Coppicing for Northeastern farms: Farmer feedback and coppice system case studies

Final Report for ONE14-209

Project Type: Partnership
Funds awarded in 2014: $14,996.00
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Region: Northeast
State: Massachusetts
Project Leader:

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Dynamics Ecological Design

Project Information

Summary:

This project involved six farmer-cooperators in the development of a forthcoming manuscript on coppice agroforestry through their review of and comments upon the manuscript to date, and by developing case study "sketch problems" of three farms. These case studies were intended as quick design sketches of how to enhance their current and future farm operations using various forms of coppice agroforestry.

Meanwhile, three of the participating farms became sites for the case studies. The authors visited each farm after creating base maps and gathering site data for each farm. We clarified the farmers' goals, analyzed and assessed the sites on the ground, and generated coppice system design ideas in collaboration with the farmers. Case studies were developed, drafts sent to farmers for review, and final case studies were re-drafted for possible inclusion in the forthcoming book *Coppice Agroforestry: Resprout Silviculture for the 21st Century*.

This project definitely improved the book manuscript overall. Despite challenges getting full farmer participation and feedback, the comments and discussions we had both as a group and individually brought about significant changes in the manuscript, honing the writing style, streamlining the content, and improving our ways of framing coppice agroforestry systems, in particular.

The case studies demonstrate that coppice systems do have potential in the Northeast, though there are still large gaps in our knowledge and experience that must be filled to get coppice systems ready for "prime time."

The case studies appear to have been helpful to the farmers involved:

- In the case of No Name Farm, it appears that without coppice systems in the form of ornamental woody cut flowers, there would have been no hope of finding a way to regenerate the damaged landscape of a soon-to-be-abandoned auto salvage yard with an income-earning farming enterprise. Even with this central aspect of the proposed farming enterprise, these folks have a tough row

to hoe.

- For Wellspring Forest Farm, the design process illuminated some access and circulation pattern options they had not considered, and provided sufficent numbers to expand their sense of possibility around fodder trees in their pastures. The design also proposes uses for a scrubby wet area with many land use challenges that provide some realistic possible directions for making those 2+ acres a valuable part of their farm. Being able to make a reasonable estimate that fodder yields from pollard alleys could provide up to 60% of their winter forage needs for their 20 sheep without reducing their summer grass yields offers hope for reducing their cash outflows while improving living conditions on their windy site.

- Sovereign Hill Farm's multiple design options have inspired farmer Kathrin Bateman to consider further research at her place to help test and develop coppice agroforestry. She wants her goats and sheep to have a more diverse diet with a higher medicinal value, especially in terms of reducing parasite loads through woody browse. The design concepts generated for Kathrin add additional production to her pastures without overly complicating or sacrificing current hay and pasture produciton and management. We believe this is an important aspect of helping coppice systems fit within our modern agricultural systems.

Introduction:

For much of human history, forestry and agriculture have at least intermingled, if not been fully integrated. The modern-day separation of agriculture from forestry has contributed to both human endeavors facing an uncertain future. Coppice agroforestry—the management of woody plants for straight, fast-grown, high quality 'stump sprouts'—has at least an 8,000 year history around the world, yet is virtually unknown in the modern U.S. Various forms of such 'resprout silviculture' hold tremendous promise for carbon-sequestering sustainable agriculture, especially in the forested Northeast.

Coppice systems can potentially increase self-reliance for fuel, building materials, livestock feed, and crafts while concurrently generating additional farm income streams. Integrating coppice into wildlife corridors, productive riparian buffers, multi-purpose hedgerows, shelterbelts, and wood pastures can prevent erosion, reduce runoff, temper microclimates, filter air, sequester carbon, provide mulch and organic matter, and improve soil quality, livestock health, and pasture productivity. Meanwhile, farmers can reduce operating costs, while offering diversified value-added products that employ artisan laborers.

We by no means believe coppicing offers a 'magic bullet' to the world's problems, but we do believe it holds tremendous potential to enhance farm diversity, sustainability, and long-term viability in numerous ways, especially as fossil energy becomes more scarce and the climate shifts. The lead time to work the bugs out of these systems is long, and the window to respond to the converging crises we and our planet face is beginning to close. The design of long-lived coppice agroforestry systems that must be practical and economical now, in a time of cheap energy, *and* in a future with unknown (and likely volatile) social, economic, technological, and ecological characteristics poses probably the biggest challenge.

