"ENGLISH" GRAINS ALONG THE COLONIAL POTOMAC

by

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The National Colonial Farm
Research Report No. 3

THE ACCOKEEK FOUNDATION

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(WHEAT, BARLEY, OATS, AND RYE)
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In September between the housing of his tobacco and the topping of his corn, the colonial Potomac planter sowed his "English" grains. These small grains included wheat, barley, oats, and rye--grains which his European ancestors had sowed and reaped for centuries. These "English corns" were the mainstay of European agriculture. In the New World, however, these grains were a secondary crop to maize or Indian corn. The most commonly planted small grain in the colonies was wheat.

Wheat was the third most important field crop along the Potomac. In some areas of the middle Atlantic colonies, it was supplanting tobacco as a cash crop. Its culture was the third step in the colonial crop rotation of tobacco, corn, and wheat.[1] Unlike the first two crops, wheat was not considered to be a labor intensive crop in the colonial period.

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[1]Entry for February 19, 1766, Landon Carter, The Diary of Landon Carter of Sabine Hall, 1752-1778, ed. Jack P. Greene (2 vols.; Charlottesville: The University Press of Virginia, 1965), I, pp. 334-35; Hugh Jones, The Present State of Virginia: From Whence is Inferred a Short View of Maryland and North Carolina, ed. Richard L. Morton (Chapel Hill: The University of North Carolina Press, 1956), p. 77; /John Beale Bordley/, Sketches on Rotations of Crops and Other Rural Matters. To which are Annexed Intimations on Manufactures; on the Fruits of Agriculture; and on New Sources of Trade, Interfering with Products of the United States of America in Foreign Markets (Philadelphia: Charles Cist, 1797), pp. 11-12; Stevenson Whitcomb Fletcher, Pennsylvania Agriculture and Country Life: 1640-1840 (Harrisburg: Pennsylvania Historical and Museum Commission, 1950), p. 129; Lewis Cecil Gray, History of Agriculture in the Southern United States to 1860 (2 vols.; New York: Peter Smith, 1941), I, p. 197.

Although these English grains were the traditional "corns" of Europe, they could not compete with the yields or uses of Indian corn in the New World. While they were not the American staff of life, they did provide a useful supplement to the colonists' diets, feed supplies, and sources of cash.

Colonial Varieties

The chief colonial species of wheat were Triticum vulgare and T. spelta. The T. hibernum, winter wheat, and T. spelta hibernum, winter spelt, were the sub-races. At least twenty-five varieties of wheat were grown, but the chief varieties were the Red Lammas, White Wheat, and spelt.[2]

The Red Lammas, usually called Red Stalk wheat in America, is the probable progenitor of the Red May variety.[3] The Red Lammas wheat variety most commonly grown in the colonies was beardless. Philip Miller identifies

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[2]Jared Eliot, Essays Upon Field Husbandry in New England and Other Papers: 1748-1762, ed. Harry J. Carman and Rexford G. Tugwell (New York: Columbia University Press, 1934), p. 55; W. Ralph Singleton, "Agricultural Plants," Agricultural History, XLVI (January, 1972), p. 75.

[3]Thomas Plater, "On the Disease in Wheat Called Stunt," Memoirs of the Philadelphia Society for Promoting Agriculture, IV, p. 125; Entry for June 1, 1768, George Washington, The Diaries of George Washington: 1748-1799, ed. John C. Fitzpatrick (4 vols.; Boston: Houghton Mifflin Co., 1925), I, pp. 274-75; Samuel Cecil Salmon and J. W. Taylor, Growing Wheat in the Eastern United States, Farmers' Bulletin No. 1817 (Washington, D. C.: U. S. D. A., 1939), p. 3; Carleton R. Ball, "The History of American Wheat Improvement," Agricultural History, IV (April, 1930), p. 53.

this variety as T. granis rubentibus.[4]

The White wheat, which the colonists called Red Chaff wheat, was a bearded variety.[5] The White wheat was often preferred by millers because it produced a whiter flour. This variety seems to have been gradually replacing the Red Lammas variety during the last half of the eighteenth century because many farmers believed it was hardier.[6] Miller identifies this White wheat as T. spica mutica.[7] Red Chaff wheat is now known as Goldcoin wheat.[8]

Some barley was grown in the middle Atlantic colonies, even though the climate and soils were unsuited to this crop.[9] Barley requires a very fertile soil. Most barley in the Chesapeake region was the Horeum

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[4]Philip Miller, The Gardener's and Botanist's Dictionary: Containing the Best and Newest Methods of Cultivating and Improving the Kitchen, Fruit, and Flower Garden, and Nursery; Of Performing the Practical Parts of Agriculture; Of Managing Vineyards, and of Propagating all Sorts of Timber Trees (4 vols.; London: F. C. & J. Rivington, 1807), IV, TRI.

[5]Ball, "The History of American Wheat Improvement," p. 53; Entry for July 28, 1767, Washington, Diaries, I, p. 239; Entry for November 6, 1756, Carter, Diary, I, p. 132; William Young, "On Smut in Wheat," Memoirs of the Philadelphia Society for Promoting Agriculture, I, p. 47.

[6]R. O. Bausman and J. A. Munroe, eds., "James Tilton's Notes on the Agriculture of Delaware in 1788," Agricultural History, XX (July, 1946), pp. 180-81.

[7]Miller, Gardener's and Botanist's Dictionary, IV, TRI.

[8]Ball, "The History of American Wheat Improvement," p. 53.

[9]S. S. Visher, ~~John C. Weaver~~, "Barley in the United States: A Historical Sketch," Geographical Review, XXXIII (January, 1943), p. 58.

polystichon hibernum, winter barley.[10] The Tennessee White barley is a descendent of the colonial six-rowed barley.[11] This variety could be grown on less fertile lands than the common two-rowed spring barley of Europe.[12] In the last quarter of the eighteenth century, some planters began to sow Naked barley (Hordeum nudum or H. celestae).[13]

Two varieties of oats (Avena sativa) were grown as spring crops along the Potomac river. One variety was the common White oat of England. Sometime in the last half of the eighteenth century, the Poland oat was

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[10]Entry for September 2, 1763, Washington, Diaries, I, p. 187; Entry for April 27, 1770, Carter, Diary, I, p. 399; Louis Morton, Robert Carter of Nomini Hall: A Virginia Planter of the Eighteenth Century (Charlottesville: The University Press of Virginia, 1941), p. 151; Bausman and Munroe, "Tilton's Notes on Agriculture," p. 181; Henri Louis Duhamel de Monceau, The Elements of Agriculture, trans. and rev. Philip Miller (2 vols.; London: P. Vaillant, 1764), II, pp. 72-73; C/harles/ Varlo, The Essence of Agriculture, Being a Regular System of Husbandry, Through all its Branches; Suited to the Climate and Lands of Ireland . . . with the Author's Twelve Months Tour thro' America. Likewise How to Raise the Valuable Crops; of Tobacco, India-Corn, and Siberian Barley. On Flax, Hemp, Rape and All Grass-seeds, &c. &c. with an Address to the Legislative and Gentlemen of Ireland. How to Levy Taxes on Luxury, Provide for the Poor, &c. &c. (London: The Author, 1786), p. 124; Gleanings from the Most Celebrated Books on Husbandry, Gardening, and Rural Affairs. From the London Second Edition of 1803. Interspersed with Remarks and Observations by a Gentleman of Philadelphia (Philadelphia: James Humphreys, 1803), pp. 21-22.

