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Climate, Cropping, and Society in Vermont, 1820-1850

Climate fluctuated dramatically in nineteenth-century Vermont, and the farm economy responded to these changes within the confines of a particular but evolving agrarian society.

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Before Edward Jones sat down to write his son in distant Wisconsin, he probably stoked the fire as he had often done throughout the cold spring and summer of 1837. His elderly body felt the sharp bite of approaching winter more than it had in his youth, but the chill in his bones was more than simply advancing age. The actual climate was changing. In the late 1830s and 1840s growing seasons became shorter in Vermont, summers cooler, and the weather generally more unpredictable than it had been in the previous twenty years. As a result, rural life in these turbulent times became ever so much more trying.

As was his habit, he described to his son the produce market and the year's harvest on his substantial Richmond, Vermont, dairy farm. Once again an "early frost has hurt the corn," but the cool weather favored potatoes and oats, which were "good" and wheat, which was "very good."[1] Despite a meager yield of the important corn crop, his farm provided a healthy income, chiefly from cheese conveyed to the New York market, as well as a large stock of meat and produce to keep the Jones

family and its hired help well-fed through the winter ahead. Edward Jones was more fortunate than most local farmers. Many of his neighbors could not call upon such economic resources, and so they weathered the 1830s and 1840s, their economic disruptions, climatic changes, and social upheavals with considerably more difficulty.

No doubt Jones could remember a very different, and more optimistic, agricultural scene in Vermont than the one he narrated for his transplanted son. In 1823 when the Champlain Canal first linked the valley to New York City, settlers were still clearing farmsteads in the Green Mountains, creating an ordered, agrarian landscape, which many hoped to fill with harmonious, organic communities of Christian households headed by individualistic family patriarchs. Harold Wilson has called this era of self-sufficient farm families and petty producers the "spring" of Vermont's history.[2] Whatever we may think of his metaphor or of the rather controversial transition to capitalism, there is no doubt that in the soil of early nineteenth-century Vermont lay the seeds of a different world to come—factories and cities, railroads, abandoned farms, industrial capitalism and the modern era. In his day Jones witnessed a profound reordering of everyday life. Vermonters confronted not only the socially constructed forces of capitalism and industrialization, religious revival and social ferment, but also climatic changes whose effects were refracted through the prism of human affairs but whose sources lay outside them. Exogenous climatic changes played an important, if unacknowledged, role in the development of capitalism in rural New England. They contributed to the breakdown of traditionally diversified household production and further accelerated agricultural specialization based on wage labor.

Agrarian Society and Ideology

The American Revolution not only promised a new political order based on democratic egalitarianism, at least for white males, but it also opened for conquest and settlement land on the margins of the old colonies, land necessary to sustain the extensive agriculture of these petty commodity producers.[3] Settlers from southern New England like the Jones family pressed northward into Vermont.

There they forged an economic and political order based on the independent yeoman and his household. Each patriarch was to have his own farmstead or workshop where he and his family would work to provide for a modest competency. He might hire a laborer occasionally or trade chores from time to time, but in this ideal domestic economy the patriarch would "depend on no haughty lord" for his family's livelihood; "he is truly independent."[4] At least in the beginning, this lifestyle produced a rough equality of circumstance in rural Vermont, despite dif-

ferences in wealth among household heads.[5] Of course, the independence and relative equality of male household heads was based upon the subjugation of each member of the household—wife, children, even unrelated apprentices and farmhands—to the authority of the family patriarch.[6] Nevertheless, it was still possible to believe that equality of opportunity meant the only real limits to a man's individual achievement were hard work and personal industry.

In the 1820s, most Vermonters believed that clearing forests and settling land represented progress, the imprint of the world's finest civilization on a vast wilderness. Settlers created a world of churches and meetinghouses, town commons lined with homes of the prominent, ordered fields, tended gardens, and mended fences, all imbued with particular meanings that helped to support the social order that had created them.[7] Though few realized it at the time, elements of this early nineteenth-century landscape foretold some things to come: heavier and more frequent freshets, and growing woodpiles but shrinking woods—part of an altered physical geography that George Perkins Marsh would decry some fifty years later.[8]

This idea of American exceptionalism even carried over in attitudes about the climate. North America has a considerably more extreme climate than equivalent latitudes in Europe, a difference that mystified early European explorers and colonial settlers alike. One prominent theory blamed the unnaturally cold winters on the tremendous expanse of forest that covered the continent and blocked the sun's warming rays.[9]

As temperatures warmed in the 1820s after more than a decade of cold capped by the disastrous summer of 1816, many people believed their efforts at taming the wilderness had finally warmed the earth. The Danville, Vermont, *North Star* explained that "as the original forests of the continent disappear . . . we may expect the same effects on our climate . . . as European countries have experienced." Its editor, William Eaton, believed that "no one this season will covet a southern latitude."[10] Soon, Vermont, like Spain or the south of France, might boast citrus and olive trees. This indeed would be progress. Such declarations were more than mere boosterism. They reflected a pervasive spirit of optimism and a boundless faith in the power of human agency to dominate the earth and render it fruitful.[11] This belief that farm-making could improve the landscape and even the climate itself further validated the agrarian ideal and the society that underwrote it. By 1850, however, most Vermonters had learned, much to their chagrin, that the warmer temperatures of the 1820s were only brief perturbations and not harbingers of some permanent alteration. They had to adjust their notions about climate.

Farm Economy and Climatic Change

The household was the basic social and economic unit and the farm the predominant means of livelihood for most Americans in 1800. As a rule they practiced an extensive and diversified agriculture. In Vermont and New England generally, this meant a judicious mix of animal husbandry—some chickens, sheep, cattle, cows, swine, and perhaps horses—alongside hay, pasture, and arable production. Almost every farmer harvested some small grains, primarily wheat, rye, and oats, as well as corn, potatoes, and "sauce" from the family garden. These staples, along with hay, formed the core of New England agriculture, but they were also supplemented by less common field crops including carrots, buckwheat, turnips, peas, flax, beans, and squash as well as fruit, especially apples and plums.[12]

Such diversified cropping was part of the ideology of domestic economy and the self-sufficient family farm. Of course, only the very wealthiest households could command the resources to be absolutely self-sufficient, but by producing a variety of foods and fibers, a family could hope to provide for most, if not all, of the necessities of life with household labor, local barter, and some trade within and beyond the immediate community. Such diversity appealed to Edward Jones because "a man would be pretty certain to be Right Side up some of the time."[13] Usually, a good year for one crop meant a poor harvest for others, as the *Farmer's Monthly Visitor* noted in the case of corn, which favors hot and dry summers not auspicious for grains, hay, or potatoes.[14] With their small grains, corn, potatoes, and hay, early nineteenth-century Vermonters had a diverse and flexible retinue of crops with complementary agroclimatic requirements (Fig. 1).[15]

The risk reduction that agricultural diversity afforded New Englanders was important because climatic fluctuations were so dramatic throughout the seventeenth, eighteenth, and early nineteenth centuries. Known widely as the Little Ice Age but notoriously difficult to define, this climatic epoch is characterized by generally cooler temperatures, increased variability, and more frequent southern displacement of the circumpolar vortex.[16] For New England, paleoclimatic information is sparse and not very precise, but pollen and tree-ring data suggest that mean growing season temperatures were as much as perhaps 1°C cooler than at present.[17] Unfortunately, greater precision is not possible until the middle of the eighteenth century when the first regular meteorological observations began. These data are not homogeneous, but they do illustrate long-term patterns of climatic change in the Northeast (Fig. 2).[18] Vermonters carving farms out of the forest had no such perspective. They assumed the cooler climate of the settlement period 1790-1820 was normal and

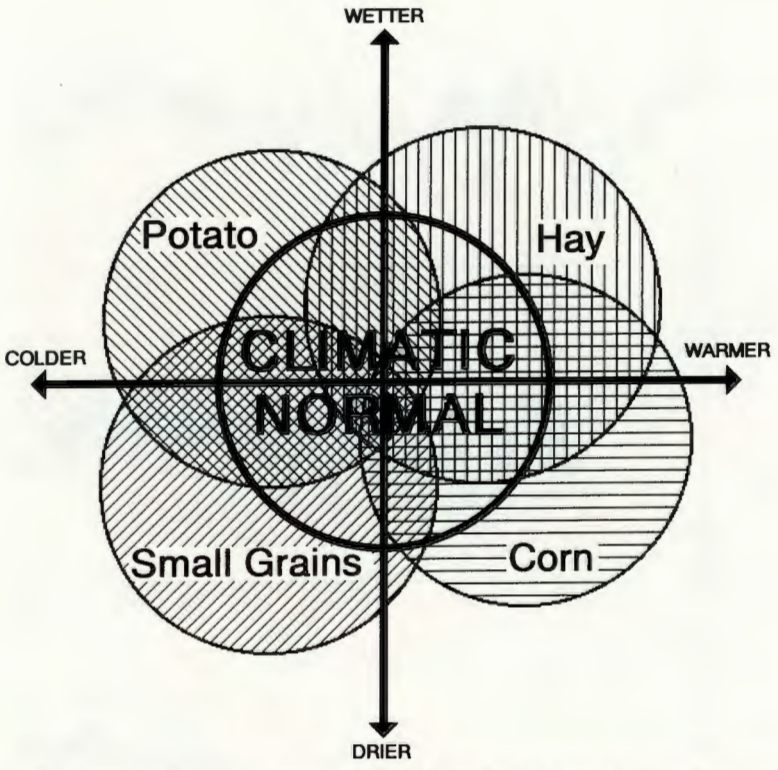

Fig. 1. Ranges of growing season conditions for highest yields of various crops in New England.

believed the warming of the 1820s and early 1830s to be the direct result of their efforts to tame the wilderness. In one sense, of course, they were correct: it was warming (Fig. 3). Vermonters only mistook the reasons, as they would discover later when temperatures declined again.

But how could such small climatic changes have any influence in Vermont or elsewhere on "agriculture and other activities of human society?" More than one prominent historian has posed this question.[19] The geographer Martin Parry has responded by pointing to climatic margins or spatial limits of possible human activity as defined by the biophysical requirements of agricultural crops and human perception of these risks. He notes that even small climatic shifts can move these boundaries great distances.[20]

The climatic swings of the early nineteenth-century affected Vermonters at this intersection of biophysical marginality, risk perception, and human expectation. In the 1820s, people expected the climate to continue warm-

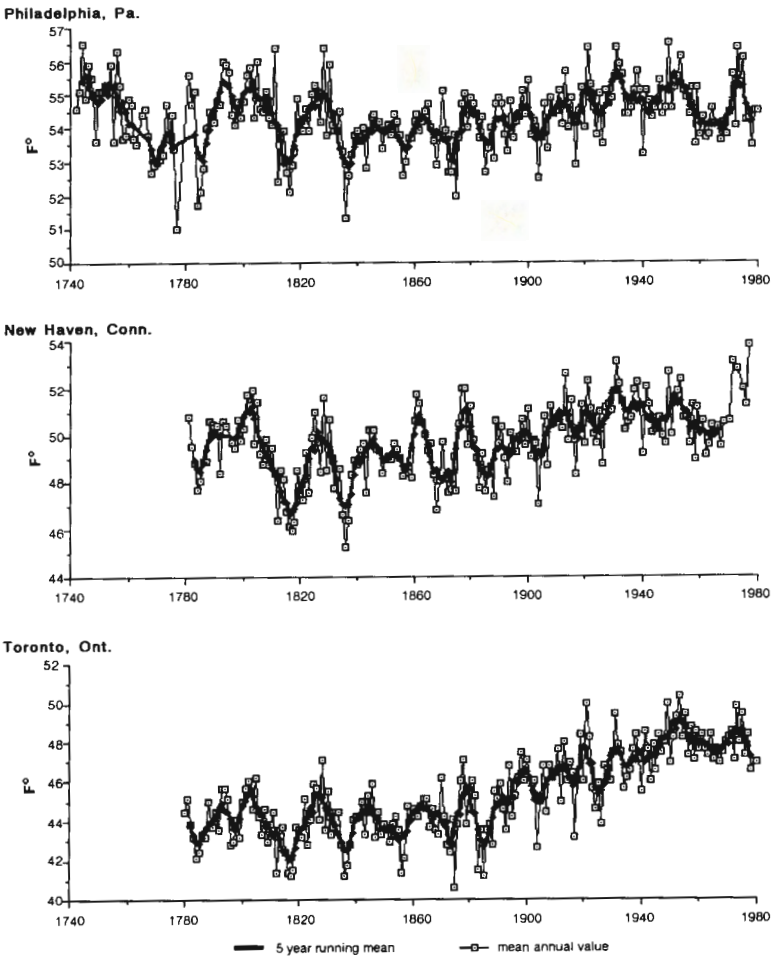

Fig. 2. Mean annual temperatures in eastern North America, 1740-1980. Source: Appendix I.

ing as they made further progress towards building their agrarian world and its complementary landscape. The biophysical range of possible corn cultivation moved northward in Vermont almost as fast as settlers themselves. The generally cooler temperatures of the late 1830s and early 1840s affected crop yields and forced Vermonters to adapt. Of course, harvests have always fluctuated; such is the nature of agriculture. What was important about these particular climatic changes was the shifting social and economic context in which they occurred.