The project's Primary Investigators are working on a forthcoming comprehensive

manual, tentatively entitled *Coppice Agroforestry: Resprout Silviculture for the 21st Century*, that will educate growers about coppice history, systems, economics, key species, best management practices, and system design, establishment and maintenance. This Partnership Grant project sought to ensure the book offers practical utility to farmers desiring to integrate various forms of coppice agroforestry into their operations. The first part of this project involved Farmer Feedback on the manuscript through review periods, written comments, and group discussion of the text so far. Six farmers agreed to participate from Pennsylvania, New York, Vermont, and Massachusetts. For the second part of the project, we worked in concert with Elizabeth and Steve Gabriel of Wellspring Forest Farm in Mecklenburg, NY, Kathrin Bateman of Sovereign Hill Farm in Chester, MA, and a third farmer who wishes to remain anonymous. We developed Case Study coppice system designs for these three farms through a set of "sketch problems."

Project Objectives:

We seek funding for Farmer Feedback and Case Study Development using Coppice System Sketch Problems to help us synthesize our work before Final Book Production. We need to integrate and fill gaps in chapter drafts and edit the Species Databases before we solicit responses from farmers. Sharing our work with farmers, visiting some of their sites, and doing sketch problems will help us integrate it all more fully, forcing us to work through bugs to refine the information and design processes before submitting to the publisher. End users will have a much better product for this proposed effort.

Farmer Feedback: We plan to work with farmers running divergent operations to get feedback on significant portions of the manuscript, adapting the intensity of our review request to match their available time and energy. We plan to solicit feedback in two rounds to both reduce farmer overwhelm and offer us additional time to prepare a second batch of chapters. In each round, we will supply farmers with hard copy manuscripts, red pencils, postage-paid return envelopes, and a deadline to return red-lined manuscripts. Upon receipt, we will review their feedback and set up a conference call to discuss thoughts and responses. This feedback will inform our Draft 5 (Final Integration) editing. In return for their effort, farmers will receive a copy of the final book once released, personal acknowledgment in the book, and a chance to participate in the Sketch Problems portion of the project.

Coppice System Sketch Problems: We will choose three diverse farm operations from our pool of reviewers as subjects for our Sketch Problems, which may become feature case studies in the book. We'll select these farms based on factors including, but not limited to: level of participation in Farmer Feedback; farmers' self-assessment of their operation as a candidate for one or more forms of resprout silviculture; farmers' need for support and potential benefit from the sketch problem work; relevancy to our book project. These site visits will occur after completing the Farmer Feedback portion of the project. This enables farmers to have as much information as possible about the subject so they can participate in the Sketch Problem process as much as feasible given their schedules.

Prior to the site visits, we'll help each farmer articulate design goals and create simple base maps of a portion of their sites, survey their land, species resources, access to local and regional markets, skill sets, and labor pools. We'll then brainstorm a series of schematic designs for each site in a couple of iterations during a single on-site day. These quick sketch problems will examine various ways coppice systems might fit into their operations practically and economically. We will seek to design systems that: meet the farmers' stated goals; provide at least one or two additional products or enterprises for their farm that will bring in at least $500-$1,500 of additional income or provide a similar decrease in costs; and/or provide defined ecosystem services that will increase crop

productivity or livestock performance and health, reduce costs, improve ecosystem health, soil quality, or farmer quality of life.

Following the site visit, we will revise and refine the designs into a single proposed design scheme for each farm with a brief write up for each, describing the goals, site and operational considerations, and design choices. The farmer will review these documents and comment, after which we'll draft a final version for potential inclusion in the book. We'll supply each farmer with copies of the final write up and all the sketches we generate.

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Research

Materials and methods:

For the review process, the manuscript was divided into two sets of chapters. The first set was sent to all six farmers at the same time for their review and comment. Manuscripts were mailed back with written comments, which were reviewed by the authors. We then held a conference call discussion of the chapters with four of the six participating farmers, with one-on-one conversations with the other two afterwards. A second round of chapters was then sent to those who had completed the first set for review, comment, and discussion as before.

- Farmers gain an understanding of coppice systems and products by reviewing the third draft manuscript of *Coppice Agroforestry* in two batches of chapters. They write comments in red on the pages, and return the marked up manuscripts for author review.
- Farmers participate in one conference call discussion for each batch of chapters to share and compare notes, respond to author questions, and build shared understanding of the content and their responses to it.
- A round of chapter editing follows each batch of manuscript response.
- Review round 1 concludes by late spring or early summer. Review round 2 concludes by late summer.
- Three farms are chosen for the case study portion of the project.
- Case studies begin with off-site data gathering and base mapping.