[11]H. B. Derr, Winter Barley, Farmers' Bulletin No. 518 (Washington, D. C.: U. S. D. A., 1912), p. 5.

[12]Gleanings on Husbandry, Gardening, and Rural Affairs, pp. 21-22.

[13]Entry for July 8, 1777, Carter, Diary, II, p. 1108; Donald Jackson, "A Preliminary Checklist of George Washington's Field Crops," National Colonial Farm, p. 2; John Gerard, The Herbal or General History of Plants, rev. Thomas Johnson (New York: Dover Publications, Inc., 1975 /1633/), p. 72.

introduced to the area.[14] Most oats were grown for livestock feed or pasturage. Very little was used for human consumption among the English settlers.[15]

Rye (Secale cereale) was grown for hay and for thatching. Some was mixed with wheat to form meslin or with corn to form "Injun." Only small amounts of rye were raised and many farmers did not raise it at all. Being a cross-fertilized plant, no specific variety existed during the colonial period.[16] Most planters in the Maryland-Virginia area planted winter rye--probably a progenitor of Arlington Winter or Virginia Winter rye.[17]

Cultivation of Small Grains

The rotation of tobacco, corn, and then wheat made the fullest use of the cleared lands in the colonial period. The cultivation of tobacco and corn for five to eight years removed the trees, stumps, and roots from

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[14]Jackson, "A Preliminary Checklist of George Washington's Field Crops," p. 5; Entry for July 19, 1776, Carter, Diary, II, p. 1060; Paul Leland Haworth, George Washington, Farmer: Being an Account of his Home Life and Agricultural Activities (Indianapolis: Bobbs-Merrill Co., Publ., 1915), p. 112; Gleanings on Husbandry, Gardening, and Rural Affairs, p. 228; Varlo, The Essence of Agriculture, pp. 133-34.

[15]Fletcher, Pennsylvania Agriculture, p. 152.

[16]Clyde E. Leighty, "The Place of Rye in American Agriculture," Yearbook of the U.S.D.A., 1918 (Washington, D. C.: U. S. Government Printing Office, 1919), p. 176.

[17]Fletcher, Pennsylvania Agriculture, p. 151; Varlo, The Essence of Agriculture, p. 131; Gleanings on Husbandry, Gardening, and Rural Affairs, pp. 289-90; Entry for October 18, 1766, Carter, Diary, I, p. 328; Entry for August 21, 1770, ibid., I, p. 470; Peter Kalm, The America of 1750. Peter Kalm's Travels in North America. The English Version of 1770, ed. and trans. Adolph B. Benson (2 vols.; New York: Wilson-Erickson, Inc., 1937), I, p. 75; Clyde E. Leighty, Culture of Rye in the Eastern Half of the United States, Farmers' Bulletin No. 756 (Washington, D. C.: U. S. D. A., 1916), p. 4.

the fields making the cultivation of small grains possible. There were two methods of cropping wheat and other small grains during the colonial period. Perhaps, the most common method for small farmers was to sow a crop of wheat between rows of standing corn.[18] The second method was to wait until the autumn of the year following a crop of corn and sow the former corn field in wheat or other small grains.[19] Whichever method was followed, the continual cropping of the field wore out the soil.

As the third element in the colonial Potomac agricultural system, small grains were planted in fields which had much of their native fertility expended by tobacco and corn. The colonial planter was aware that planting his grain crops on such lands would not give him the greatest yields.[20] They, however, seemed to be content with the yields of six to eight bushels of wheat per acre since tobacco and corn were economically more important. They planted small grains because they could expect a crop which would supplement their food and

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[18] J[ohn] B[eale] Bordley, Essays and Notes on Husbandry and Rural Affairs (2nd Ed.; Philadelphia: Thomas Dobson, 1801), p. 100; John Harrower, The Journal of John Harrower: An Indentured Servant in the Colony of Virginia, 1773-1776, ed. Edward Miles Riley (Williamsburg, Va.: Colonial Williamsburg, Inc., 1963), p. 60; John Tayloe, "On Virginia Husbandry," Memoirs of the Philadelphia Society for Promoting Agriculture, II, p. 102.

[19] Bordley, Sketches on Rotations of Crops, p. 14.

[20] Varlo, The Essence of Agriculture, pp. 126-27; John Lawson, A New Voyage to Carolina; Containing the Exact Description and Natural History of that Country: Together with the Present State thereof. And a Journal of a Thousand Miles, Travel'd thro' several Nations of Indians. Giving a Particular Account of their Customs, Manners, &c. (Ann Arbor: University Microfilms, Inc., 1966 [1709]), p. 75; Duhamel du Monceau, Elements of Agriculture, II, p. 74; Salmon and Taylor, Wheat in the Eastern United States, p. 3.

fodder supply without using additional lands.

If the colonial farmer planned to sow his small grains in between his corn hills, he would not have to make any special preparations to the soil. His last weeding of his corn would prepare the soil for small grains. If the farmer was planting the small grains on fields which were in grass or other vegetation, he would cut the vegetation short and then with his hoe (or if he was one of the fortunate few, with a plow) turn over the top few inches of top soil. With a hoe he could prepare an acre of corn field (while giving the corn a weeding) every two or three days.[21] With oxen and a plow, the farmer could prepare approximately an acre a day for grain.[22] Only the top two or three inches of top soil was disturbed by the colonial farmer.[23] When the soil was thoroughly pulverized, it was ready to seed.

Most colonial planters steeped their seed before planting. They employed steeps to improve yields and to ward off smuts and other diseases. Salt, alum, urine, lime, and other exotic concoctions were used in attempts to prevent smut.[24] An eighteenth century recipe for improving barley yields called for the planter to soak his seeds in "Copperas" for twenty-four hours. Then he

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[21]Henry A. Wallace, "Thomas Jefferson's Farm Book: A Review Essay," Agricultural History, XXVIII (October, 1954), p. 133; Entry for June 1, 1771, Carter, Diary, I, p. 567; Bausman and Munroe, "Tilton's Notes on Agriculture," p. 181.

[22]Haworth, George Washington, Farmer, pp. 122-23.

[23]Entry for April 13, 1777, Nicholas Cresswell, The Journal of Nicholas Cresswell: 1774-1777 (Port Washington, N. Y.: Kennikat Press, Inc., 1968 [1924]), p. 198.

[24]Haworth, George Washington, Farmer, p. 95; Eliot, Upon Field Husbandry, pp. 49-50; Allan E. Smith and D. M. Secoy, "Salt as a Pesticide, Manure, and Seed Steep," Agricultural History, L (July, 1976), pp. 513-14.

dried the barley seed on powdered lime.[25]

One of the greatest problems for eighteenth century farmers was obtaining good seed. In order to retain the vigor of the grain, farmers swapped seed with one another every few years.[26] Unless a farmer used great care in picking his seed from his previous crop, much of the seed was likely to be filled with the seeds of weeds.[27]

Most wheat in the Chesapeake colonies was winter wheat because spring wheat was subject to blasting (black stem rust).[28] Wheat along the Potomac was planted from the middle of August through the end of September.[29] The rate of sowing was from one-half bushel to a bushel of seed to an acre depending upon soil fertility.[30]

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[25]Eliot, Upon Field Husbandry, p. 50.