For the less fortunate, those renting on shares or trying to pay

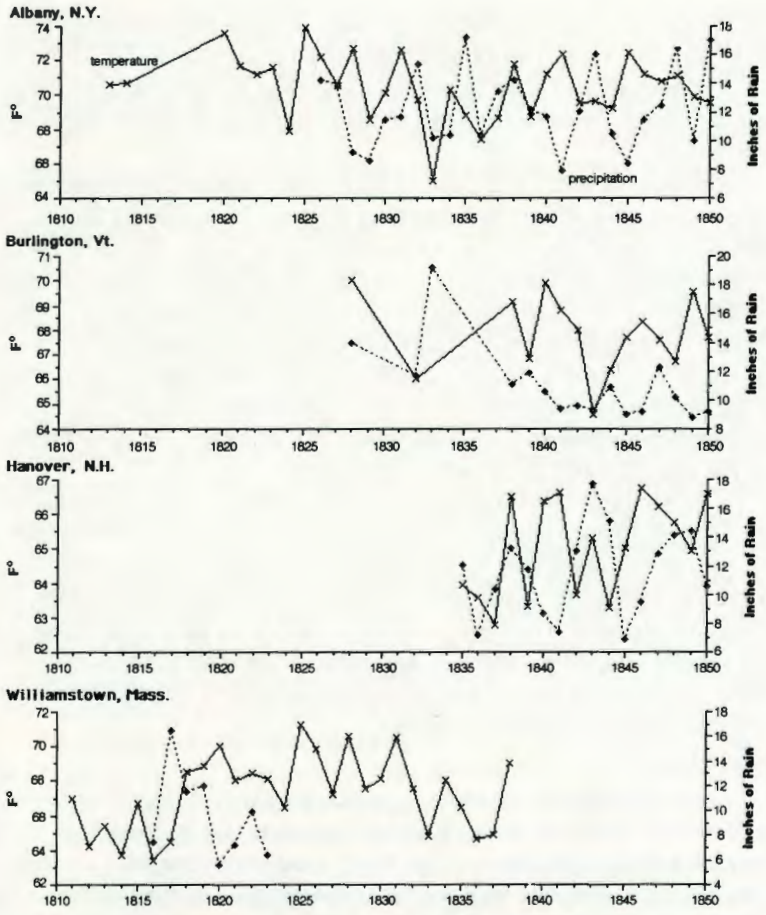

Fig. 3. Summer (June-August) temperature and precipitation at selected sites around Vermont, 1810-1850. Source: Appendix I.

mortgages on farms of their own, climatic change made it even harder to establish economic independence. The old safety net of communal obligation and deference was eroding in Vermont. Back in the spring of 1817, when both food and cash had been in short supply in Bennington, "neighbors began to solicit favors." Without such aid, Mr. Andrews "would have suffered for want of bread."[21] That same year the town of Cornish, New Hampshire, considered buying a poor farm, a novel step indeed, but the matter was tabled and support of individual paupers auctioned off to families as before. Cornish did not buy a poor farm for segregating this new and growing category called the poor for another seventeen years.[22] By 1843, Edward Jones could dismiss his grumbling

son-in-law Levi, because "I could get another man to do the work at $10 pr. month."[23] Out of work and without a farm of their own, Levi and his wife were all alone, an unpleasant situation as rising land prices and climatic changes made achieving a modest competency more difficult than ever before.[24]

In this time of social and climatic flux, many substantial farmers began abandoning their diversified cropping strategy for more profitable, but also more risky, specialized agriculture. For them, climatic change further destabilized the older pattern that was already being undermined by market forces. After about 1835, cereals and, later, even potatoes became increasingly uncertain crops in Vermont. There seemed little reason for them to occupy as much valuable acreage when hay fed to cattle or sheep provided a better return on labor and capital costs.[25] Of course, such intensification and specialization were dependent in large measure on the sale of labor by those without farms.[26]

To understand the interrelationships between climatic change and agricultural specialization in Vermont, we need to look individually at the four major staples of New England agriculture: small grains, corn, potatoes, and grass. Each crop responded differently to climatic and economic changes. Together, of course, they were part of an integrated but rapidly changing system of agriculture. Separate discussions reveal many pressures on and adjustments to agriculture in Vermont during the first half of the nineteenth century.

Small Grains

Pioneers found wheat and rye particularly well suited to their needs in Vermont. Both of these "English" grains could be broadcast in the autumn among fresh stumps and brush cleared the previous summer.[27] On such soils, enriched with nutrients liberated in clearing and burning, wheat and rye often yielded in excess of thirty or even forty bushels per acre. However, upland yields in New England were usually closer to fifteen bushels per acre.[28] Winter-sown grains were liable to winter kill, especially at higher elevations; as the clearing of stumps and expansion of tillage progressed, farmers switched to spring-sown wheat. Many also continued with hardier winter rye.[29] Although they offered smaller yields and lower prices at market than winter wheat, rye and spring wheat still fetched enough to bring "a great many [sleigh] loads" full of Green Mountain grain as far as Troy, Montreal, and even Boston.[30] Then there were always local distilleries that eagerly sought rye for whiskey, which lubricated so much farm work.[31]

Vermonters were market savvy, traveling long distances to get the best price, but they were not all perfect profit maximizers. As Edward Jones later recalled, "We never counted the Expense [of our time] . . . only what

money we paid out for Expenses."[32] In such a mindset, wheat and the long trips required to market it made economic sense. Even for those who ate rye and Injun bread, wheat could still earn cash useful for paying taxes or creditors. P. Jeffrey Potash's study of Middlebury probate inventories (1811-13) found that twenty-nine out of a sample of thirty-one farmers grew some wheat; rye, barley and oats were sown by less than half of the sample.[33]

As the State of New York pressed ahead with the Erie and Champlain canals, and locks around falls along the Connecticut River improved navigation there, many commentators in Vermont, particularly merchants and the river town elites, believed that lower transportation costs would spur the industry of farmers and their grain production. Citizens in Danville believed these measures would "promote both the individual and general interest by . . . bringing a ready market near our own doors."[34] A committee of the state legislature predicted that Vermont farmers would soon produce "an immense surplus of grain" for export at "the nearest seaport."[35] Initially, this seemed to be the case. In its first full year of operation, the Champlain Canal carried 41,314 bushels of grain from the Champlain Valley to New York City where twenty-one guns saluted the first boatload of Green Mountain grain.[36] Some Vermonters were clearly exploiting this export opportunity, but which farmers and why remain open questions. The wealthy probably benefitted most of all. People like Ezra Meech owned enough land and could command enough labor outside of Burlington to harvest five to eight hundred acres of wheat each year.[37] He could sell more wheat than hundreds of his neighbors put together. More modest farmers were not able—perhaps not even willing—to produce and market wheat to this degree.

Of course, canals could carry commodities into Vermont just as easily, and soon boats were bringing flour and grain. By 1826 Ezekiel Niles estimated that the state was importing 15,000 barrels of flour a year.[38] In this flood of flour and wheat, which by 1834 had reached 61,247 barrels and 20,406 bushels conveyed annually by the Champlain Canal alone, prices of these commodities fell relative to other farm products.[39] Increasingly, Vermonters, especially those who linked time and money, turned their efforts away from wheat production towards other farm products. In Bennington, Hiram Harwood stopped sowing wheat in 1826. The next year he bought flour in Troy and used the extra acreage to plant more corn and cut more hay to feed his growing herd of dairy cattle. But the extra labor required for wheat production was even more important. With thirty-seven acres of meadow to mow in the summer of 1828, Harwood could scarcely afford to waste sunny August days cradling grain when there was hay to make.[40]

Climatic changes acted in concert with these social and economic forces to render wheat production an increasingly marginal affair in Vermont. The late 1830s in particular were poor years for English grains in Vermont (Fig. 4). In Quebec, where farmers relied even more heavily on wheat, famine threatened more than once.[41] Some years, like 1828, were too wet, encouraging the growth of rust and making the harvest difficult. Others, like 1838, were too warm, aiding the ravages of the grain weevil.[42] Some years were good, of course, but in a new calculus of dollars, cents, and opportunity cost, the returns from wheat seemed less and less attractive. Vermonters tried to adapt, studying these pests, sowing so as to avoid the fly, soaking their seed in lye or plaster, even trying new seed varieties, but more than one New Englander considered competition with the fertile west in grain production a "suicidal policy."[43] By 1847, Edward Jones and his neighbors around Richmond, Vermont, were planting "very little" wheat or rye. In Vermont and New England more generally, these crops would "no longer procure a price equal to the labor."[44]

Vermont's farmers also planted barley, always a minor grain crop in the state, and oats, which steadily became the most important of the small grains. In 1839, Green Mountain farmers produced 2,222,387 bushels of oats; in the drought year of 1859, they harvested 3,630,267 bushels.[45] They found oats to be more resistant than wheat to insects and rust, but Vermonters were more attracted to it as feed for sheep and cattle.[46] Animal products—chiefly wool, butter, and cheese, but also meat on the hoof—were quickly becoming the staples of a new commercial agriculture in the state. The switch to oats to feed this growing industry

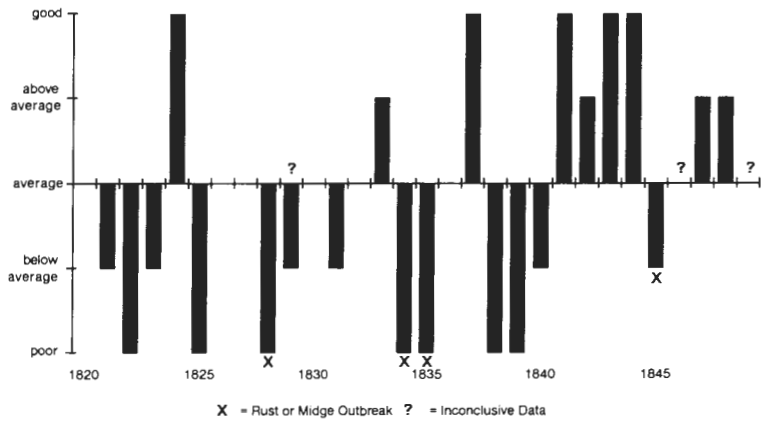

Fig. 4. Vermont small grain harvest quality index, 1820-1849. Source: Appendix II.

not only retained some of the climatic safety provided by traditional patterns of diverse cropping but it also represented an adaptation to emergent market forces.

However, sowing oats as part of an animal husbandry industry is a different proposition than producing wheat for human consumption. Wheat is the staff of life and occupied a central position in the imagery and discourse of the farm press. The fact that increasing numbers of Vermonters were willing to depend on the vagaries of the market for their daily bread made conservatives like Henry Colman uneasy. On the one hand, they urged New England's yeomen to systematize their agriculture, reckon in terms of time as money, and produce farm commodities that would pay. Wheat production and home-grown flour were among the first victims of this new logic—a source of profound concern to those same people who viewed the humble yeoman as the bedrock of the polity.[47] Editorials bemoaned grain imports, urged wheat cultivation, and longed for the days when "Vermont raised a surplus of wheat."[48] Such calls refused either to confront the contradictions in the rhetoric of the agricultural reform movement or address the realities of agriculture at mid-century. Farmers listened selectively, and as they became petty capitalists, they sowed more oats for hungry sheep and cattle and less wheat for the family table.

Corn

In southern New England, unlike in the early forest clearings of Vermont, corn, not English grains, was the chief cereal. In towns such as Concord, Massachusetts, corn made up about two-thirds of all cereal production.[49] Timothy Dwight observed that "maize" or Indian corn, as it was widely called, "is nearly as valuable to this country as all other kinds of corn [grain] united, and yields a crop much more certain, and much more extensively than any other."[50] The Connecticut clergyman hit on two of the three chief attractions of this New World cultigen: its reliability and its high per acre yield. Corn was not subject to the rusts and insects that plagued New England wheat, and as long as the growing season remained long enough, it was an excellent crop, well adapted to the climate. After all, aboriginal peoples had been planting it in the region for at least five hundred years before the arrival of the first European colonists.[51] According to Henry Colman, an average yield was thirty bushels per acre, but on highly fertile intervales, or where well fertilized, corn yielded even more bounteously.[52] Most importantly though, it provided stalks and leaves for livestock feed, in addition to the more familiar ears that farmers could roast, boil, or grind for their own tables.[53]

Corn was much less common in Vermont than in southern New England. In his 1811-13 probate inventory sample, Potash found that

only fifty-five percent of Middlebury farm households planted any corn at all.[54] Of course, Vermont, New Hampshire, and Maine alike lie considerably to the north of Timothy Dwight's New Haven home, and in the 1810s their more abbreviated growing seasons seriously inhibited corn cultivation.[55] In Bennington, Vermont, the growing season in the decade 1810-19 averaged 117 days, while in the Boston area it averaged 164 days.[56] This was an important difference because 150 days is widely acknowledged as an important threshold for maize production.[57] The very shape of the landscape also discouraged Vermonters from planting corn. They could sow wheat among stumps on newly cleared fields where they could not plow to plant corn. Wheat, of course, was also an important cash crop with exchange value outside of the community. These interlocking considerations made wheat and other small grains more popular than corn in the first two decades of the nineteenth century.