- Each case study farmer participates with the authors in a 6-8 hour on-site design charrette (an intensive time-limited design session) for their operation. We articulate goals, assess the site and farm operation, and develop a set of brainstormed design ideas/sketches for potential coppice systems on their farm.
- Authors refine and develop the design ideas, researching further as necessary to fill knowledge gaps revealed by the charrette, and hone their coppice system design processes along the way.
- Authors present one or more sketches and schemes for farmers' review and comment.
- Authors revise and refine the sketches and schemes as necessary within time constraints.

Activities

- The first set of chapters was mailed in mid-March, the second in mid-July.
- The first conference call took place on June 30 and went for over two hours. The second conference call never happened, but was replaced by a series of one-on-one conversations with the various participants about what they had read and how they saw what they had read applying to their farm.
- Manuscript revision in response to the farmer's comments was, of course, more viable with the first round of chapters, given the limited commentary on the second set of chapters. Manuscript revisions were nonetheless extensive in response to the comments and feedback, and they are ongoing.
- Review round 1 concluded in a reasonably timely manner, though delayed by about two months. No one has as yet returned the second set of chapters. Ideally, manuscript reviews were to conclude prior to beginning the case study portion of the project so farmers could participate in the case study portion as maximally informed as possible. We ended up starting the case study portion of the project in late September so as to have some non-winter observation time on each design site.
- The three farms chosen for the case studies included: Wellspring Forest Farm, a sheep, mushroom, duck, and maple syrup operation in upstate New York; Sovereign Hill Farm, a sheep and goat farm on the Berkshire Plateau in Chester, MA; and an anonymous farm (which we call "No Name Farm") intended to regenerate the site of an auto salvage operation in an urbanized setting in the Northeast with an open palette of possible operations, but probably to include medicinal herbs, vegetables, and fruits grown on the edges of the salvage yard and non-edibles on the yard itself. Despite some similarities in scale and crops, these farms provided varying design problems for us to solve.
- The case study visits came off without a hitch. Our on-site days and discussions were fruitful, clarifying, and enthusing, and generated several clear directions for design.
- The office portion of the case studies was more challenging. We had to dig more deeply into the literature as we discovered that we knew less than we thought and we needed to know more. Much more literature searching commenced, along with deeper and more careful rereading of studies we had already read. Overall, the case studies brought about a grounding and deepening of our

knowledge.

- The final case studies are significantly larger documents than originally intended, but they offer readers detailed background information to help ground the designs in our observations and the literature. You can download them below.

Research results and discussion:

Discussion:

We ended up putting more emphasis on the case studies part of the project than originally intended due to the lower-than-desired participation in the review and commentary aspect of the project, but this proved entirely useful. Grounding our experiences, research and writing so far with on-the-ground issues was more challenging than anticipated. We learned that, despite the hundreds of studies we have found in the worldwide literature on these topics, few studies have direct practical relevance to designing the kinds of systems our case studies demanded—most of the research we've discovered has small slices of relevance that must be aggregated to understand their design implications. Nonetheless, the process deepened our understanding, offered the farmers concrete ideas to explore, and forced deeper literature inquiry to get the design options as clear and useful as possible given the early state of the art of coppice agroforestry in modern North America. Our generalized, but also detailed look at projected yields and system metrics has helped us better organize this data and become more comfortable sharing these figures with our audience. The case studies demonstrate that coppice systems do have potential in the Northeast, though there are still large gaps in our knowledge and experience that must be filled to get coppice systems ready for "prime time."

- Clearly beginning a project of this nature at the very beginning of the growing season was poor timing, but this could not be helped given the Partnership Grant's schedule. We wanted six participating farmers because we expected attrition in the review process. We hoped for a wide set of reviewers and commentators on the manuscript, and that we would end up with at least three farmers well-informed enough to participate in the case studies. These expectations and hopes were mostly met.
- Getting the first set of chapters back from the farmers took about two months longer than originally planned, and a few never sent the first set back. The remainder received the second set of chapters, but it was mid-growing season by that point, and the deadlines for the second batch of chapters passed twice before we let go and gave folks into the winter to get them back to us. Our hope to get completed reviews of the second set of chapters from at least some farmers during the winter was not met. We still hear from some of them that they plan on getting comments back to us, which we will welcome.
- Clearly the project design had faults, as holding farmers to their commitment was very difficult. We know that everyone we spoke to was fairly burned out by the end of the season, and major life events had occurred for others, and this surely contributed to the lack of returns of the second chapter batch. The

project as designed had little carrot for the farmers, and no stick. While additional incentives to participate might have been useful, there is still some doubt that they would overcome whatever issues prevented full participation by the majority of the farmers. Still, we got a lot from what people had to offer and they gave of themselves just to accomplish what they accomplished, for which we feel grateful.