[26]Bausman and Munroe, "Tilton's Notes on Agriculture," p. 181.

[27]Haworth, George Washington, Farmer, pp. 110-11.

[28]Darrett B. Rutman, Husbandmen of Plymouth: Farms and Villages in the Old Colony, 1620-1692 (Boston: Plimouth Plantations, Inc., 1967), p. 52; Fletcher, Pennsylvania Agriculture, p. 144.

[29]Douglas Southall Freeman, Planter and Patriot, Vol. III of George Washington: A Biography (New York: Charles Scribner's Sons, 1951), pp. 81-82; Thomas Jefferson, Thomas Jefferson's Garden Book 1766-1824 with Relevant Extracts from his Other Writings, ed. Edwin Morris Betts (Philadelphia: American Philosophical Society, 1944), p. 67; Entry for September 22, 1764, Washington, Diaries, I, p. 202; Entry for November 1, 1774, Harrower, Journal, p. 68.

[30]Bausman and Munroe, "Tilton's Notes on Agriculture," p. 181; Tayloe, "On Virginia Husbandry," p. 100; Entry for April 8, 1789, Wilson Account Book, Maryland Historical Society, MS 915; [John Beale Bordley], Summary View of the Courses of Crops, in the Husbandry of England and Maryland; with a Comparison of their Products; and a System of Improved Courses, proposed for Farms in America (Philadelphia: Charles Cist, 1784), p. 15n.

Barley and rye were also winter varieties. They were sown about the same time as winter wheat. Barley was sown at the rate of approximately two bushels to the acre.[31] The rate for sowing rye was two to two and a half bushels per acre. Rye was also sown with wheat or spelt to make meslin. When rye was sown with wheat the ratios of each grain ranged from one-quarter to one to a one to one mix of rye to wheat.[32]

Oats were a spring grain during the colonial period. Farmers tried to plant oats as early in the spring as possible--that is, as soon as the frost had left the ground. Thus most oats were sown in late February or early March in the Potomac region.[33] Oats were sown at the rate of about three to four bushels an acre.[34]

There were four methods of sowing small grains--broadcast, drilling in rows, drilling in clusters, and dibbling. The broadcast method was by far the most commonly used.[35] Beginning at the margin of the field, the farmer cast a handful of seed off the ends of his fingers.

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[31]Entry for September 27, 1770, Carter, Diary, I, p. 504.

[32]Entry for September 18, 1771, ibid., II, p. 635; Gleanings on Husbandry, Gardening, and Rural Affairs, pp. 289-90; Fletcher, Pennsylvania Agriculture, p. 151.

[33]Entry for February 26, 1760, Washington, Diaries, I, p. 131; Entry for February 27, 1766, Carter, Diary, I, p. 335; Samuel Deane, The New England Farmer: or Georgical Dictionary. Containing a Compendious Account of the Ways and Methods in Which the Important Art of Husbandry, in All its Various Branches, is, or May Be, Practiced, to the Greatest Advantage, in this Country (Worcester, Mass.: Isaiah Thomas, 1797), p. 231.

[34]Ibid.; Entry for February 28, 1757, Carter, Diary, I, p. 147.

[35]Bordley, Essays and Notes on Husbandry, pp. 476-77; Rutman, Husbandmen of Plymouth, p. 7; Entry for September 11, 1771, Carter, Diary, II, p. 626.

The seed was cast with sufficient height and force so that it would fall evenly on the ground. A stake was placed at each end of the field to mark the width of the cast seed. Generally, a farmer made a pass or "through" the field casting in one direction and then made a second pass at right angles to the first. This insured that the field would be evenly sown.[36] Using the broadcast method, a planter would be able to sow ten acres with small grains in a day to a day and a half.

After broadcasting the seed, most farmers used a brush harrow to cover the seed. Brush harrows were replaced in the late colonial period with A-frame rake harrows. This type of harrow was often made from local materials. The frame was of ash or other similar woods with hardwood teeth pounded into the frame.[37] If he did not possess a draft animal, the farmer himself pulled the harrow to cover the seed. Without using draft animals, a man could harrow his ten acres in two days.

Once the harrowing was completed the colonial farmer did nothing more to his small grain fields until the coming of spring.[38] In the spring it was a common practice to roll the small grain fields with a roller. The roller usually was a heavy, peeled log with a yoke of wood or rope fastened to each end of the log. Rolling

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[36]Serano Edwards Todd, The American Wheat Culturist: Embracing a Brief History and Botanical Description of Wheat, with Full Practical Details for Selecting Seed, Producing New Varieties, and Cultivation on Different Kinds of Soil (New York: Taintor Brothers & Co., 1868), p. 299.

[37]Bausman and Munroe, "Tilton's Notes on Agriculture," p. 181; Fletcher, Pennsylvania Agriculture, p. 95; Lyman Carrier, The Beginning of Agriculture in America (New York: McGraw-Hill Book Co., 1923), p. 265.

[38]Bausman and Munroe, "Tilton's Notes on Agriculture," p. 181.

compacted the soil and promoted tillering of the grain.[39] Ten acres of small grains could be rolled in a day and a half.

The spring warmth also promoted the growth of weeds. When the planter had time, he weeded his small grains until they had attained sufficient height and density to crowd out or shade out most weeds. Weeding was done only when the number of weeds was so great as to threaten the crop.

Hazards to Small Grains

Weather, weeds, insects, and diseases--the scourges of agricultural efforts from time immemorial--were threats to the successful production of small grains in colonial America. Experience was the chief ally in combatting these threats. In spite of centuries of European practice in growing small grains, the best efforts of the colonial farmers often resulted in a poor crop.

As for all growing things, weather had great effects on small grain crops. Winter grains had to be planted early enough to become well established before the winter frosts. In the spring an early thaw might promote growth, but it also subjected the grain to the dangers of a late frost. The Potomac region was and is an area where winter thaws are common. These thaws may be followed by a hard freeze. These cold snaps occur as late as early May.[40]

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[39]Fletcher, Pennsylvania Agriculture, p. 97.

[40]Entry for April 6, 1760, Washington, Diaries, I, p. 149; Philip V. Fithian to John Peck, Nomini Hall, June 3, 1774, Philip Vickers Fithian, Journal & Letters of Philip Vickers Fithian, 1773-1774: A Plantation Tutor of the Old Dominion, ed. Hunter Dickinson Farish (New ed.; Williamsburg, Va.: Colonial Williamsburg, Inc., 1965), p. 112; Entry for June 16, 1774, Harrower, Journal, pp.46-47.

The amount and timing of the rains also were a factor in determining the grain yields. Rain in the fall was necessary for the germination of the seeds and the growth of root systems.[41] Too much moisture in the winter and early spring promoted the growth of weeds and fungi.[42] Droughts hindered the growth of grains. Rains followed by hot, dry weather while the kernels were "in milk" caused the wheat to "blast."[43] Moisture in the form of heavy dews and fogs was believed to be the cause of mildew.[44] Finally, rain when the grain was ready to harvest caused great difficulty in cutting.