For the poor, however, corn was the grain "on which a large proportion . . . depend[ed]."[58] Although it brought a lower price at market, corn provided a higher yield than small grains as well as fodder for the family cow or hog. Following the example of indigenous peoples, New Englanders with small farms or very little improved land could plant beans, squash, and pumpkins among their corn hills and not only maximize the caloric output per acre and balance their diet with essential amino acids but also increase corn yields through the nitrogen fixed by bean vines.[59] Of course, struggling Vermonters like John Wittenmore who tried to rely on corn were coming up against the climatic limits this crop could physically tolerate. He and his older brother tried to finance the purchase of an eighty-acre farm in St. Albans by planting corn, but repeated harvest failures between 1810 and 1817 made this difficult. Fortunately, their creditors were willing to defer payment, and Wittenmore was able to renegotiate his loan on different terms.[60]

The schedule and pace of labor in corn cultivation also made this crop attractive to the less wealthy strata of rural Vermont. Although corn requires intensive labor—early spring manuring and plowing, hoeing in June and early July, cutting and gathering in September and October, and finally winter husking and grinding—these tasks did not conflict with the hay and grain harvests in July and August. As a result, those forced to sell their labor to balance the family account could work off the farm and still cultivate corn. Hoeing, weeding, and even autumn harvesting and husking, unlike midsummer mowing and cradling, were not chores reserved exclusively for men; farm women and children could do them, while male labor only was hired for the critical hay season.[61]

In the 1820s, as Vermonters cleared more land and the climate warmed a bit, they began to increase their acreage in corn. Although Hiram Har-

wood was hardly the typical Vermonter, his case illustrates a common reaction to the warming of the 1820s. In 1817, he sowed sixteen and one-half acres of small grains but only two and three-quarter acres of corn. By 1829 he had increased his corn planting to six acres but now sowed a meager six acres of winter rye along with a smaller but unspecified amount of oats. That autumn he carefully collected the cornstalks and leaves to feed his herd of twenty-five cows.[62] Unfortunately, diaries from more modest Vermonters are not available, and there are no household or even aggregate statistics that might definitively establish an increase in corn production. Nevertheless, Vermonters could not have failed to notice the larger harvests and consistent quality of their corn crops (Fig. 5). Throughout the 1820s and early 1830s people must have repeatedly exclaimed, much like William Eaton, editor of the Danville *North Star*, that the corn has "never exhibited finer and heavier fields."[63] Many Vermonters probably followed the route of Hiram Harwood, planting more corn and sowing fewer acres with small grains. They did not abandon the older diversified cropping strategy entirely, but adjusted the crop mix to take advantage of changed conditions, both economic and climatic, more favorable to the production of corn.

However, as the climate cooled in the late 1830s, prospects for corn in Vermont declined. At first, boosters denied that there was even a problem. Increasingly, though, it became impossible to deny that in the face of this "continued change of climate" corn was becoming a marginal crop.[64] Severe frosts in 1832, 1834, 1836, 1837, and 1842 damaged the crop in many places. With a shortened growing season, the schedule of farm work became tighter, particularly for those who had to borrow teams

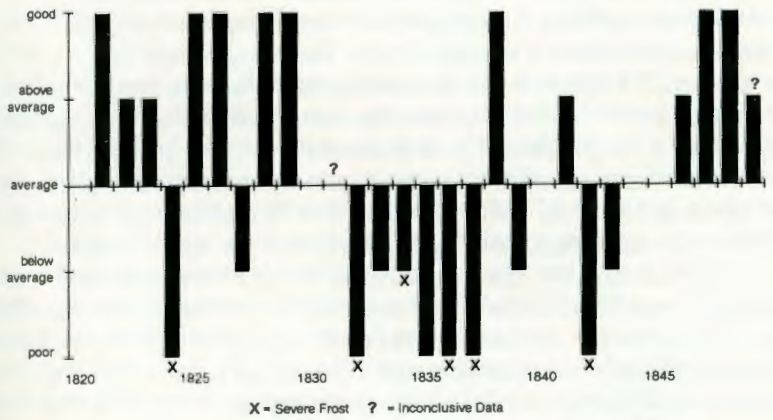

Fig. 5. Vermont corn harvest quality index, 1820-1849. Source: Appendix II.

or tools from better equipped neighbors. Gone were the early springs of the 1820s when Lovel Kelton of Calais, Vermont, could exclaim, "good weather. warm. no lost time." Instead farmers had to rush to cut their corn before Jack Frost did it for them. Time became precious and, for some, even a commodity, much as the agricultural editors said it should be. After replanting the cornfield struck down by a 12 June 1842 frost, Jabez Jones of Somers, New York, faced "hoeing, mowing, and [grain] harvest altogeth[er] and labouring men Scarce."[65] Diversification had backfired: there were too many things to do at once.

Progressive farmers and the agricultural press tried to combat the increasing marginality of corn production. The *Boston Cultivator* promoted buckwheat, a quick maturing substitute to which farmers like William Nutting of Randolph, Vermont, might turn after a late spring frost.[66] Some writers urged cutting corn tops to speed autumn drying and reduce the risk of frost damage.[67] Others tried to develop and promote strains of corn that could mature in less than ninety days. Particularly prominent in these efforts was John Brown of Moultonborough, New Hampshire, whose "Brown's Corn" was one of the most successful of these early corns. Vermonters could also plant Sioux or Canada corn as well as a strain developed by Daniel Putnam of Danvers, Massachusetts, but all the early corn varieties shared one major drawback: lower yields.[68] Still the effort to adapt corn to New England's changing climate was an important one, not least because it represented the beginnings of a professionalized agricultural science and the first sale of genetic material as a commodity.

These agricultural reformers also promoted a very particular, and increasingly powerful, vision of what a cornfield should look like. Farmers should plant corn in cross-ploughed rows, and not in the aboriginal fashion of hills with squash, pumpkins, and nitrogen-fixing beans among the cornstalks. This older way was sloppy farming, not proper modern economy.[69] Later as horse-drawn cultivators became more common it was even harder to practice this polyculture because the new technology could not accommodate different plants in the way that hand hoeing could. These developments made it easier to specialize in large-scale corn production, but more difficult to continue with the polycultural corn strategy that had long been a mainstay in the farm economy of the poor.[70]

Fear and reaction against change as much as a new ideal for New England agriculture ignited the fiery speeches of journalists, self-appointed agricultural critics, and gentlemen farmers. People like Isaac Hill feared that northern New Englanders would "change our Indian corn product for other kinds of bread."[71] This was particularly worrisome because in the late 1830s market and climatic conditions had combined to render wheat and other small grains marginal in Vermont. For conservatives,

New England's dependency on imports for its bread had great symbolic importance, but for the marketwise, like Edward Jones, it spelled potential profit. As he explained, "I never [k]new a time when the corn crop was short but what there was a call for bread stuff before the year come Round." In the autumn of 1842, after yet another dismal corn harvest, he arranged to have his son in Wisconsin ship twenty barrels of flour to Burlington, where "every creature that has any on hand will make a dollar on every barrell they sell."[72]

For most Vermonters, though, climatic change meant not profit but hardship and adjustment. It was particularly difficult for the rural poor and those on marginal lands who relied on corn the most. In 1842, Edward Jones had "half of what you would call a good crop [of corn] . . . but East of us on the high land" on the upper Winooski River "there cannot be but little corn." After the failure of the corn crop many of these unfortunates had to trek to Burlington to buy flour, where Jones and other speculators hoped to turn a tidy profit. Going to market to buy bread required selling something in exchange. For those Vermonters who ran their own farms this usually meant some animal product, either wool, meat, cheese, or butter. The increased marginality of the corn crop denied them an important source of livestock feed and so made the brief haying season an even more critical part of the farm economy. However, with the rising price of land, a growing class of Vermonters did not own their own farms; they had only their labor to sell. Many tried to stash away enough capital to rent or buy a farm, but it became increasingly difficult to ascend this ladder to farm ownership in Vermont.[73] Laborers had little choice in these matters and less and less hope.

People who owned or rented a bit of land but had previously balanced their farm accounts by hiring out to mow were in a particularly awkward situation as corn crops became more marginal. Hay was now even more important to the farm economy, but with mowing, unlike corn cultivation, there was no substitute for male labor. Men could stay at home and make hay to feed their own livestock or they could hire out and earn wages. In good years there were enough sunny July days to do both, but when the season was wet and there were precious few days suitable for mowing, it became more difficult to maintain this balance between work at the homeplace and wage labor off the farm. The greatest challenge, though, came from a new ethic that had begun to penetrate rural Vermont; creditors were demanding swift repayment. In the face of new climatic uncertainty, debtors could no longer count on the patience that had saved John Wittenmore from foreclosure when his corn crop failed repeatedly in the 1810s.[74]

Potatoes

Although rarely planted in large acreages, the potato was an important component of the crop mix in Vermont. Editorialists recommended it to settlers moving into northern New England as a substitute for tender corn, nipped too often by frost. It was reasonably reliable and provided more calories per acre than any other field crop. For this reason poor farmers relied on it most heavily—as a "'staff of life' to the New England farmer."[75] Women could prepare potatoes in a dazzling variety of dishes for the table, or simply boil the tubers and feed them to livestock, the use that progressive farmers who advocated the English model of intensive agriculture recommended most highly. The potato and other high yielding root crops could provide enough fodder to feed a large herd of cattle on the small, closely managed, and intensively fertilized farms that these Anglophiles believed should dot the New England landscape.[76]

By the mid-1820s some Vermonters were producing more potatoes than ever before. A commission merchant named Jack Taylor visited John Wittenmore and other farmers in the Champlain Valley to bid on their next potato crop, which he could now ship by canal to the New York market. Wittenmore increased his acreage in the spring of 1824 and earned $150 from six hundred bushels, which helped put him a year ahead on his renegotiated farm mortgage. Taylor probably sent most of Wittenmore's crop to the South where New England potatoes were fast becoming a staple in the diet of plantation slaves.[77]

Meanwhile, other Vermonters began selling their potatoes to the starch factories springing up throughout the region. Levi Bailey operated a small one in Reading, Vermont, which opened in 1831 and sold its processed potato starch to agents who conveyed it to the large textile mills in Lowell and Providence. In 1834, the year with the most detailed accounts, he bought 5,423¼ bushels of potatoes from forty-two different farmers who sold him an average of 129.1 bushels each.[78] Dotted across the landscape were many other starch factories, some of which operated at a much larger scale than Bailey's. In 1835, D. Carpenter, agent for the Starch Factory on Joe's Brook in Danville, wanted to purchase twenty thousand bushels from farmers in the upper Connecticut River Valley.[79] At two hundred bushels per acre, this single mill required one hundred acres of land planted to potatoes each year to keep it supplied.[80] Other land would have to feed the local population, and, increasingly, other labor would have to harvest it, because Vermonters, especially young women, were trekking off to work in textile mills supplied by Vermont starch. Although Bailey's seven largest suppliers accounted for fifty-four percent of his total potato purchases, his mill and the factory system of production reached far into

the countryside. Not only was he an important and, no doubt, leading supplier of seed potatoes in his vicinity, but even those farms not actually selling potatoes to him had to buy and sell according to world prices set at distant entrepôts.[81] So pervasive were these developments that no household or individual could remain insulated or detached from them.[82]

Although the potato suffered occasionally with rusts it remained a reliable and important crop in Vermont until the first outbreak of the potato blight in 1844 (Fig. 6). In fact, large-scale potato production for starch mills was one line of business that farmers in the Richmond, Vermont, area entered after repeated frustrations with corn.[83] However, after 1844—when the potato blight (*Phytophthora infestans*) first struck western Vermont—and in almost every year thereafter when it returned after several consecutive hot, humid August days, the potato harvest was dismal. In 1845, the only year when the fungus did not plague New England potatoes, the summer was so dry that the crop shrivelled.[84]

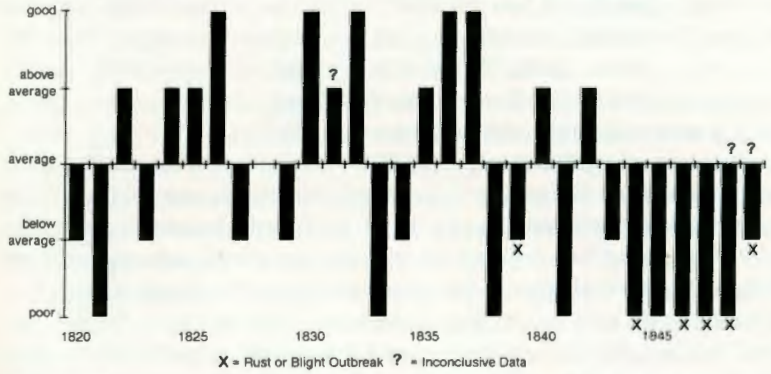

Fig. 6. Vermont potato harvest quality index, 1820-1849. Source: Appendix II.