- Nonetheless, the farmer reviews we did get were quite useful in both honing the manuscript, and in instigating some major redirection, reframing and more complete integration of the history, systems, and design chapters, in particular. How these three interconnect has been elucidated by this process. This has been exceedingly valuable to our understanding, to the case studies, and to the book as a whole.
- Most readers found the history of coppice agroforestry very interesting and elucidating. However a few felt the information was less useful in that chapter. We had much discussion of the economic and societal aspects of the history of coppice: the history demonstrates the depth of the intertwining of social and economic context with the forms and practices of coppice agroforestry, and this is a key issue in our age. These are questions of how cultures work, how agriculture fits into that, and whether and how we can design cultures. Most of us felt clear that no agricultural system can flourish in an incompatible cultural and economic context. Yet the book needs to focus on techniques and systems and not get into that topic too deeply, even though they cannot be separated from each other. We still wrestle with that balance.
- It is clearer than ever to us now that we are in a phase of radically rethinking and reinventing what coppice systems are and can be. The systems of the past are useful guides, but they may or may not be appropriate to any particular farm or landscape. Europe's history of coppicing is quite different than North America's, and the genetics that coevolved with the practices have survived in Europe, but have been lost in North America. We are starting from scratch, and appear to have a long way to go.
- A clearer frame for coppice agroforestry systems also arose from this work. Coppice systems *as systems* basically emerge from the intersection of several factors:
    - The purposes of the system;
    - The crops or species involved;
    - The management practices, that is, the location, scale, intensity, and severity of disturbance of individual woody plants and their patches;
    - The timing and chronology of that disturbance, which effects the architecture of the ecosystem (especially vegetation layers);
    - The patterns of those disturbances in the landscape, and the patterns of the plants involved in the system.

Getting to the essence of what makes an agroforestry system tick in this way is assisting us in structuring the book and its contents in the most efficacious manner. It will also help us to better design such systems in new cultural and ecological contexts.

- The case study design processes have also greatly clarified gaps in knowledge and deepened our reading of the literature. We conducted further literature searches for specific kinds of information we hadn't realized we didn't *quite* have. For example, we thought we had a number of studies that gave us enough practical information that we could design pollard fodder systems for the case studies, but when we actually tried to design with that data we found it wasn't translatable to the situations we faced in any meaningful way. If it weren't for one Norwegian study (Austad, I., L.N. Hamre, K. Rydgren, and A. Norderhaug. 2003. "Production in wooded hay meadows." *Transactions on Ecology and the Environment,* 64: 1091-1101.) we would not have been able to design the pollard fodder systems we did. Clearly more study and experience is needed to make well-reasoned design choices.
- The case study process has also sharpened our focus and cleared a path for how to navigate, understand and display the vast amount of widely varying "leaf hay" nutrition data we have acquired. The table of "Crude protein content of leaves of selected woody plants" (available for download below) produced for two of the case studies was one unexpected result of this project, and played a key role in guiding the species selection for Wellspring Forest Farm and for Sovereign Hill Farm. We had intended to produce such a table eventually, but the case studies forced our hand and we offer this table here as a product of this project. We still have much to synthesize for other kinds of crops, including yield data for ornamental woody cut flowers, for example.
- Another learning currently emerging from the case study process is a deeper appreciation of how much and which specific species characteristics really matter in making a species serviceable in a coppice or pollard management system. Things like the formation of numerous dormant buds, the ability to be trained to coppice mangement at a young age, low mortality under coppice management cycles, the ability to layer branches to propagate and fill in gaps in a coupe, which species have wood with qualities that make it useful for one or more specific uses, and so on. The list of characteristics is fairly long, and this, along with the lower overall species diversity of Western Europe, may help explain why a few species came to dominate coppicing in Europe over the centuries: only a few species have all or most of these characteristics.
- In addition, 8,000 years or more of coppice management must have influenced the genetics of coppiced European species, and improved their coppicing characteristics. Here in North America, knowledge of which species were coppiced by the native peoples has mostly been lost, as has the knowledge of how to mange them, and the genetics of the species used have probably been at least scrambled or gone missing in the woods, if they have not gone extinct completely in the last 500 years. How quickly can we rediscover and re-establish these information banks, genetic and cultural? Only time will tell. But we need to get busy!