Since it was difficult to weed broadcast small grains, weeds were a problem for colonial farmers. In large part, the number of weeds in a grain field was related to the problems of obtaining clean seed and to the removal of perennial weeds such as crab grass.[45] The most troublesome and most frequently named weeds in small grains during the eighteenth century were chess (Bromus secalinus), cockle (Lolium temulentum), and

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[41]Entry for September 21, 1756, Carter, Diary, I, p. 127.

[42]George Washington to Burwell Bassett, Mount Vernon, August 2, 1765, George Washington, The Writings of George Washington: From the Original Manuscript Sources: 1745-1799, ed. John C. Fitzpatrick (39 vols.; Washington, D. C.: U. S. Government Printing Office, 1931-1944), III, p. 424; George Washington to Burwell Bassett, Mount Vernon, July 5, 1763, ibid., III, p. 401; Entry for July 11, 1770, Carter, Diary, I, p. 440.

[43]John Hancock Klippart, The Wheat Plant: Its Origin, Culture, Growth, Development, Composition, Varieties, Diseases, etc., etc., Together with a Few Remarks on Indian Corn, Its Culture, etc. (Cincinnati: Wilstach, Keys, & Co., 1860), pp. 559-60.

[44]Jacques Pierre Brissot de Warville, New Travels in the United States of America. Performed in 1788 (New York: Augustus M. Kelley, Publ., 1970 [1792]), pp. 254-55.

[45]Fletcher, Pennsylvania Agriculture, p. 146; Entry for September 16, 1773, Carter, Diary, II, pp. 771-72.

wild or crow garlic (Allium sylvestre).[46]

Insects also took their portion of the colonial farmers' small grain crops. The insects which attacked wheat included: chinch bugs (Blissus leucopterus), army-worms (Cirphis unipunta), frit flies (Oscinis frit), and occasionally "grass-hoppers."[47] The most frequently mentioned pest in the Potomac region was the "Wheat Fly," "Wheat Weevil," or "Wheat Moth;" all of which were probably the frit fly. This insect laid eggs in the maturing wheat kernels. The larvae then ate their way out of the kernel and appeared as "a Small Whiteish Miller" around the piles or stacks of harvested wheat.[48] Grasshoppers seldom did damage to Maryland's wheat and what was called a grasshopper was probably the seventeen-year locust (Cicada septendecium).[49] The Hessian fly

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[46]William Douglass, A Summary, Historical and Political of the First Planting, Progressive Improvements, and Present State of the British Settlements in North America (2 vols.; London: R. and J. Dodsley, 1770), II, p. 206; John Bartram to Philip Miller, June 16, 1758, William Darlington, ed., Memorials of John Bartram and Humphrey Marshall, with Notices of their Botanical Contemporaries (Philadelphia: Lindsay & Blakiston, 1849), pp. 383-85; Bausman and Munroe, "Tilton's Notes on Agriculture," p. 182.

[47]William Crowell Edgar, The Story of a Grain of Wheat (London: George Newnes, Ltd., 1903), p. 21; Salmon and Taylor, "Wheat in the Eastern United States," pp. 55-58.

[48]Colonel George Morgan to Sir John Temple, New York, August 26, 1788, Memoirs of the Philadelphia Society for Promoting Agriculture, IV, p. 155; St. John de Crevecoeur, Sketches of Eighteenth Century America: More "Letters from an American Farmer," ed. Henri L. Bourdin, Ralph H. Gabriel, and Stanley T. Williams (New Haven: Yale University Press, 1925), pp. 87-88; Entry for January 4, 1775, Harrower, Journal, pp. 131-32; J[ohn] B[eale] B[ordley], Queries Selected from a Paper of the Board of Agriculture in London, on the Nature and Principles of Vegetation, with Answers and Observations by J. B. B. (n. p., 1797), pp. 17-18.

[49]Ibid., pp. 18-19.

(Phytophaga destructor) did not become a problem in the Maryland and Virginia areas until well after the American Revolution.[50] There was very little the colonial planter could do to prevent the ravages of insects. Oats were planted with wheat to attract the wheat fly and later the Hessian fly.[51] Various seed steeps were also tried.[52]

Colonial grain crops were subject to a number of diseases. The most common complaint of the colonial grain producers was rust (Puccinia graminis tritici). Black stem rust, as it is now known, was generally called the "blast" in the colonial era. This fungus was associated with barberry bushes early in the eighteenth century, but its exact relationship to the barberry was unknown. Farmers thought that fogs, dews, or winds from the Northeast or Northwest were the causes of the "blast." Eradication of the barberry bushes, which harbored this fungus, lessened the dangers of black stem rust. In any case, the grain of blasted wheat was of little use for flour.[53] Leaf rust (Puccinia

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[50]Entry for October 23, 1785, Robert Hunter, Jr., Quebec to Carolina in 1785-1786: Being the Travel Diary and Observations of Robert Hunter, Jr., a Young Merchant of London, ed. Louis B. Wright and Marion Tinling (San Marino, Cal.: The Huntington Library, 1943), p. 150; Klippart, The Wheat Plant, pp. 608-10.

[51]Richard Peters, "Notices for a Young Farmer; Particularly one on Worn Lands; Being some Rudiments for an Epitome of Good Husbandry; and Subjects Promotive of Its Prosperity," Memoirs of the Philadelphia Society for Promoting Agriculture, IV, p. xxvii.

[52]J. S., "On the Cultivation of Barley," The Agricultural Museum, II (January, 1811), p. 194.

[53]Klippart, The Wheat Plant, p. 581; Bordley, Queries on the Nature and Principles of Vegetation, p. 11; Fletcher, Pennsylvania Agriculture, p. 146; Bausman and Munroe, "Tilton's Notes on Agriculture," pp. 182-83; Entry for July 25, 1768, Washington, Diaries, I, p. 281.

recondita), although not usually specifically identified separately, also caused damage.[54] One recommended defense against the blast was the companion planting of rye mixed with the wheat or surrounding a wheat field.[55]

Another problem for colonial grain producers was the condition variously called mildew, black wheat or sometimes simply "sick wheat." This fungus (Erysiphe graminis tritici) was most commonly found in newly cleared fields surrounded by forest. Damp spring weather seemed to promote the prevalence of black wheat.[56]

Although loose smut (Ustilago tritici) was not a problem in colonial Maryland or Virginia, farmers were afraid that it might spread from New York. This fungus attacked the wheat kernels and had to be separated from the grain by soaking in water before milling.[57]

In addition to rusts, mildews, and smuts, various specific diseases attacked barley, oats, and rye. Crown rust (Puccinia coronata) ravaged oats.[58] Ergot disease (Claviceps purpuria) is a dangerous disease in rye because it is poisonous to men and livestock.[59]

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[54]Warren H. Leonard and John H. Martin, Cereal Crops (New York: The Macmillan Co., 1963), pp. 389-92.

[55]Bordley, Essays and Notes on Husbandry, p. 487.

[56]Klippart, The Wheat Plant, p. 575; Fletcher, Pennsylvania Agriculture, p. 146.