Journalists, amateur scientists, and ordinary farmers discussed and debated with great concern the cause of this new affliction. They experimented with various cultivation methods and tried different potato varieties, searching in vain for some sure-fire cure to the affliction.[85] Ironically, such experimentation had probably been responsible for conveying the disease to eastern North America in the first place. In part to combat a viral disease called the curl, but also as part of the first fumblings of a scientific agriculture, horticulturalists and gentlemen farmers began collecting and exchanging different potato varieties from around the world. This passion trumpeted the Rohan potato, a large and high yielding but rather unpalatable tuber, as one of the new varieties to save New England agriculture.[86] One of these shipments, however, brought the blight, indigenous to Mexico and the Andes, to the eastern

United States where it first bloomed in 1843 outside of New York and Philadelphia. It then spread quickly across North America and Europe, accelerated in part by the habit of changing seed stock periodically to combat the curl.[87] In fact, one of the earliest theories to explain the blight blamed it on tired varieties "actually dying of old age."[88] The solution, naturally, was further experimentation and genetic exchanges.

Fortunately, Vermonters were not as reliant on the potato for subsistence as the Irish or the "backlanders" of Cape Breton Island, Nova Scotia. Dependent almost solely on the potato, they faced starvation, while New Englanders, protected by their relatively diverse agriculture, faced only readjustment, a process more difficult for some than for others.[89] J. Gillet of Richmond, for instance, continued "Raising Potatoes for the Factory" despite the blight.[90] Eventually though, he and others like him learned the hard way and scaled back their production. The United States Patent Office believed that New England's potato crop in 1847 was scarcely ten percent of what it had been in 1843. Census statistics do not bear this estimate out entirely, but they do indicate the scale of impact. In 1839, Vermont harvested 8,669,751 bushels of potatoes, but in 1849 it produced only 4,951,014 bushels—a forty-three percent decline. As a result, many starch mills went out of business.[91]

Of course, the potato was important for fattening livestock before autumn slaughter. Without it, Gillet would have had a more difficult time concentrating "his attention to Cattle" or Green Mountain sheep. The potato blight and the persistent marginality of corn placed even more importance on the hay crop and further encouraged Vermonters to turn to oats and other root crops that promised to diversify their fodder supplies.[92] The Irish potato famine and the repeal of the Corn Laws in Britain also boosted world grain and flour prices dramatically, a boon to those Vermonters still involved in these lines of business. Such price fluctuations spurred another round of debate about the potential for cereal production in New England, but the chief beneficiaries of rising cereal prices were those, like Vermont-born Milo Jones, who had settled the Midwest. Increasingly, as Vermonters realized that in grain as in wool, they were price takers and could not compete at world prices that dominated even local markets, they looked westward through a kaleidoscope of regret, envy, and ambition.

Hay

Hay had always been an important crop in the Green Mountain State where long, cold winters prevented livestock from grazing for up to six months each year. In the initial days of settlement, Vermonters turned their animals into woods to fend for themselves, but people quickly raised barns and cleared pastures and hay meadows for their growing

herds. Livestock was important not only in this corner of New England, where meat on the hoof was an important early export, but more broadly in the agricultural revolution of northwestern Europe. The introduction of clover and new fodder crops increased the size of livestock herds, producing more manure, which in turn raised grain yields. This grain fed population increases that helped launch the industrial revolution in Europe.

Making hay presented Vermonters with some unique challenges. Although grass grows most luxuriantly under warm, damp conditions, harvesting proceeds best in hot, dry weather when new-mown hay can dry and cure in the sun; wet and damaged hay does not provide as much nutrition as properly cured hay.[93] Usually sometime in July, once the grass was mature and the weather seemed right, farmers would sharpen their scythes and gather their mowers for haying season. Women occasionally worked at spreading and tedding or raking, but actual mowing was an almost exclusively male preserve.[94] In such masculine company, mowers might compete with each other for speed, always important when "a threatened thunder-storm" might rouse Hiram Harwood in the middle of the night to get in his hay, or in friendly drinking contests. Alexander Miller reckoned that he had hired ninety-one days of labor and bought ten gallons of rum to refresh his men during the 1820 hay season.[95] Once the mowing was done, farmers still had to gather their hay and store it for the winter ahead, either in barns or outdoors in stacks where some would rot. Barn size, therefore, marked both a man's status and the upward limit to his herd size.

The scale of Alexander Miller's haying operations in Wallingford, Vermont, exemplified a new kind of agriculture just beginning to emerge around 1820. During the twenty-two days of the 1820 season, he hired an average of 3.8 hay makers per day. Previously it had been unnecessary —impossible even—to make fifty-seven tons of hay, but Miller and others like him across Vermont needed such huge supplies to fodder their growing flocks and herds. After the autumn slaughter of 1826 Miller owned 179 sheep; by November 1835 his flock had nearly doubled in size to 332.[96] He was by no means alone. Buoyed in part by rising prices from protective tariffs and a flourishing domestic woolen industry, the number of sheep in Vermont increased from 450,000 in 1810 to 1,681,819 in 1839.[97] In the midst of this sheep boom, the governor declared that "Our citizens have become so dependent upon the growing of wool" that it has become "the staple of the state."[98] Dairying along the lake as well as butter and beef in the upper Connecticut River Valley were also important industries.[99]

The steady growth of animal husbandry in Vermont increased the acreage devoted to hay in the old four-crop system. Hiram Harwood went from mowing thirty acres in 1817 to making hay on thirty-seven acres

in 1828, while Alexander Miller invested in diking so that he could flood his alluvial meadows and cut two crops a year. Reliable aggregate statistics are not available until 1839, when, despite a below average harvest, tiny Vermont mowed 836,739 tons of hay, making it the fourth largest producer in the union.[100] Despite these dramatic production increases, the supply of hay could not keep up with demand; its price rose faster in Vermont than other farm commodities.[101] This is just a small indication of how reliant Vermonters had become on the grass crop. Farmers could only keep as many animals as they could winter, so fodder supply was critical for the continued expansion of wool and dairy production.

Aggregate statistics conceal the fact that the wealthiest farmers enjoyed most of these production increases. In Shoreham and Cornwall, Vermont, the wealthiest thirty percent of all household heads owned in 1835 an average of 131.2 and 88.2 sheep respectively, having nearly doubled their holdings since 1829. Over the same period, the mean number owned by the bottom forty percent actually declined in Shoreham and increased from a mere 3.2 to 4.2 sheep in Cornwall; in both towns over forty percent of all households owned no sheep at all. In these increasingly stratified communities, the ability of men like William Jarvis, one of the first merino entrepreneurs, to run "his many hundreds of sheep" on his Weathersfield farm was dependent upon the impoverished men whom he could hire to cut the prodigious quantities of hay needed to winter his flock. Throughout the nineteenth century, the price of farm labor rose, as did the ratio between haying season wages and those in other parts of the year, but not as fast as the price of hay or of land.[102] These emerging markets were closely linked to the rising price of land relative to labor, helping, in part, to supply the class of landless farm laborers working the fields of the wealthy.

Owners of large flocks often rented pasture elsewhere, so they could devote more of their own land to hay production.[103] By the middle of the 1830s a busy market in Green Mountain pastures had emerged. Some Vermonters reacted against the concentration of land and power accelerated by the sheep industry, but their protests and attempts to link the "western fever" of outmigration with the sale of farms "to your rich neighbors for sheep pastures" fell on deaf ears.[104] Investors calculated that the "first crop [of wheat] will always more than pay for the clearing" of a new upland pasture.[105] With erosion and thin, montane soils, wheat yields and forage production dropped so quickly that this land use was not sustainable for more than a few years, but the goal was short-term profit, not intergenerational homesteading. Other people simply passed on the risk and labor of raising and feeding their own sheep by renting the animals out and collecting a rental as with any other form of

capital.[106] This kind of instrumentalist logic about the farm economy and its constituent parts was a new way of thinking.

As these economic forces helped make hay the paramount crop in Vermont, climatic changes further magnified its importance relative to others on the farm. Longer winters and later springs not only restricted the growing season and rendered corn marginal, but also reduced the length of the pasture season. This put an even greater strain on the hay supply, because farmers needed more fodder to winter the same number of animals. As long as the hay was luxuriant, there was no problem, but, as always, a shortfall in the hay crop had to be made up somehow. In the eighteenth century, New Englanders, rather than "lose their Cattle . . . give out the very Corn upon which their family should Subsist."[107] By the late 1830s, there was less corn to give out in Vermont, and after the potato blight in 1844 there were few potatoes either.

Despite the climatic changes of the 1830s, hay remained a relatively reliable fodder crop in the state (Fig. 7). There were several poor hay years, but feed could run short at winter's end even after normal harvests. In 1835 a long "Greenland winter" and a cold, "backward" spring taxed fodder supplies and kept animals out of pasture until May in many places. In Wallingford, "Hay [was] very Scarce," and Alexander Miller, heeding older communal notions and the desperate pleas of his less wealthy neighbors, felt "obliged to Sell mine to keep cattle from starving." Elsewhere, however, a "considerable number" of livestock died.[108] Hay shortages and livestock losses, by affecting future productive capacity, hit the poor hardest of all. Unlike a short-term flour shortage that might be made up by borrowing or buying, the loss of livestock "embarrasses

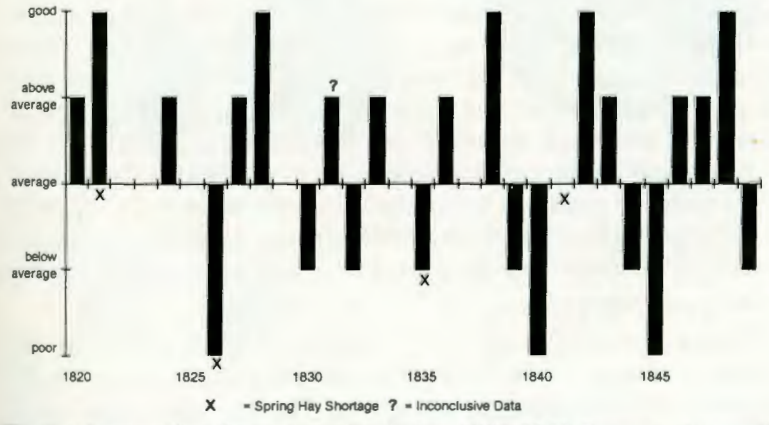

Fig. 7. Vermont hay harvest quality index, 1820-1849. Source: Appendix II.

the farmer for many successive seasons."[109] Vermonters coped as best they could. Unlike wheat production, hay and the pastoral economy that it undergirded was not something they would or could abandon. Farmers were specializing. At the expense of a diversified and more evenly placed labor schedule, they focused much of their effort on producing still more hay and more grass in the short hay season.

The agricultural press offered much advice about the hay crop. Critics urged farmers to cock new-mown grass at the end of each day to protect it from rain. They discussed proper seeding and field dressing as well as techniques for salting damaged hay and even for predicting rain.[110] Vermonters like Hiram Harwood who owned large and expanding operations were a receptive audience. He carefully noted his purchases of clover seed and the applications of Nova Scotia plaster to his meadows. Always on the lookout for something to make his farm economy more efficient, he experimented with "a method of drawing in hay, new to us," which a field hand explained to him.[111] These discussions were part of an effort to come to grips with the added risk of specializing in this one field crop.

Farm journals and the agricultural societies were also conduits of information about technical improvements. They carried extensive discussions of the innumerable variety of horse-drawn hay rakes and mowers patented in the 1820s and 1830s. Although New Englanders were by no means uninterested, westerners adopted these new technologies more quickly. Until the middle of the century, hay making remained an almost entirely manual process, but specialization in hay production and the increased risk associated with it made the adoption of new harvesting technology inevitable.[112] Machines could offer a palliative to the climatic hazard of haymaking because faster harvesting reduced exposure to potential rain damage. This was particularly important in wet years when hay days were scarce and hay labor dear. The mechanization of haying also had important social implications. By further raising entry costs and the price of good land relative to bad, it made it more difficult for the young to establish themselves in independent farm households. Formerly, the marginal and stony soil of the hill towns had served as an outlet for these aspirations, but much of this land was unsuitable for the new systemized agriculture emerging in the middle of the nineteenth century.

