages, and works like Thomas Wusser's *Five Hundred Points of Good Husbandry* from the sixteenth century are examples of textual sources for agricultural daily practice. For discussion of *Tacuinum Sanitatis* images, see, Brucia Witthoft, "The Tacuinum Sanitatis: A Lombard Panorama," *Gesta* 17:1 (1978): 49-60; Jules Janick et al., "Horticulture and Health in the Middle Ages: Images from the *Tacuinum Sanitatis*," *Horticultural Science* 45 (Nov. 2010): 1592-596.

10. Harry S. Paris et al., "The Cucurbitaceae and Solanaceae Illustrated in Medieval Manuscripts Known as the *Tacuinum Sanitatis*," *Annals of Botany* 103 (June 2009): 1187-205.

11. This trait was surely bred out when Chinese pig breeds were mixed with European stock. For a history of the new English and American breeds, see, Sam White, "From Globalized Pig Breeds to Capitalist Pigs: A Study in Animal Cultures and Evolutionary History," *Environmental History* 16 (Jan. 2011): 94-120. For a survey of pig conformations in medieval art, see, H. Meyer, "Wie sahen Schweine im Mittelalter aus?" *Deutsche tierärztliche Wochenschrift* 113 (Jan. 2006): 15-23.

12. H. Meyer, "Schwein am Seil," *Deutsche tierärztliche Wochenschrift* 111 (Sept. 2004): 364-65.

13. Andrea L. Matthies, "The Medieval Wheelbarrow," *Technology and Culture* 32 (Apr. 1991): 356-64.

14. For a full discussion of the activities depicted in calendar images, see, Bridget Ann Henisch, *The Medieval Calendar Year* (University Park: Pennsylvania State University Press, 1999); Colin Hourihane, *Time in the Medieval World: Occupations of the Months and Signs of the Zodiac in the Index of Christian Art* (Princeton: Princeton University, 2007).

15. For sheep shearing images, see, Henisch, *Medieval Calendar Year*, 87.

16. Tom Wilkie et al., "A Dental Microwear Study of Pig Diet and Management in Iron Age, Romano-British, Anglo-Scandinavian, and Medieval Contexts in England," in *Pigs and Humans: 10,000 Years of Interaction*, ed. Umberto Albarella et al. (Oxford: Oxford University Press, 2007), 241-54.