[57]Klippart, The Wheat Plant, p. 584; Young, "On Smut in Wheat," p. 48; John Heckewelder, Thirty Thousand Miles with John Heckewelder, ed. Paul A. W. Wallace (Pittsburgh: University of Pittsburgh Press, 1958), p. 314.

[58]Leonard and Martin, Cereal Crops, p. 584.

[59]Ibid., p. 465.

During the colonial period the forces of nature, the attacks of insects, and the susceptibility of small grains to many diseases made the raising of such grain crops for subsistence a precarious undertaking. While small grains increasingly were raised as a cash crop in the late eighteenth century, it was less by choice than necessity.

The Harvest

If the weather had been favorable, the insect damage moderate, and the "blast" not too severe, the farmers along the Potomac could expect their small grains to begin ripening about the middle of June. Colonial small grains ripened in the following order: barley, rye, wheat, and then oats.[60] Most colonial planters waited until the stalks had fully turned color before harvesting. They reasoned that as long as there was "milk" in the stem of the plant, the kernels were still maturing. This practice, of course, resulted in some dropping of the grain.[61] The harvest in the Potomac region usually began in the last week of June and continued through about the end of July--weather and work in the tobacco and corn fields permitting.[62]

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[60] Bausman and Munroe, "Tilton's Notes on Agriculture," p. 182; Entry for June 12, 1769, Washington, Diaries, I, p. 331; Entry for June 28, 1769, ibid., I, p. 332.

[61] Entry for July 25, 1768, ibid., I, pp. 281-82 (In this entry Washington describes the various experiments he made with the time of harvesting wheat.); Varlo, The Essence of Agriculture, pp. 118-19.

[62] Entry for June 25, 1774, Fithian, Journal & Letters, pp. 125-26; Entry for July 7, 1774, ibid., p. 133; Algernon Roberts, "Account of the Produce of Wheat and Rye, During 16 Years in Lower Merion Township, Philadelphia County, and Times of Harvesting, &c.," Memoirs of the Philadelphia Society for Promoting Agriculture, I, p. 99; Entry for July 26, 1775; Harrower, Journal, p. 160; Entry for August 20, 1775, ibid., pp. 111-12.

Until after the American Revolution most small grains were harvested with a sickle or grass hook. The scythe was introduced in the last half of the eighteenth century, but most small farmers probably continued to use a sickle for cutting their grain.[63] The attachment of a cradle tended to be a development of the post-Revolutionary era.[64] The sickle of the eighteenth century was a long, curved, narrow-bladed instrument which often had a serrated cutting edge.[65]

As with so many other farm activities, reaping involved all members of the family old enough to work. Until the introduction of the scythe and cradle, most reapers used a sickle. Bending over and grasping a handful of grain near the ground, the reaper then passed the sickle around the bunch of grain between his hand and the ground. By pushing his handful of grain stalks over the sickle, he cut them free. He continued to do this until he could hold no more stalks in his hand. A reaper would cut a ten foot swath across the field. He laid the loose handfuls of grain stalks behind him. The reapers were followed by children who gathered the loose grain stalks into larger bundles and carried a sheaf sized bundle to the women and older children. They bound the grain into a sheaf. Wheat and rye having longer stalks were bound with a single handful of

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[63]Entry for November 24, 1748, Kalm, Travels in North America, I, p. 185; Peter H. Cousins, Hog Plow and Sith: Cultural Aspects of Early Agricultural Technology (Dearborn, Mich.: Greenfield Village & Henry Ford Museum, n.d.), p. 11; George Washington to Robert Cary & Co., Mount Vernon, July 21, 1766, Washington, Writings, III, p. 439; Entry for June 20, 1774, Harrower, Journal, p. 47; Entry for July 4, 1774, Cresswell, Journal, p. 25.

[64]Harrower, Journal, p. 181n.

[65]Fletcher, Pennsylvania Agriculture, p. 98.

stalks wrapped around the sheaf and twisted over to make a "binder's knot" with the heads of grain turned inward behind the knot. Shorter stemmed grains such as oats and barley were bound with two handfuls of grains tied head to head to form a binder.[66] Barley was not always bound in sheaves. In the evening eight or more sheaves would be stacked in a shock or more likely in the case of wheat and barley taken to the barn.[67] To make a shock, two or three tight sheaves were leaned against one another with their butt ends on the ground. The remaining sheaves were then placed around the core sheaves and topped with one or two sheaves to form a cover for the shock. The shock would protect the grain until it was dry enough to take inside to be threshed.[68]

If a farmer had enough hands, he might take his cut grain directly to the barn. While this practice protected the grain from the weather, there was a danger that the straw would not be thoroughly dry and therefore might rot in the barn.

With someone doing the gathering and binding, a man could reap from one-half to one acre per day.[69] The harvesting of ten acres, therefore, took from ten to twenty man-days.

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[66] T. Hennell, Changes in the Farm (Cambridge: Cambridge University Press, 1934), pp. 112-14, 119.

[67] Bausman and Munroe, "Tilton's Notes on Agriculture," p. 183.

[68] Freeman, Planter and Patriot, p. 186; Singleton, "Agricultural Plants," p. 75; Thomas Hale, A Compleat Body of Husbandry (London: T. Osborne, 1756), pp. 366, 380, 385.

[69] Fletcher, Pennsylvania Agriculture, p. 98; Hennell, Changes in the Farm, p. 116.

Threshing

When the straw was thoroughly dry, the grain was taken to the barn or in the case of a small Potomac planter to the floor of an empty tobacco house. There were two common methods of threshing small grains in the Potomac region--beating with flails and treading out with animals. Generally, flailing was used for smaller crops of grain, and treading was employed when the crop would amount to a hundred bushels or more. Flailing grains generally produced a cleaner product than treading out with animals. In addition, weeds such as wild onion and garlic could be more easily removed when the flailing method was used. Treading, however, threshed a greater quantity of grain for a given period of time.

To thresh grain with a flail some practice and skill are required. The flail consists of two parts: the handle--a four to five foot piece of wood, and the swingle--a piece of hardwood about a foot and a half to two feet long attached to the handle with a piece of leather cord.[70] Usually a few hard knocks on the head are one's earliest experiences in learning to use a flail. The flail is swung around and over your head and brought down with a resounding thwack on the heads of the grain, hopefully.[71]

In order to protect the grain from the weather and to provide a hard, clean surface for flailing, the grain was threshed out on barn floors. Sheaves of grain were laid out on cloths or tarps in two rows with the heads toward the center. An aisle was left between

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[70] Ibid., pp. 168-69; Bausman and Munroe, "Tilton's Notes on Agriculture," p. 183.

[71] Hennell, Changes in the Farm, p. 168; Fletcher, Pennsylvania Agriculture, p. 99.

the rows. Wheat was threshed in the sheaves which were beat out on one side and then turned over to be flailed again. Then the sheaves were unbound and beaten. The piles were turned over with the end of the handle and beaten again. Finally, the straw piles were gathered in loose bundles and struck against the sides of a barrel to shake loose any remaining kernels.[72] Depending upon the number and size of the kernels per stalk, one man could flail from one to ten bushels of grain a day. In the Potomac region the amount threshed by this method tended to be towards the lower number.[73] Flailing of small grains was usually a winter activity. Oats and barley were usually flailed loose rather than in sheaves as wheat and rye were.