Vermont at Mid-century

Climate fluctuated dramatically in nineteenth-century Vermont, and the farm economy responded to these changes within the confines of a particular but evolving agrarian society. These interrelationships are dynamic; we cannot begin to understand them outside of the social contexts in which people live, think, and act. By mid-century then, a new

Vermont, a place remarkably different from the one that Edward Jones had experienced as a boy, was emerging from these interactions. The yeomen of Jones's youth along with their extensive, diversified agriculture were disappearing from Vermont's landscape. They became either more specialized, commercial farmers, governed increasingly by the logic of profit maximization, or they were hired hands, without farms or capital of their own. Many simply left to become western pioneers, factory operatives, or urbanites.

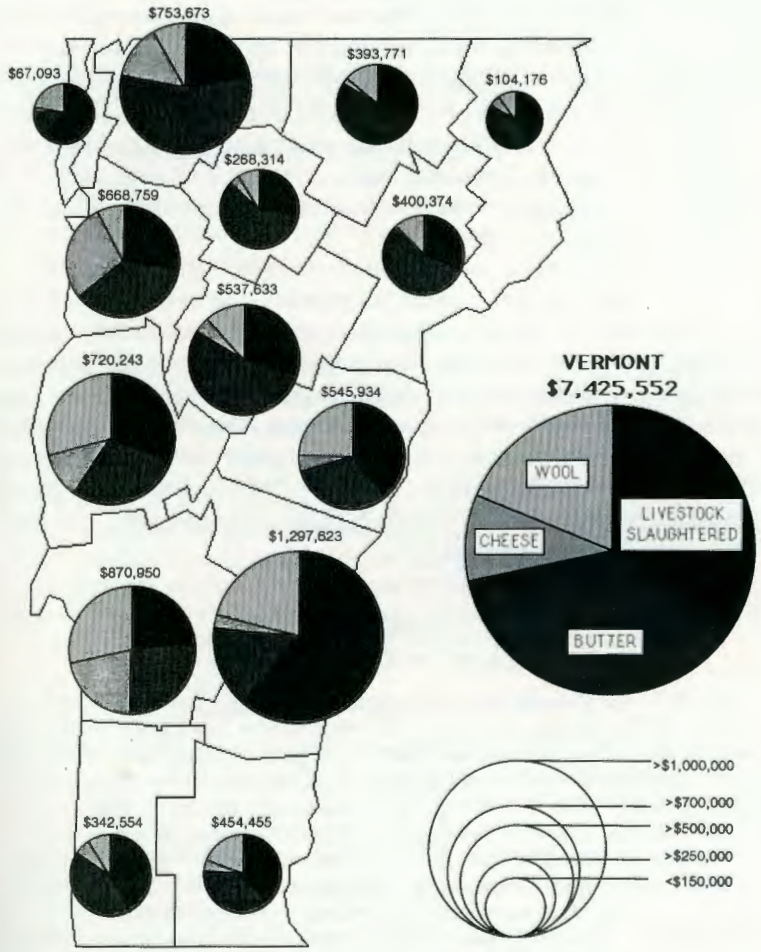

Fig. 8. Value of animal husbandry production in Vermont, 1859. Source: 1860 U.S. census converted to dollar values using prices in Adams, *Vermont Farm Prices* (Burlington, 1944).

By 1850, private abuse of forest and soil seemed more pervasive and its depredations more prevalent because of the tensions between capitalist agriculture and older notions of communal good. Farmers produced more for world markets with less thought of their neighbors or the health of their communities. They mined the soil to run larger flocks or feed bigger herds, because with higher capital costs it became increasingly difficult to switch from one line of business to another. Vermonters still planted combinations of the old staples – small grains, corn, potatoes, and hay – but, more and more, success rode on the brief hay season. Market pressures and opportunities for profit had induced them to give up much of the old security of diversity, in a state which by 1860 was already differentiated into regions specializing in particular agricultural commodities (Fig. 8). Agricultural science tried to show farmers how to squeeze even more out of the land and to adjust to western competition. However, the new logic of profit, loss, and opportunity cost allowed farmers to see only as far as the annual balance sheet. Sustainable landuse was, and still remains, an elusive goal.

Perhaps the most remarkable change in mid-century rural Vermont was that increasingly it became a place that people chose to leave. Even those who stayed found it difficult to settle their children nearby in the agrarian landscape the state's first settlers had hoped would always accommodate their progeny. With his family dispersed across a continent, Edward Jones expressed a common parental disappointment. "Had it been so ordered in the nature of things that you and Jabez could have Remained with me it would have been pleasant," he wrote. "My consolation is derived from a Reasonable belief that you are capable and competent . . . of handsomely supporting yourselves."[113]

Appendix 1
Sources of Climate Data

Until 1967, the Philadelphia, Pa., record (Fig. 2) is from H. E. Landsberg, C. S. Yu, and L. Huang, *Preliminary Reconstruction of a Long-Time Series of Climatic Data for the Eastern United States* (College Park: University of Maryland, Institute for Fluid Dynamics and Applied Mathematics, technical note BN-571, 1968). Thereafter I used data from the Philadelphia airport in NOAA, *World Weather Records, 1961-70* (Washington: National Oceanic and Atmospheric Administration, 1979) and NOAA, *World Weather Records, 1971-80* (Washington: National Oceanic and Atmospheric Administration, 1979). The New Haven, Conn., record (Fig. 2) is compiled from a variety of sources detailed, with station history data, in David Demeritt, "The Effects of Volcanic Eruptions on Surface Temperatures in Northeastern North America, 1800-1978," (M.Sc. thesis, University of Maine, 1990). I took the Toronto, Ont., record (Fig. 2) from R. B. Crowe, "Reconstruction of Toronto Temperatures 1778-1840 Using Various United States and Other Data," *Climatological Bulletin* 24 (1990): 28-50.

The Albany, N.Y., temperature and precipitation record (Fig. 3) comes from Benjamin Franklin Hough, *Results of a Series of Meteorological Observations Made in Obedience to Instructions from the Regents of the University at Sundry Academies in the State of New York from 1826 to 1850* (Albany, 1855). A partial station history is available in Demeritt, "Effects of Volcanic Eruptions," 74-75. I compiled the Burlington record (Fig. 3) from Weather Bureau, *Climatic Summary of the United States: Climatic Data Herein from the Establishment of Stations to 1930, Inclusive* (Washington: G.P.O., 1934). The data for Hanover, N.H., (Fig. 3) is available in Dartmouth College, "Monthly Annual and Average Temperature and Precipitation at Hanover, NH, 1834-1905," *New England Section of the Climate and Crop Service of the Weather Bureau, Annual Summary* (1905):11. A partial station history is available in Demeritt, "Effects of Volcanic Eruptions," 101. The Williamstown, Mass., record (Fig. 3) comes from W. Milham, *Meteorology in Williams College* (Williamstown, Mass.: McClelland Press, 1950). A partial station history is available in Demeritt, "Effects of Volcanic Eruptions," 125.

Several forthcoming publications from the Maine Agricultural Experiment Station will detail these and other series of climatic data in the Northeast: W. R. Baron et al., *Selected Northeastern Precipitation Records* and W. R. Baron et al., *Selected Northeastern Temperature Records.*

Appendix II
Sources of Harvest Data

I compiled the harvest quality indices (Figs. 4-7) by extracting crop reports and weather information from the diaries and newspapers listed below. Although the Harwood and Miller diaries provided some long runs of quantitative yield data, most of my information was local impressions—"hay abundant" noted the Danville, Vermont, *North Star* of 26 July 1825. Comparing and assessing such disparate bits of spatially variable information is an imperfect process to say the least. I have tried to indicate those years when my information was so inadequate or contradictory as to render my assessment of that year's harvest little more than a guess. I compared harvest information against weather data for purposes of quality control, but my indices are only estimates, albeit carefully considered ones. No doubt conditions and harvests varied with local circumstances.

Diaries and Personal Papers

The Diaries of Sally and Pamela Brown 1832-1838, eds. B. B. Bryant and G. E. Baker, 2d ed. (Springfield, Vt.: William L. Bryant Foundation, 1979).
Diary of Marshall Castle, Essex, Vt.; MS. Vermont Historical Society (VHS).
Diary of Hiram Harwood, Bennington, Vt.; MSS. Bennington Museum.
Journal of James Johns, Huntington, Vt.; MS. James Johns collection, VHS.
Letters of Edward Jones, Richmond, Vt.; MSS. Jones family papers, VHS.
Diary of Lovel Kelton, Calais, Vt.; MS. VHS.
Diary of Alexander Miller, Wallingford, Vt.; MS. VHS.
Diary of William Nutting, Randolph, Vt.; MSS. VHS.
Cashbook of Nathaniel Taylor, Plymouth, Vt.; MS. VHS.
Daybook of James Whitelaw, Ryegate, Vt.; MSS. James Whitelaw papers, VHS.

Periodicals

(Bennington, Vt.) *Vermont Gazette*
(Brattleboro, Vt.) *Independent Inquirer*
(Danville, Vt.) *North Star*
(St. Albans, Vt.) *Vermont State Paper*
(Concord, N.H.) *Farmer's Monthly Visitor*
(Boston, Mass.) *New England Farmer*
Boston (Mass.) *Cultivator*
U.S. Patent Office Report, Agriculture

Notes

I would like to thank the Vermont Historical Society and its director, Michael Sherman, for financial support through the Weston A. Cate Fellowship. Both W. R. Baron and David C. Smith have been so very kind as to share with me their notes and climatic data. Mark W. Anderson and the Maine Agricultural Experiment Station funded our collaborative reading of the Harwood diary. My text has benefitted from the insightful comments of Dan Clayton, Cole Harris, Dan Heibert, Katie Pickles, Dave Smith, Tim Solnick, and Graeme Wynn.

[1] Letter from Edward Jones of Richmond, Vt., to Milo Jones, 3 November 1837, Jones Family Papers, Vermont Historical Society (VHS), Montpelier, Vt.

[2] Harold Wilson, *The Hill Country of Northern New England: Its Social and Economic History, 1790-1930* (1936 reprint. New York: AMS Press, 1967).

[3] Many people were disappointed with the distribution of land and disagreed, sometimes violently, with dominant visions of liberty, equality, and the Republic. See David Szatmary, *Shays' Rebellion: The Making of an Agrarian Insurrection* (Amherst: Univ. of Massachusetts Press, 1980); Thomas Slaughter, *The Whiskey Rebellion: Frontier Epilogue to the American Revolution* (New York: Oxford Univ. Press, 1986); Alan Taylor, *Liberty Men and Great Proprietors: The Revolutionary Settlement on the Maine Frontier* (Chapel Hill: Univ. of North Carolina Press, 1990).

[4] (Bennington) *Vermont Gazette*, 27 August 1822, quoting *Trenton (N.J.) Emporium*. The father in a short story called "The Settlers" in the (Danville, Vt.) *North Star*, 2 September 1823, advised his children, "Depend not on others. He only is wise who applies himself to gaining the means of an independent livelihood."

[5] On wealth stratification, see P. Jeffrey Potash, "'Toward a New Rural History': Patterns of Community Organization in Three Addison County, Vermont Towns, 1761-1850," (Ph.D. diss., University of Chicago, 1986), 136; Randolph Roth, *The Democratic Dilemma: Religion, Reform, and the Social Order in the Connecticut River Valley of Vermont, 1791-1850* (New York: Cambridge Univ. Press, 1987), 122-26.

[6] Laurel Thatcher Ulrich, *Good Wives: Image and Reality in the Lives of Women in Northern New England, 1650-1750* (New York: Alfred A. Knopf, 1982); Mary P. Ryan, *Cradle of the Middle Class: The Family in Oneida County, New York, 1790-1865* (New York: Cambridge Univ. Press, 1981). On female labor in farm households, see Joan Jensen, *Loosening the Bonds: Mid-Atlantic Farm Women, 1750-1850* (New Haven: Yale Univ. Press, 1986). Frequently, account and day books credited the male household head for the spinning of the female members of his household—shorthand in a world that reckoned in terms of household units and could only acknowledge women in specifically structured ways.

[7] John R. Stilgoe, *Common Landscape of America, 1580 to 1845* (New Haven: Yale Univ. Press, 1985); Jane Kamensky, "'In These Contrasted Climes, How Chang'd the Scene': Progress, Declension, and Balance in the Landscapes of Timothy Dwight," *New England Quarterly* 63 (1990): 80-108. Jeremiah Day, another son of Eli, did not approve of the "rough and rocky" look of Guilford, Vermont, in 1805. Its ramshackle houses and poor lands provided "a most despicable idea of Vermont," at least at first impression. Journal of Jeremiah Day, 23 August 1805, folder 285, box 20, Jeremiah Day Papers, Yale University, New Haven, Conn. Also see the essays and prints in *Vermont Landscape Images, 1776-1976*, eds. W. C. Lipke and P. N. Grime (Burlington: Robert Hull Fleming Museum, 1976).