If a farmer had a large crop of grain or a lack of time, he might thresh his grain by treading. Treading tended to damage the straw and the grain was often dirty because of animal droppings and dirt from the animal's hooves. However, far more grain (as much as ten times) could be threshed in a day than with a flail. The sheaves or loose grain piles were spread out in a circle either inside the barn, if it was large enough, or on a hard-packed area outside. Horses or oxen were then ridden or driven over the grain and the kernels were freed from the straw. Occasionally, the straw was piled to the side and the grain scooped up. The direction of travel was periodically reversed to prevent the

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[72] Ibid.; Hennell, Changes in the Farm, p. 170.

[73] Clarence H. Danhof, "The Tools and Implements of Agriculture," Agricultural History, XLVI (January, 1972), p. 84; Entry for August 16, 1771, Carter, Diary, II, p. 613.

men and animals from getting dizzy.[74]

Whichever method was used, the grain had a good deal of chaff mixed with it. The process of removing the chaff, winnowing, had changed little over the centuries. The simplest method of winnowing was to wait for a windy day and then sift the grain through one's fingers. The grain would fall to the ground and the chaff would be blown away. Colonial farmers used shovels to throw grain into the air with a breeze blowing through open barn doors. An improvement in winnowing was the grain or wheat riddle. The riddle was a coarse sieve. Standing on a stump or stool, the planter shook a filled riddle and the wind would separate the chaff and the grain. The larger pieces of chaff remaining in the riddle were then cast aside.[75]

Because the wind could not be depended upon, fanning mills were introduced in the second half of the eighteenth century. A fanning mill was a large fan with blades of wood or cloth attached to an axle. With a crank the axle was turned providing a sufficient air flow to winnow the grain.[76]

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[74]G. Melvin Herndon, "Agriculture in America in the 1790s: An Englishman's View," Agricultural History, XLIX (July, 1975), p. 511; Bordley, Essays and Notes on Husbandry, p. 202; Entry for August 22, 1775, Harrower, Journal, p. 107; Fletcher, Pennsylvania Agriculture, p. 100; J. B. Bordley, "Some Account of Treading out Wheat," Memoirs of the Philadelphia Society for Promoting Agriculture, VI, pp. 115-21.

[75]Fletcher, Pennsylvania Agriculture, p. 102; Hennell, Changes in the Farm, p. 177.

[76]George Washington to Robert Cary & Company, Mount Vernon, August 22, 1766, Washington, Writings, III, pp. 440-41; Hale, The Compleat Body of Husbandry, p. 366; Fletcher, Pennsylvania Agriculture, p. 102.

After winnowing the grain was scooped up and placed in barrels for storage or sale. The chaff and straw was used for bedding and for thatching materials.

To grow, harvest, and thresh a crop of small grains on ten acres of land, the colonial farmer had to invest approximately 76 ten-hour days. Since the average yield of wheat in the Potomac region during the last half of the eighteenth century was only six bushels to the acre, each bushel of wheat required thirteen hours of labor. In the early colonial period the higher yields per acre meant that fewer hours of labor were required for each bushel. By the middle of the eighteenth century the hours per bushel of wheat was relatively high in comparison with corn which required only about nine and one-half hours per bushel.

Milling and Use

Unlike Indian corn, the English grains could not be easily ground for use by hand. Although encouragement in the form of land was offered in Maryland to build mills, the lack of water mills on Maryland rivers continued throughout the eighteenth century. This lack of water mills meant that many Maryland planters probably had their wheat ground in Virginia.[77] Millers both in

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[77] "An Act for encouragement of such persons as will undertake to build Water-Mills," Assembly Proceedings, May 10--June 9, 1692, Archives of Maryland (70 vols.; Baltimore: The Maryland Historical Society, 1883 --), XIII, pp. 534-36; "Petition of William Dent and Joseph Bullet," Proceedings of the Council of Maryland, 1692-1694, ibid., VIII, p. 449; "An Act for Encouragement of Such persons as will undertake to build Water Mills &c.," Assembly Proceedings, June 29--July 22, 1699, ibid., XXII, pp. 530-33; "An Act for the encouragement of such persons as will undertake to build Watermills," Assembly Proceedings, September 5--October 3, 1704, ibid., XXVI, pp. 228-31; Entry for August 17, 1774, Fithian, Journal & Letters, pp. 170-71; Haworth, George Washington, Farmer, p. 97.

Virginia and Maryland exacted a one-eighth portion of the grain as payment for their services.[78] Of the wheat brought for grinding, about forty percent of the total was ground into flour suitable for market; another forty percent, seconds, was usuable for home consumption or ship's flour; and the remainder was bran.[79] Thus the colonial farmer, who produced sixty bushels of wheat from ten acres of land, would receive twenty-one bushels of marketable flour and the same amount for home use after the miller had received his share. If the farmer sold the marketable flour, he would still have about 1323 pounds of flour for his own bread.

The chief use of wheat was for bread. Baking bread was nearly a daily task in the colonial farm kitchen.[80] Wheat or white bread was a welcome change from the common corn-bread or hoe-cake fare. One recipe for white bread required 6 pounds of flour; 2½ pints of warm water; 4 to 8 teaspoonsful of liquid yeast; and 2 ounces of salt. Half of the water was mixed with the yeast. The salt was dissolved in the other half of the water. Then the flour and water were kneaded together. The dough was then left to rise for four to five hours. Meanwhile, the oven was heated. If a green vegetable turned black when placed in the oven, it was too hot and the door was opened to cool the oven. The bread dough was kneaded again and formed into loaves. Then the loaves were immediately placed in the oven. The bread was allowed to rise to its full height for two to three hours with the oven door tightly closed. After

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[78] Ibid., p. 98; Assembly Proceedings for October 11, 1694, Archives of Maryland, XIX, p. 68.

[79] Douglass, Present State of British Settlements, II, pp. 331-32; Haworth, George Washington, Farmer, p. 98.

[80] Jones, The Present State of Virginia, p. 86.

that time had elapsed, the oven door could be opened to check to see if a crust had formed indicating that the bread was done. This recipe would produce about seven to eight pounds of bread.[81] Given that a small colonial farmer would have had 1323 pounds of flour, his family would be able to enjoy four one-pound loaves of bread a day.

One problem for colonial housewives was obtaining yeast. Yeast was usually collected from brewing beer. The top-yeast which was probably used for colonial brewing could be gathered by skimming the top of the brew with a whisk or bunch of twigs and dried. Water was added to the dried yeast and the mixture allowed to stand for several days before using.[82] When yeast was unavailable, the colonial family had to be satisfied with corn bread or unleavened wheat bread.

On Long Island an unleavened bread called handy cake was made. The ingredients were 2 pounds of flour, ½ pound of sugar, 1 pint of sour milk, and 1 teaspoon of salt of tartar or aged pearl ashes. The potash or pearl ashes were dissolved in the sour milk. The liquid was then mixed and kneaded with the flour and shaped into loaves. The loaves were then baked in a hot oven. This mixture produced a "fine, spungy [sic] cake."[83]

Rye and wheat were sometimes grown and harvested

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[81] Bordley, Essays and Notes on Husbandry, pp. 409-10.