[8] George Perkins Marsh, *Man and Nature; Or, Physical Geography as Modified by Human Action* (1864 reprint with intro. by D. Lowenthal. Cambridge: Harvard Univ. Press, 1965). For more contemporary interpretations, William Cronon, *Changes in the Land: Indians, Colonists, and the Ecology of New England* (New York: Hill & Wang, 1983); Carolyn Merchant, *Ecological Revolutions: Nature, Gender, and Science in New England* (Chapel Hill: Univ. North Carolina Press, 1989).

[9] Edward Holyoke, "An Estimate of the Excess of the Heat and Cold of the American Atmosphere beyond the European in the Same Parallel of Latitude," *Memoirs of the American Academy of Arts and Sciences* 2 (1793): part 1, 65-92; (Portland, Me.) *Eastern Argus*, 9 October 1816; Kenneth Thompson, "Forests and Climatic Stability in America Before 1900," *Climatic Change* 3 (1980): 47-64; Karen O. Kupperman, "The Puzzle of the American Climate in the Early Colonial Period," *American Historical Review* 87 (1982): 1262-89.

[10] *North Star*, 1 February and 26 July 1825. Ira Allen, *The Natural and Political History of the State of Vermont* (1798 reprint. Montpelier: Vermont Historical Society, Collections volume I, 1870), 337 [pages 11-12 in the original]; Samuel Williams, *Natural and Civil History of Vermont* (2d ed. Burlington, 1809), 70-80; John Lambert, *Travels Through Canada and the United States . . . in 1806, 1807, and 1808* (3d edition. London, 1816), I: 114-15, 120-21. Vermonters were not alone in this belief. Robert B. Thomas, *The Farmer's Almanack for 1815* (Boston, 1815), n.p.; Joseph Whipple, *A Geographic View of the District of Maine* (Bangor, 1816), 6-7; (Paris, Me.) *Oxford Observer*, 17 December 1826; (Boston, Mass.) *New England Farmer*, 8 June 1827, 18 May 1831, quoting *Boston Transcript*.

[11] As Carolyn Merchant has argued in *Ecological Revolutions*, New Englanders were beginning to change their conceptions of nature from a female, mother earth that could be encouraged to bear fruit to an asexual mechanistic world of Newtonian physics. Both visions could justify nineteenth-century efforts to shape a more productive landscape.

[12] Howard S. Russell, *A Long, Deep Furrow: Three Centuries of Farming in New England* (Hanover, N.H.: University Press of New England, 1976); Potash, "New Rural History," 202. Farmers' account books and diaries supply ample evidence of this diversity strategy. See, for example: account books (5 vols.) of Plumer farm, Epping, N.H., 1793-1847, Baker Business Library, Harvard University, Cambridge, Mass.; diary of Marshall Castle, Essex, Vt., 1830-35, VHS; day book of Nathaniel Taylor, Plymouth, Vt., 1828-1831, VHS; account book of Arad Holbrook, Townsend, Vt., 1813-1877, VHS; account book of Jacob A. Spear, Braintree, Vt., 1821-1840, VHS; account books of John McConnel (3 vols.), Wallingford, Vt., 1811-1851, VHS.

[13] Jones to Milo Jones, 13 September 1844. Milo's specialization in Wisconsin wheat was a source of constant worry to his father in Vermont. See Edward Jones to Milo Jones, 4 September 1845 and 14 November 1846. Risk minimization is also a prominent strategy among non-commercial agriculturists in other times and other places. M. Lipton, "The Theory of the Optimising Peasant," *Journal of Developmental Studies* 4 (1968): 327-51; Peter M. Solar, "Harvest Fluctuations in Pre-Famine Ireland: Evidence from Belfast and Waterford Newspapers," *Agricultural History Review* 37 (1989): 162-4.

[14] (Concord, N.H.) *Farmer's Monthly Visitor*, 15 April 1839; 31 March and 30 September 1841. Jared Eliot, *Essays Upon Field Husbandry in New England*, ed. H. Carman (1754; reprint, New York: Columbia University Press, 1934), 92, quotes an old English proverb: "Wet May makes short corn and long hay / Dry May makes long corn and short hay." Corn in this older English usage meant small grains, not *Zea mays spp.* or corn to which modern Americans refer.

[15] I used the following as supplements to primary sources in the preparation of Figure 1. F. W. Reichelderfer, *Climate and Man: Yearbook of Agriculture* (Washington: U.S. Dept. of Agriculture, 1941); G. Z. Ventskevich, *Agrometeorology*, 1958; (trans. Jerusalem: Israel Program for Scientific Translations, 1961); Neal C. Stoskopf, *Cereal Grain Crops* (Reston, Va.: Reston Publishing Co., 1985); R. K. Scott and S. J. Wilcockson, "Application of Physiological and Agronomic Principles to the Development of the Potato Industry," in *The Potato Crop*, ed. P. M. Harris (London: Chapman and Hall, 1978), 678-704; Charles Flint, *Grasses and Forage Plants*, 4th ed. (Boston, 1859).

[16] The best introductions to the Little Ice Age and paleoclimatology are H. H. Lamb, *Climatic History and the Future, Volume 2, Climate: Present, Past and Future* (London: Methuen & Co. Ltd., 1977); R. S. Bradley, *Quaternary Paleoclimatology: Methods of Paleoclimatic Reconstruction* (Boston: Allen & Unwin, 1985); W. R. Baron, "Retrieving American Climate History: A Bibliographic Essay," *Agricultural History* 63 (1989): 7-36. More recent, and contradictory, discussion of the Little Ice Age is available as well. See, Jean M. Groves, *The Little Ice Age* (New York: Methuen, 1988); K. R. Briffa et al., "A 1,400-Year Tree-Ring Record of Summer Temperatures in Fennoscandia," *Nature* 346 (1990): 434-39.

[17] Konrad Gajewski, "Late Holocene Climatic Changes in Eastern North America Estimated from Pollen Data," *Quaternary Research* 29 (1988): 255-62; Laura E. Conkey, "Red Spruce Tree-Ring Widths and Densities in Eastern North America as Indicators of Climate," *Quaternary Research* 26 (1986): 232-43. For other climatic parameters, W. R. Baron and G. A. Gordon, "A Reconstruction of New England Climate Using Historical Materials, 1620-1980," *Syllogeus* 55 (1985): 229-45; W. R. Baron, "Historical Climates of the Northeastern United States: Seventeenth through Nineteenth Centuries," in *Holocene Human Ecology in Northeastern North America*, ed. G. P. Nicholas (New York: Plenum Press, 1988), 29-46.

[18] On the difficulty of constructing homogeneous quantitative records, see David Demeritt, "The Effects of Volcanic Eruptions on Surface Temperatures in Northeastern North America, 1800-1978," (M.Sc. thesis, University of Maine, 1990), 11-21.

[19] The quotation is Emmanuel Le Roy Ladurie, *Times of Feast, Times of Famine: A History of Climate Since the Year 1000*, trans. B. Bray (1971; reprint, with new afterword by author, New York: Noonday Press, 1988), 292-93. For similar skepticism, Jan de Vries, "Histoire du climat et économie: des faits nouveaux, une interprétation différente," *Annales: Économies, Sociétes, Civilisations* 32 (1977): 198-226 and his "Measuring the Impact of Climate on History: the Search for Appropriate Methodologies," *Journal of Interdisciplinary History* 10 (1980): 599-630.

[20] Martin L. Parry, *Climatic Change, Agriculture and Settlement* (Folkstone, U.K.: Archon Books, 1978) and his "The Impact of Climatic Variations on Agricultural Margins," in *Climatic Impact Assessment: Studies of the Interaction of Climate and Society*, eds. R. W. Kates, et al. (Chichester, U.K.: John Wiley & Sons, 1985), 351-67.

[21] Both quotations come from the diary of Hiram Harwood, 9 April and 11 August 1817, Bennington Museum, Bennington, Vt. For more on this neighborly charity in rural New England, Harwood diary, 1 December 1816, 8 August 1817, 9 February 1823; John Wittenmore, "The Autobiography of John Wittenmore, 1796-1885," *Vermont Historical Society Proceedings* 6 (1938): 331; diary of Caleb Prentiss, Paris, Me., 25 January 1816, Bangor (Me.) Public Library; diary of Joshua Whitman of Turner, Me., 23 June 1816, Norlands Living History Center (Livermore, Me.). In New York City, the tremendous strain placed upon the older system of poor relief in these years elicited widespread reform and Malthusian anti-poverty laws. Raymond A. Mohl, *Poverty in New York, 1783-1825* (New York: Oxford University Press, 1971), 114-18.

[22] William H. Child, *History of the Town of Cornish, New Hampshire, with Genealogical Record, 1763-1910* (Concord, N.H.: Rumford Press, 1911), 204. On poor farms, Jensen, *Loosening the Bonds*, 58-76.

[23] Edward Jones to Milo Jones, 1 October 1843, VHS.

[24] On the declining land purchasing power of farm laborers, Roth, *Democratic Dilemma*, 122-23.

[25] Robert A. Gross, "Culture and Cultivation: Agriculture and Society in Thoreau's Concord," *Journal of American History* 69 (1982): 42-61; Andrew H. Baker and Holly Izard Paterson, "Farmers' Adaptations to Markets in Early-Nineteenth Century Massachusetts," in *The Farm*, ed. Peter Benes (Boston: Boston Univ., 1988), 95-108; Paul W. Gates, *The Farmer's Age: Agriculture, 1815-1860* (New York: Holt, Rinehart and Winston, 1960).

[26] In 1793, Titus Hall of Cornwall, Vt., earned nearly sixty-four percent of his income by selling his labor. Potash, "New Rural History," 32. Also see, Rusty Bitterman, "The Hierarchy of the Soil: Land and Labour in a 19th Century Cape Breton Community," *Acadiensis* 18 (1988): 33-55. Hal S. Barron has argued that a shortage of farm labor prevented the switch-over in Vermont from sheep to dairy farming. "The Impact of Rural Depopulation on the Local Economy: Chelsea, Vermont, 1840-1900," *Agricultural History* 54 (1980): 318-35.

[27] Eli Canfield, "In the Twilight of His Years: Eli Canfield Recalls His Boyhood in Arlington, 1817-1831," *Vermont History* 40 (Spring 1972): 114-15; Rebecca C. Skillin, "William Cheney (1787-1875): The Life of a Vermont Woodsman and Farmer," *Vermont History* 39 (Winter 1971): 47; Lewis D. Stilwell, *Migration from Vermont* (1948; reprint, Montpelier: Vermont Historical Society, 1983), 99. The settlers of eastern Maine also sowed wheat and rye with considerable success. Whipple, *District of Maine*, 15-16; *Portland (Me.) Gazette*, 27 May 1817; Jamie Eves, "'The Poor Had Suddenly Become Rich': A Boom in Maine Wheat, 1793-1815," *Maine Historical Society Quarterly* 27 (1987): 114-41.

[28] Harwood diary, 31 January 1817, Bennington Museum; Stilwell, *Migration from Vermont*, 99; *Farmer's Monthly Visitor*, 15 April, 15 July 1839; Timothy Dwight, *Travels in New England and New York*, ed. B. M. Solomon (1821; reprint, Cambridge: Harvard Univ. Press, 1969), I: 109; Jeremy Belknap, *The History of New Hampshire*, 2d ed. (Boston: 1812-13), III: 136; Henry Colman, *Agricultural Address at Norwich, New Haven and Hartford Connecticut, at the County Cattle Shows in the Year 1840* (Boston, 1840), 27.

[29] *Farmer's Monthly Visitor*, 20 September 1839; *U.S. Patent Office Report, Agriculture*, 1847, 354; David M. Ellis, *Landlords and Farmers in the Hudson-Mohawk Region, 1790-1850* (Ithaca: Cornell Univ. Press, 1946), 136-37. On winter rye, Harwood diary, passim, Bennington Museum; Taylor day book, 14 October 1831, VHS; diary of Lovel Kelton of Calais, Vt., VHS. Rye was especially favored for poor soils. Eliot, *Field Husbandry*, 64-65; *Farmer's Monthly Visitor*, 31 August 1841, quoting *Boston Cultivator*.

[30] The quotation, which refers to Troy, N.Y., comes from the Harwood diary, 1 December 1817, Bennington Museum. Also, see Lambert, *Travels*, II, 502; N. J. T. George, *Gazetteer of the State of Vermont* (Haverhill, N.H., 1823), 11; Kelton diary, 29 December 1821 and 26 January 1836, VHS; H. Nicholas Muller III, "The Commercial History of the Lake Champlain-Richelieu River Route, 1760-1815," (Ph.D. diss., University of Rochester, 1968).