[82] Some Information Respecting the Use of Indian Corn: Collected from the Papers of Mr. Winthrop & Mr. Howard: With Observations from Mr. Parmentier, on the Use of Potatoes in Bread; and Mr. Dossie's Directions for Making Bread in Private Families (Birmingham: Thomas Pearson, 1795), pp. 16-17.

[83] Bordley, Essays and Notes on Husbandry, pp. 411-12.

together making a flour called meslin. This flour was used for bread in a manner similarly to wheat flour.

Barley was grown for the brewing of beer. Since the climate and land of the Atlantic coast colonies was not suited to barley production, malt had to be imported from Europe to supplement colonial barley supplies.[84] A recipe for beer in the colonial period consisted of taking 2 quarts of malt, adding 2 handfuls of bran, and 2 handfuls of hops. These ingredients were boiled in 20 gallons of water for two hours. The solids were strained out and the brew cooled. Then 2 quarts of molasses and 1 pint of yeast were added and the brew worked well.[85] This recipe made from fifteen to eighteen gallons of beer.

Barley could also be used to make a broth or stew. One recipe called for 4 quarts of water, 4 pounds of unboned beef, and 4 ounces of barley or barley meal. These ingredients were stewed for two hours. Then herbs, salt, and green garden vegetables, which had to include onions or leeks, were added to the stew and boiled until the ingredients were tender. The stew was then served.[86]

Oats were used chiefly for feeding livestock, particularly horses. The Scots, however, were fond of

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[84]John Hammond, "Leah and Rachel, or the Two Fruitfull Sisters of Virginia and Mary-land, by John Hammond, 1656," Narratives of Early Maryland: 1633-1684, ed. Clayton Colman Hall (New York: Barnes & Noble, Inc., 1910), p. 292; Douglass, Present State of British Settlements, II, p. 332; Jones, The Present State of Virginia, p. 86.

[85]Deborah Norris Logan, "Recipe appended to George Logan to the Society, August 1, 1787," Memoirs of the Philadelphia Society for Promoting Agriculture, VI, pp. 138-39.

[86]Bordley, Essays and Notes on Husbandry, p. 335.

oat-meal mush and the presence of Scottish factors along the Potomac probably induced some planters to try oat-meal mush. To make oat-meal mush the oats were finely ground and rolled. The mush was prepared by adding oat-meal and salt to water and boiling.

Straw from small grains, particularly wheat, was used for thatching buildings until late in the colonial period.[87] The problem with thatching was the time required to properly thatch a roof. A more common use of straw was for stuffing mattresses. Most straw was used for animal bedding.

The Grain Market

In the last half of the eighteenth century, men on exhausted tobacco lands along the Potomac began to grow wheat as a cash crop in place of tobacco.[88] The production of grains had been promoted by the colonial government since nearly the beginning of Maryland's settlement. Grain was required for payment of quit-rents in 1636. Throughout the colonial period favorable prices were established by the government to promote the

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[87] Entry for June 29, 1771, Carter, Diary, I, p. 584.

[88] Pamela C. Copeland and Richard K. MacMaster, The Five George Masons: Patriots and Planters of Virginia and Maryland (Charlottesville: The University Press of Virginia, 1975), p. 105; Merrill Jensen, "The American Revolution and American Agriculture," Agricultural History, XLIII (January, 1969), pp. 111-12.

production of small grains.[89]

The colonial government enacted legislation to control and protect the grain trade within the colony. To provide a preferred market for Maryland grain raisers, the Assembly prohibited the importation of wheat and other English grains from Pennsylvania for sale.[90]

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[89]"Conditions of Plantations, 1636," Proceedings of the Council of Maryland, 1636-1647, Archives of Maryland, III, pp. 47-48; "An Acte for Encouragemt of soweing English Grayne," Assembly Proceedings, April 1662, ibid., I, p. 445; "Act for Encovragemt of Tillage & Raising Provisions for Advancemt of trad wthin this Province," Assembly Proceedings, April--May 1682, ibid., VII, pp. 321-22; "An Act for Encouragement of Tillage and raising Provisions for advancemt of Trade within this Province," Assembly Proceedings, May 10--June 9, 1692, ibid., XIII, pp. 432-33; Newton D. Mereness, Maryland as a Proprietary Province (New York: The Macmillan Co., 1901), pp. 120-21; "An Act for the Encouragement of Tillage and relief of poor Debtors," Assembly Proceedings, September 5--October 3, 1704, Archives of Maryland, XXVI, pp. 278-80; "An Act for the better Relief of poor Debtors," Assembly Proceedings, 1714-1726, Acts Not Previously Printed, ibid., XXXVI, pp. 555-57.

[90]"An Act Reviving a Certain Act of Assembly of this province Intituled an Act prohibiting the Importation of bread beer flower wheat or other English or Indian grain or Meale horses or Mares Colts or filley's from Pensilvania and the territorys thereto belonging," Assembly Proceedings, March 26--April 15, 1707, ibid., XXVII, pp. 172-73; "An Act to allow the Importation of Bread flower and Indian Corne from the End of this Sessions of Assembly to the End of the next Sessions," Assembly Proceedings, October 24--November 10, 1709, ibid., XXVII, pp. 482-83; "An Act Reviveing an Act Entituled an Act prohibiting the Importation of Bread, flower, Malt, Wheat or other English or Indian Grains or Meal . . .," Assembly Proceedings, October 24--November 4, 1710, ibid., XXVII, pp. 574-75; "Message from the Council, November 10, 1713," Assembly Proceedings, October 27--November 14, 1713, ibid., XXIX, p. 238; "An Act reviving an Act of Assembly of this province Entituled an Act prohibiting the importation of bread beer flower malt wheat or other English or Indian grain or meale . . . ," Assembly Proceedings, 1694-1728, ibid., XXXVIII, p. 182; "An Act prohibiting the Importation of bread beer flower, Mault, wheat, or other Indian or English Graine or Meale . . . ," Assembly Proceedings, April 26 --June 3, 1715, Acts, ibid., XXX, pp. 226-27.

When grain supplies were short, the government removed the restrictions on the importation of grains and enacted prohibitions on their exportation. When the supplies returned to normal, the prohibitions were restored and the bans on exportation lifted.[91] To protect the people from fraudulent weights and measures, the government enacted a law to regulate the size and construction