[31] Letter from Finch Tucker to Ephraim Briggs of Royalton, Vt., 21 December 1818, Briggs Papers, VHS. In 1810, Vermont's 110 distilleries produced 173,285 gallons of liquor worth $50,637. Zadock Thompson, *History of Vermont* (Burlington, 1842), II: 214. By 1823, there were 150 distilleries in the state. George, *Gazetteer of Vermont*, 12. Not all of these, however, produced rye whiskey. Colonel

Norton's Bennington distillery made apple brandy, for instance. Harwood diary, 31 October 1822, Bennington Museum.

[32] Jones to Milo Jones, 30 April 1847, VHS. Winifred B. Rothenberg, "The Market and Massachusetts Farmers, 1750-1855," *Journal of Economic History* 41 (1981): 288-95, argued the often staggering distances that Massachusetts farmers regularly traveled to market are evidence of their capitalist orientation.

[33] Potash, "New Rural History," 202.

[34] Resolutions printed in *North Star*, 1 February 1825. Similar meetings occurred elsewhere in the valley, *North Star*, 17 February 1824 and 15 February 1825. Roth, *Democratic Dilemma*, 139-40 discusses the controversies over the nature and equitable distribution of these transportation boons.

[35] Quoted in *North Star*, 9 March 1824.

[36] The statistic is from *Plattsburgh (N.Y.) Republican*, 8 November 1823 quoting *Troy (N.Y.) Sentinel*. On the celebration in New York harbor, *North Star*, 16 September 1823. On Vermont wheat, *New England Farmer*, 23 November 1822; John E. O'Hara, "Erie's Junior Partner: The Economic and Social Effects of the Champlain Canal Upon the Champlain Valley," (Ph.D. diss., Columbia University, 1951), 299.

[37] *Farmer's Monthly Visitor*, 31 January 1840.

[38] *Niles Weekly Register*, 3 November 1827. Increasingly, store merchants advertised New York, Rochester, Troy, and Western superfine flours. *Vermont Gazette*, 15 January 1828; *North Star*, 16 September 1833; (Brattleboro, Vt.) *Independent Inquirer*, 28 December 1833, 22 February 1834.

[39] Thomas F. Gordon, *Gazetteer of the State of New York* (Philadelphia, 1836), 93. In 1828, flour sold for $7 per barrel in Montpelier, *New England Farmer*, 17 October 1828, quoting *Montpelier (Vt.) Republican*. By 1842, it was down to $5 in Burlington, and this despite the failure of the corn crop, which Edward Jones predicted would make the price of flour rise sharply. Edward Jones to Milo Jones, 1 September and 9 November 1842, VHS. For relative price indices, T. M. Adams, *Prices Paid by Vermont Farmers for Goods and Services and Received by Them for Farm Products, 1790-1940* (Burlington: Vermont Agricultural Experiment Station, bulletin 507, 1944).

[40] Harwood diary, Bennington Museum. On 5 January 1835, Lovel Kelton recorded in his diary the purchase of a barrel of store flour. Back in 1827, he had harvested 124 bushels of wheat on his farm which once provided its own breadstuffs. Kelton diary, VHS.

[41] Fernand Ouellet, *Economic and Social History of Quebec, 1760-1850: Structures and Conjunctures* (1966; trans. Ottawa: The Carleton Library, no. 120, 1980), 337-45.

[42] Joseph C. G. Kennedy, *Agriculture of the United States in 1860* (Washington, 1864), xxxiii; Percy W. Bidwell and John I. Falconer, *History of Agriculture in the Northern United States, 1620-1860* (1925; reprint, New York: Peter Smith, 1941), 238-39; Ouellet, *History of Quebec*, 341-43; Stilwell, *Migration from Vermont*, 153-54; Ventskevich, *Agrometeorology*, 125.

[43] The quotation is "M" writing from Pembroke, Mass., in *Boston Cultivator*, 27 September 1845. On early scientific efforts, *North Star*, 2 December 1823, 16 November 1835; *Vermont Gazette*, 8 July 1823; *Farmer's Monthly Visitor*, 30 June and 31 July 1841. On sowing data, Eliot, *Field Husbandry*, 64; *Walton's Vermont Register . . . for 1833*, n.p. (April entry). On lye, *Portland Gazette*, 27 May 1817; *Vermont Gazette*, 1 May 1821, quoting *Plattsburgh Republican*; *North Star*, 2 December 1823; Prentiss diary, 9 May 1816, Bangor, Me., Public Library; Harwood diary, 19 March 1819, Bennington Museum. On wheat varieties, Harwood diary, 26 April 1816, Bennington Museum; *Farmer's Monthly Visitor*, 20 September, 20 October, and 20 November 1839, 28 February 1840.

[44] The first quotation is Edward Jones to Milo Jones, 13 July 1847, VHS; the second, Kennedy, *Agriculture of U.S. in 1860*, xxxii-xxxiii. Also see Nathan Hoskins, *A History of the State of Vermont* (Vergennes, 1831), 268.

[45] *Compendium of the Enumeration of the Inhabitants . . . of the United States as Obtained . . . from the Returns of the Sixth Census . . .* (Washington, 1841); Kennedy, *Agriculture of U.S. in 1860*, 151-53.

[46] *Farmer's Monthly Visitor*, 30 October 1841.

[47] Tamara P. Thornton, *Cultivating Gentlemen: The Meaning of Country Life Among the Boston Elite, 1785-1860* (New Haven: Yale University Press, 1989), 192-94; Donald B. Marti, "In Praise of Farming, 1815-1840," *New York History* 51 (1970): 351-75. Jesse Buel believed "System" to be "essential in farming," by which he meant cost-benefit analysis, the selection of crops and allocation of labor on the basis of market value rather than community dictates or family values as well as judicious manuring to increase production that could be sold on the market. *Albany Cultivator*, quoted in *Farmer's Monthly Visitor*, 31 March 1841.

[48] The quotation is from *Independent Inquirer*, 4 January 1834, quoting *Windsor Republican*. For more, see *Independent Inquirer*, 21 September 1833; (Montpelier) *Vermont Watchman*, 6 December 1841, 10 January 1845, 7 October 1847; David C. Smith, "Toward a Theory of Maine History: Maine's Resources and the State," in *Explorations in Maine History*, ed. A. M. Johnson (Orono: Univ. of Maine Press, 1970), 45-64. This rhetoric carried on until the end of the century. Jonathan Lawrence, "Must Grain Raising in Vermont Be Abandoned?" *Vermont Board of Agriculture Report* 4 (1877): 75-77.

Thornton, *Cultivating Gentlemen*, 192-94 offers the best analysis of elitist rhetoric, changing conceptions of the meaning of country life, and the self-sufficient yeoman.

[49] Gross, "Culture and Cultivation," 60. In 1801, maize was sixty-six percent of all grain raised in Massachusetts. Bidwell and Falconer, *History of Agriculture*, 90. In places like Brookline, Mass., however, farmers were even more dependent on it. There, corn was ninety-four percent of all grains on the 1821 valuation list. Ronald D. Kerr, "The Transformation of Agriculture in Brookline, 1770-1885," *Historical Journal of Massachusetts* 15 (1987): 44.

[50] Dwight, *Travels*, II: 47; "An American," *American Husbandry*, ed. H. J. Carman (1775; reprint, New York: Columbia Univ. Press, 1939), I: 50; *Memoirs of the Philadelphia Society for Promoting Agriculture* 4 (1818): 112. A Massachusetts correspondent to the *New England Farmer*, 3 June 1840, observed, "Corn is our greatest crop on the Connecticut River."

[51] David Demeritt, "Climatic Change and Prehistoric Maize Culture in Northeastern North America," paper presented at Fifth Annual Meeting of the Canadian Committee on Climatic Fluctuations and Man, 24 January 1990, Ottawa, Canada.

[52] Henry Colman, "Address to the Agricultural and Horticultural Societies of New Haven County," printed in *Farmer's Monthly Visitor*, 31 January 1841. Dwight, *Travels*, I, 108, believed twenty-five bushels was the Connecticut average while J. W. Colburn of Springfield, Vt., thought forty bushels per acre typical in his state. *Patent Office Report, Agriculture*, 1848, 369. Some even claimed maize yields in excess of one hundred bushels per acre. *Farmer's Monthly Visitor*, 31 October 1840; *Patent Office Report, Agriculture*, 1848, 130.

[53] William N. Parker, "A Note on Regional Culture in the Corn Harvest," *Agricultural History* 46 (1972): 184-86. Some argued corn shocks were the equal of hay. *Patent Office Report, Agriculture*, 1849, 223.

[54] Potash, "New Rural History," 202.

[55] Wittenmore, "Autobiography," 331; *New York Evening Post*, 25 May 1816; *Portland Gazette*, 6 May and 15 July 1817; *North American Review* 4 (1816): 101; Anonymous, *Letters on the Eastern States* (New York, 1820), 199; Whipple, *District of Maine*, 15; journal of Zadoc Humphrey, Yarmouth, Me., Westerfield Family Collection, Univ. of Maine Library, Orono, Me.

[56] Growing season length is the number of days between the last killing frost in spring and the first in autumn. For Bennington, I calculated these occurrences from data in the Harwood diary, Bennington Museum, but excluded 1812 and 1813 for want of consistent diary entries. Their exclusion raises the decadal mean since both years had notoriously short growing seasons. The statistic for Boston comes from W. R. Baron et al., "Frost-Free Record Reconstruction for Eastern Massachusetts, 1733-1980," *Journal of Climate and Applied Meteorology* 23 (1984): 317-19. The pattern is similar in southern Maine as well. David C. Smith et al., "Climatic Fluctuation and Agricultural Change in Southern and Central New England, 1765-1880," *Maine Historical Society Quarterly* 21 (1982): 185.

[57] Dean R. Snow, *The Archaeology of New England* (New York: Academic Press, 1980), 335. Merle T. Jenkins has argued that 140 days without a frost was really the threshold for successful maize production in his "Influence of Climate and Weather on Growth of Corn" in *Climate and Man*, 310. However, a frost-free line provides only the most general indication of the geographic limits of maize production. Demeritt, "Maize Culture, Climate and Environment," 7-12.

[58] The quotation is (Concord) *New Hampshire Patriot*, 22 October 1816; Sarah F. McMahon, "A Comfortable Subsistence: The Changing Composition of Diet in Rural New England, 1620-1840," *William and Mary Quarterly*, 3d series, 42 (1985): 32-33. After severe frosts cut off the corn crop in 1816, Governor Galusha worried about the failure of this and other "important articles of produce on which the sustenance of man and beast depends." *Records of the Governor and Council of the State of Vermont*, ed. E. P. Walton (Montpelier, 1878), 431.

[59] Corn *(Zea mays)* lacks two amino acids, lysine and trytophone provided by beans *(Phaseolus vulgaris)*. James R. Stoltman and David A. Barreis, "The Evolution of Human Ecosystems in the Eastern United States," in *Late Quaternary Environments of the United States: Volume 2, the Holocene*, ed. H. E. Wright Jr. (Minneapolis: Univ. Minnesota Press, 1983), 260. On this aboriginal polyculture, Prentiss diary, 24 May 1817, Bangor Public Library; diary of Stephen Longfellow of Gorham, Me., 4 July 1812, Maine Historical Society, Portland, Me.; *Portland Gazette*, 13 May 1817, quoting *Portsmouth (N.H.) Gazette*; Merchant, *Ecological Revolutions*, 164-65.

[60] Wittenmore, "Autobiography," 331.

[61] Women and children sometimes planted, hoed, harvested and husked corn. For example, see diary of John Baxter of Flatlands, N.Y., 6 May 1816, Brooklyn (N.Y.) Historical Society; Prentiss diary, 29 May 1817, Bangor Public Library. On the gendering of harvest labor, Jensen, *Loosening the Bonds*.

[62] In 1817, Harwood sowed three and a half acres of winter rye, nine acres of winter wheat, two acres of spring wheat, and two acres of oats. In 1829, he did not specify how many acres of oats he sowed, but since he and his two hired hands mowed them all on 14 August, there could not have been more than an acre or two at the most. Harwood diary, 1817 and 1829, Bennington Museum.

[63] *North Star*, 17 October 1822.

[64] The quotation is *Farmer's Monthly Visitor*, 15 June 1839. Also, *Farmer's Monthly Visitor*, 15 January, 15 April, 20 August, 20 September, 20 October, 20 December 1839, 30 June, 31 August 1840.

[65] Kelton diary, 2-6 May 1826, VHS. Edward Jones quoted his son Jabez in a letter to his other son Milo, 1 September 1842. Later that year, Edward complained that although he had "2 large stout young men to work for Me," they were slow and inefficient, largely because he was "unable to go into the field" to monitor them. As a result, his corn was injured by a September frost. Jones to Milo Jones, 9 November 1842, VHS.

[66] *Boston Cultivator*, 9 March 1839; diary of William Nutting of Randolph, Vt., 12 June 1834, VHS.

[67] (Farmington, Me.) *Sandy River Yeoman*, 19 September 1832; *Boston Cultivator*, 2 December 1843.

[68] On Brown's Corn, Isaac Hill, "Address Before the Cheshire County Agricultural Society," printed in *Farmer's Monthly Visitor*, 20 October 1839; *Farmer's Monthly Visitor*, 31 October 1840; *Patent Office Report, Agriculture*, 1847, 130. On other early corn varieties, *Farmer's Monthly Visitor*, 15 April and 20 October 1839, 31 March, 31 August, and 30 September 1840.

[69] See, for example, *North Star*, 20 June 1822. On this point more generally, see Bidwell and Falconer, *History of Agriculture*, 339-40; Merchant, *Ecological Revolutions*, 211-17.

[70] Of course, older patterns still persisted to a degree. In 1882, Marshall Carpenter of Derby, Vt., planted beans among his corn "phosphated as usual." Allen R. Yale, "Vermont Haying: The Impact of Changing Technologies," (M.A. thesis, University of Vermont, 1983), 116-17.

[71] *Farmer's Monthly Visitor*, 15 June 1839. Also, Henry Colman's speech before the Massachusetts legislature, printed in *Farmer's Monthly Visitor*, 31 April 1840.

[72] The quotations are from Edward Jones to Milo Jones, 1 September 1842, VHS, but these speculations continue in letters dated 9 November 1842 and 2 August 1843.

[73] On the rising cost of land in Vermont and the difficulties of ascending the ladder to farm ownership, see Roth, *Democratic Dilemma*, 122-25; Potash, "New Rural History," 213-21, 304-05; Hal S. Barron, *Those Who Stayed Behind: Rural Society in Nineteenth Century Vermont* (New York: Cambridge Univ. Press, 1984), 93-97.

[74] Wittenmore, "Autobiography," 331. For an example of the new kind of creditor claims, see Thomas Emerson, "Laying Up Treasures in Heaven and Collecting Debts on Earth: A Vermont Banker Asks for His Money, 1834," *Vermont History* 42 (Winter 1974): 34-35.

[75] The quotation is *Farmer's Monthly Visitor*, 31 July 1841. Also, *New York Evening Post*, 25 May 1816; *Diary of Thomas Robbins*, ed. I. N. Tarbox (Boston, 1886), I: 711; *Patent Office Report, Agriculture*, 1847, 134; Mary T. Wilson, "Americans Learn to Grow the Irish Potato," *New England Quarterly* 32 (1959): 333-50.

[76] See, for example, *North American Review* 8 (1819): 141; *Vermont Gazette*, 30 January 1821, 1 July 1828; *North Star*, 27 February 1823; *New England Farmer*, 17 and 24 September 1830; *Farmer's Monthly Visitor*, 15 March and 20 October 1839. For an overview of the links between these reformers and their British counterparts, see David C. Smith, "North American Views of British Agriculture, 1790-1860," paper presented at the British Agricultural History Society meeting, Bristol, England, 4 April 1989.

[77] Wittenmore, "Autobiography," 343-44. (Portland, Me.) *Yankee Farmer*, 31 March 1838; *Farmer's Monthly Visitor*, 31 July 1840; Bidwell and Falconer, *History of Agriculture*, 374; David C. Smith, "Coastal Shipping on the Eve of the Railroad: Gardiner, Maine in the Early 1830s," *Maine Historical Society Quarterly* 13 (1974): 148-77.

[78] Daybook of Levi Bailey of Reading, Vt., Baker Business Library, Harvard University. The median was sixty-six bushels of potatoes.

[79] *North Star*, 27 April 1835. On starch factories and potato production to supply them, see Edward Jones to Jabez Jones, 15 June 1846, VHS. *Patent Office Report, Agriculture*, 1844, 77-78; *Patent Office Report, Agriculture*, 1848, 367; Abby M. Hemenway, *Vermont Historical Gazetteer* (Burlington, 1871), I: 887, II: 283, 589, III: 152, 884; Stilwell, *Migration from Vermont*, 174; Katharine A. Wilder, "The Potato Starch Mill of Wilton, New Hampshire," *New England Galaxy* 14 (1973): 16-21.

[80] *Farmer's Monthly Visitor*, 3 July 1841, quoting *Albany Cultivator*, contests claims to higher potato yields and suggests the range 175-250 bushels per acre is more realistic.

[81] Calculated from Bailey day book, Baker Business Library, Harvard University. In the spring of 1835, alone, he loaned out 234 bushels of seed potatoes.

[82] Thomas Dublin, *Women at Work: The Transformation of Work and Community in Lowell, Massachusetts, 1826-1860* (New York: Columbia Univ. Press, 1979) and Jonathan Prude, *The Coming of Industrial Order: Town and Factory Life in Rural Massachusetts, 1810-1860* (New York: Cambridge Univ. Press, 1983); Steven Hahn and Jonathan Prude, *The Countryside in the Age of Capitalist Transformation: Essays in the Social History of Rural America* (Chapel Hill: Univ. North Carolina Press, 1985) offer recent accounts of this phenomenon.

[83] Edward Jones to Milo Jones, 15 August 1845, VHS.

[84] On the blight, John Grainger, "Meteorology and Plant Physiology in Potato Blight Forecasting," in *Weather and Climate*, ed. J. A. Taylor (Oxford: Pergamon Press, 1967), 105-13; Ventskevich, *Agrometeorology*, 125.

[85] See, for example, the debates carried in the *Boston Cultivator*, 5 and 26 October 1844, 18 January, 15 February, 31 May 1845. Discussions were similar elsewhere. *Patent Office Report, Agriculture*, 1847, 139-56, attempted to summarize American knowledge to date. Neil E. Stevens offers a good introduction to these early scientific efforts in his "The Dark Ages in Plant Pathology in America, 1830-1870," *Journal of the Washington Academy of Science* 23 (1933): 435-46.

[86] On the Rohan, see Arthur H. Cole, "Agricultural Crazes," *American Economic Review* 16 (1926): 633-34.

[87] P. M. A. Bourke, "Emergence of the Potato Blight, 1843-46," *Nature* 203 (1964): 805-08. For maps of the spread of the disease in eastern North America, see Stevens, "Plant Pathology in America," 441-45. "STODDARD" advised farmers to change their seed source every few years. *Farmer's Monthly Visitor*, 31 March 1840. Only a few scattered individuals had to follow this advice in order to diffuse the blight over vast distances in a matter of three short years.

[88] *Boston Cultivator*, 26 October 1844 quoting *Bangor (Me.) Whig and Courier*.

[89] Redcliffe N. Salaman, *The History and Social Influence of the Potato*, rev. ed. (New York: Cambridge Univ. Press, 1985); Robert Morgan, "'Poverty, wretchedness, and misery': The Great Famine in Cape Breton, 1845-1851," *Nova Scotia Historical Review* 6 (1986) 88-104.

[90] Edward Jones to Jabez Jones, 15 June 1846, VHS.

[91] *Patent Office Report, Agriculture*, 1847, 135; *Compendium of the Sixth Census* (1840); J. D. B. DeBow, *Statistical View of the United States . . . Compendium of the Seventh Census* (Washington, 1854), 317; Wilder, "Potato Starch Mill," 16-21.

[92] The quotation is Edward Jones to Jabez Jones, 15 June 1846, VHS. On the turn to oats and root crops, C. Goodrich, "Agricultural Societies and Agriculture of Vermont," *Transactions of the New York State Agricultural Society* 6 (1848): 381; *Patent Office Report, Agriculture*, 1848, 343.

[93] William R. Baron and Anne E. Bridges, "Making Hay in Northern New England: Maine as a Case Study, 1800-1850," *Agricultural History* 57 (1983): 171-74.

[94] Jensen, *Loosening the Bonds*, 36-56, argues that female rakers were quite common in the Philadelphia area. I find no evidence for this in any of the family papers, farm diaries or account books cited in this paper. Baron and Bridge, "Making Hay," 175, also seem to indicate that female participation in the hay harvest was quite rare in New England. In his novel *A Busy Year at the Old Squires*, (Norway, Me.: Old Squires Bookshop, 1922), 155-61, C. A. Stephens described a Maine superstition that required the farm wife to drive the season's last load of hay into the barn. I am indebted to David C. Smith for bringing this important detail to my attention.

[95] Harwood diary, 24 July 1818, Bennington Museum; Miller diary, 28 July 1820, VHS. On mowing races and other forms of masculine harvest competition, see (Winthrop) *Maine Farmer*, 23 July 1848.

[96] Miller diary, 29 November 1826, 20 November 1835, VHS.

[97] Tench Coxe, *Statement of the Arts and Manufactures of the United States . . . for 1810* (Philadelphia, 1814), n.p.; *Compendium of the Sixth Census* (1840), 120. Also see the town level map in Stilwell, *Migration from Vermont*, 172, based on data in C. Benton and S. F. Barry, *A Statistical View of the Number of Sheep . . .* (Cambridge, Mass., 1837).

[98] *Vermont Watchman*, 21 October 1842. On the sheep boom in Vermont, Harold F. Wilson, "The Rise and Decline of the Sheep Industry in Northern New England," *Agricultural History* 9 (1935): 12-42; Betty J. Belanus, *They Lit Their Cigars with Five Dollar Bills: The History of the Merino Sheep Industry in Addison County* (Middlebury: National Endowment for the Humanities, 1977).

[99] On Champlain Valley dairying, Jones Family Papers, VHS; Harwood diary, Bennington Museum; Robert Hodgson, "The Champlain-Richelieu Lowland: A Study in Historical Geography," (Ph.D. diss., University of Michigan, 1951). On the beef and dairy industries in the Connecticut River Valley, *Independent Inquirer*, 19 July 1834, quoting *Barre (Vt.) Gazette*; *Farmer's Monthly Visitor*, 31 January, 20 September, 20 October 1839, 31 October 1840.

[100] Harwood diary, 1 September 1817, Bennington Museum; Miller diary, 30 September 1817, VHS; *Compendium of the Sixth Census* (1840), 120.

[101] Adams, *Prices Paid by Vermont Farmers*, 32-34.

[102] Potash, "New Rural History," 304-07; *Farmer's Monthly Visitor*, 31 January 1840; Adams, *Prices Paid by Vermont Farmers*.

[103] Kelton diary, 2 June 1821, 25 October 1826, 9 June 1834, 28 September 1835, VHS; Miller diary, 6 May 1834, VHS; account book of Hiram Fellows of Washington, Vt., VHS.

[104] *Vermont Chronicle*, 17 October 1834. Several weeks later, Thomas Fessenden of the *New England Farmer*, 29 October 1834, picked up this snippet, but cast it in terms of nostalgia for the passing of the New England yeoman instead of the language of class conflict in which the "Green Mountaineer" originally issued it. On reactions to the concentration of land, see David M. Ludlum, *Social Ferment in Vermont, 1791-1850* (Montpelier: VHS, 1948), 261-63; Roth, *Democratic Dilemma*.

[105] The quotation is from *Farmer's Monthly Visitor*, 28 February 1840. Also see *Farmer's Monthly Visitor*, 15 January, 15 July, 20 August 1839. For summer pasturage advertising, *North Star*, 19 June 1827, 5 June 1832, 20 May 1833, 31 March and 23 June 1834.

[106] Once his flock had increased in size, Lovel Kelton rented out his sheep for one pound of wool per head per year and the entire fleece if it died. It is not clear from his diary entries if he retained ownership to newborn lambs. Kelton diary, 15 November 1834, 14 November 1839, VHS. E. B. Chase of Lyndon, Vt., also rented out his sheep. See his day book, 27 November 1841, vol. 5, Chase Collection, Baker Business Library, Harvard.

[107] Eliot, *Field Husbandry*, 36.

[108] The first quotation is *North Star*, 4 May 1835, quoting *Claremont (N.H.) Eagle*; the second is Miller diary, 8 May 1835, VHS; the third is *North Star*, 18 May 1835. For more on the "great scarcity of hay," see Edward Jones to Milo Jones, 13 April 1835, VHS.

[109] *Vermont Gazette*, 23 July 1822, quoting *Boston Daily Advertiser*.

[110] See, for example, *North Star*, 27 July 1824, quoting *New England Farmer*; *Vermont State Paper*, 11 August 1835, quoting *Vergennes (Vt.) Palladium*; *Farmer's Monthly Visitor*, 15 July, 20 August 1839, 31 May 1841. For a more complete discussion, see Baron and Bridges, "Making Hay," 169-74.

[111] Harwood diary, 21 July 1821, Bennington Museum.

[112] Harwood diary, 19 August 1823, Bennington Museum; *Farmer's Monthly Visitor*, 15 March, 20 August 1839, 31 January, 30 June 1840; Flint, *Forage Plants*, 308-09; Clarence Danhof, "Gathering the Grass," *Agricultural History* 30 (1956): 170-01.

[113] Edward Jones to Milo Jones, 4 July 1839, VHS.