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[91]"An Act prohibiting the exportation of Corne," Assembly Proceedings, October 1640, ibid., I, p. 96; "An Act limiting the exportacon of Corne," Assembly Proceedings, July--August 1642, ibid., I, p. 161; "Proclamation, October 13, 1674," Proceedings of the Council of Maryland, 1671-1675, ibid., XV, p. 44; "Proclamation, September 3, 1678," Proceedings of the Council of Maryland, ibid., XV, pp. 194-95; "Proclamation, December 20, 1683," Proceedings of the Council of Maryland, 1681-85/6, ibid., XVII, pp. 179-80; "Proclamation, August 7, 1684," Proceedings of the Council of Maryland, 1681-85/6, ibid., XVII, pp. 260-70; "Proclamation, October 15, 1695," Proceedings of the Council of Maryland, 1694-97, ibid., XX, pp. 327-28; "Proclamation, September 29, 1696," Proceedings of the Council of Maryland, 1694-97, ibid., XX, p. 503; "An Act to prohibit the Exportation of European Comodity's out of this Province," Assembly Proceedings, April 2-19, 1706, ibid., XXVI, pp. 631-32; "An Act to repeal an Act, entituled, An Act prohibiting the Importation of Bread, Beer, Flour, Malt, Wheat or other Indian or English Grain, or Meal . . .," Assembly Proceedings, October 3--November 2, 1728, ibid., XXXVI, p. 275; "Proclamation, August 3, 1737," Proceedings of the Council of Maryland, 1737, ibid., XXVIII, p. 127; "Proclamation, November 2, 1728," Assembly Proceedings, October 3--November 2, 1728, Upper House, ibid., XXXVI, pp. 168-69; "An Act to prohibit the Exportation of Grain Bread and Flour," Assembly Proceedings, August 11-16, 1737, Acts, ibid., XL, pp. 134-38; "Address of the Governor to the Upper and Lower Houses, August 12, 1737," Assembly Proceedings, August 11-16, 1737, ibid., XL, pp. 104-05; "Address of the Governor to the Assembly, May 15, 1751," Assembly Proceedings, May 15--June 8, 1751, The Upper House, ibid., XLVI, p. 505; "Reply of the Upper House to the Governor's Message, May 16, 1751," Assembly Proceedings, May 15-June 8, 1751, The Upper House, ibid., XLVI, p. 507; "Address to the Governor," Assembly Proceedings, September 28--December 16, 1757, The Lower House, ibid., LX, p. 302; "Address of the Lower House to the Upper House, December 8, 1757," Assembly Proceedings, September 28--December 16, 1757, ibid., LV, p. 181.

of barrels and casks for bread and flour in 1745.[92] This law was continued by additional acts through 1770.[93]

The export of wheat to England, Europe, and the West Indies became increasingly important to farmers along the Potomac throughout the eighteenth century.[94] When wheat began to be a trade commodity, larger planters often collected wheat from smaller farmers for shipping and sale.[95] By the outbreak of the American Revolution, the colonies were exporting 450,000 bushels of wheat. Maryland and Virginia accounted for over 85 percent of the total.[96] Most of the production of small grains in Maryland was centered on the Eastern shore rather than along the Potomac river.

A problem for the colonial grain producers who

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[92]"An Act for the Gauge of Barrels of Pork, Beef, Pitch, Tar, Turpentine, and Tare of Barrels for Flour or Bread," Assembly Proceedings, August 5--September 28, 1745, ibid., XLIV, pp. 221-24.

[93]"An Act continuing an Act entituled, An Act for the Gauge of Barrels for Pork, Beef, Pitch, Tar, Turpentine; and Tare of Barrels for Flour or Bread," Assembly Proceedings, May 8--June 2, 1750, Acts, ibid., XLVI, p. 463; "An Act continuing an Act, entituled, An Act for the Gauge of Barrels, for Pork, Beef, Pitch, Tar, Turpentine, and Tare of Barrels for Flour and Bread," Assembly Proceedings, April 8--May 9, 1757, Acts, ibid., LV, p. 131.

[94]"Answer to the Board of Trade Inquiries, December 21, 1748," Proceedings of the Council of Maryland, 1749, ibid., XXVIII, p. 469.

[95]William Fitzhugh to Mrs. Elear. Cutt and Mr. George Jeffries, February 5, 1682/3, William Fitzhugh, William Fitzhugh and his Chesapeake World: 1676-1701: The Fitzhugh Letters and Other Documents, ed. Richard Beale Davis (Chapel Hill: The University of North Carolina Press, 1963), p. 129.

[96]Jensen, "American Revolution and American Agriculture," p. 109; Gray, Agriculture in the Southern United States, I, p. 166.

sought to market their grains was that these commodities were a part of an international market. When the European grain producing areas were at peace and had good crops, they were able to undersell the American producers in almost every market save that of the West Indies. The size of the American crop often meant that the prices received by American planters for their grain crops were low.[97] In the eighteenth century, the price of wheat was generally twice as much as that of maize, oats, and barley. This price differential can be explained partially by the yields per acre.[98]

The Past and Present

The colonial planter in labor short America had to farm in a manner which was labor efficient. He needed to obtain the greatest possible total yields from a a given amount of cleared land. By continuous cropping of tobacco, corn, and small grains, he was able to "use" the land to its fullest. Although in the process he "wore-out" the land, the seemingly endless amounts of new lands allowed this profligacy. Towards the end of the eighteenth century, men who farmed old lands either by choice or necessity began to employ practices which would help retain or restore the land's fertility.[99]

The adoption of "labor-saving" devices permitted farmers to cultivate more land and a few to do so more

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[97]Entry for April 13, 1777, Cresswell, Journal, pp. 198-99.

[98]Haworth, George Washington, Farmer, pp. 96, 123-24; Morton, Robert Carter, pp. 170-71; Entry for January 7, 1757, Carter, Diary, I, p. 137; Entry for August 22, 1771, ibid., II, p. 619; Entry for September 23, 1774, ibid., II, p. 853; Fletcher, Pennsylvania Agriculture, p. 145; Herndon, "Agriculture in America in the 1790s," p. 511.

[99]Bordley, Sketches on Rotations of Crops, p. 12n.; Bordley, Queries on the Nature of Vegetation, p. 4.

wisely. By the middle of the twentieth century, small grain farming had become almost entirely mechanized. This mechanization was achieved through the purchase of energy. In terms of energy, the colonial farmer using the "human machine" was more energy efficient. He was able to produce, without the use of external energy sources, approximately the same grain yields per acre on fertile lands as his modern counterpart can at the cost of far greater amounts of external energy use.[100]

The most significant changes in the culture of small grains have been the development of varieties which can be grown in different climatic conditions, are disease and insect resistant, and are designed for mechanical cultivation. A number of these varieties, however, depend upon the use of chemical herbicides, pesticides, and fertilizers to achieve their maximum yields per acre.[101]

Although the colonial farmer would no doubt be amazed at the machinery used by his progeny, he would still recognize the crops and processes of cultivating them. Given that early colonial yields were comparable with modern yields in the same area, the colonial farmer might question the expenditures of time, money, and energy that the modern agriculturist expends to achieve his stands of grains nearly free of weeds and insects.

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[100]John Smith, The Generall Historie of Virginia, New-England and the Summer Isles (Ann Arbor: University Microfilms, Inc., 1966 /1624/), p. 126; John Clayton, The Reverend John Clayton: A Parson with a Scientific Mind: His Scientific Writings and Other Related Papers (Charlottesville: The University Press of Virginia, 1965), p. 79; J. R. Miller et al., Yield Goals in Crop Production, Fact Sheet 97 (College Park: The University of Maryland Department of Agronomy, 1966), p. 2.

[101]Charles B. Heiser, Jr., Seed to Civilization: The Story of Man's Food (San Francisco: W. H. Freeman and Co., 1973), p. 84.

The question of the use of energy is one which is increasingly raised. Farming today with its high energy use is predicated on the "need" for a maximum amount of production over a given period of time. Low energy prices for decades encouraged farmers to substitute mechanical energy for human energy. In the future, we may well have to reaccess the ratios of human energy versus mechanical energy in the production of food. In part the ratio will be determined by the amount of the value of production that is consumed in paying for the mechanical energy.

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