- Crude Protein Content of Leaves of Selected Woody Plants
- "No Name Farm" Coppice Case Study
- Sovereign Hill Farm Coppice Case Study
- Wellspring Forest Farm Coppice Case Study

Research conclusions:

- While the authors are both experienced designers, the real-world challenges posed by developing practical case studies has been invaluable. This process has stretched our abilities to develop practical, functional designs for working landscapes and landowners, while concurrently enabling us to refine and articulate this process to readers in our book. We believe our chapter on system design will prove a major contribution to the world of resprout silviculture, so these test runs will have a significant impact on the value of the completed book.
- The case studies appear to have been helpful to the farmers involved:
    - In the case of No Name Farm, it appears that without coppice systems in the form of ornamental woody cut flowers, there would have been no hope of finding a way to regenerate the damaged landscape of a soon-to-be-abandoned auto salvage yard with an income-earning farming enterprise. Even with this central aspect of the proposed farming enterprise, these folks have a tough row to hoe.
    - For Wellspring Forest Farm, the design process illuminated some access and circulation pattern options they had not considered, and provided sufficent numbers to expand their sense of possibility around fodder trees in their pastures. The design also proposes uses for a scrubby wet area with many land use challenges that provide some realistic possible directions for making those 2+ acres a valuable part of their farm. Being able to make a reasonable estimate that fodder yields from pollard alleys could provide up to 60% of their winter forage needs for their 20 sheep without reducing their summer grass yields offers hope for reducing their cash outflows while improving living conditions on their windy site.
    - Sovereign Hill Farm’s multiple design options have inspired farmer Kathrin Bateman to consider further research at her place to help test and develop coppice agroforestry. She wants her goats and sheep to have a more diverse diet with a higher medicinal value, especially in terms of reducing parasite loads through woody browse. The design concepts generated for Kathrin add additional production to her pastures without overly complicating or sacrificing current hay and pasture produciton and management. We believe this is an important aspect of helping coppice systems fit within our modern agricultural systems.
- As the case studies now get published online, we go into the world to teach and design, and we move into the final aspects of writing and publishing the book, the impacts of this project will only grow.
- Despite a few challenges, this project did what he had hoped: it helped us hone, refine, and improve the *Coppice Agroforestry* book.

Participation Summary

Education & Outreach Activities and Participation Summary

PARTICIPATION SUMMARY:

Education/outreach description:

- The case studies have been posted on our website at http://www.coppiceagroforestry.com/case-studies.html.
- Marketing to announce the case studies' release involved posts on Facebook to 18 related interest groups (mostly permaculture, agriculture, and forestry related) and our personal "friends" lists, with 68,679 members in total. Surely there is significant overlap in those groups, but still, surely tens of thousands around the world will now see these posts and have access to download the case studies. Friends will share these posts, too, so the ripples will spread rapidly.
- In the future, this publicity will only expand through our teaching and writing work.

Project Outcomes

Assessment of Project Approach and Areas of Further Study:

Areas needing additional study

- The areas needing additional study for coppice agroforestry are probably far too numerous to mention! Highlights follow.
- Basic, solid, practical, and cross-study-comparable information on the nutritional value of the leaves of numerous North American woody species for various forms of livestock is critical. We are compiling what we can of this, but many more studies are needed, with sampling at various times of year and, ultimately, under different growing conditions.
- Working out how to measure the yields of woody leaf hay in a way that is sensible and practical for farmers, and getting yield estimates for a range of nutritious species, is critical for improving fodder system design.
- There is much to learn about the ability of various species to pollard successfully, and about the practical pruning techniques required to pollard without shortening the trees' lifespans.
- Many different kinds of data are needed on potential coppice species in North America, from the ability of different species to form numerous dormant buds, the ability to be trained to coppice mangement at a young age, mortality rates under coppice management cycles with and without juvenile coppice training, the ability to layer branches to propagate and fill in gaps in a coupe, which species have wood with qualities that make it useful for one or more specific uses, and so on. As we finalize the book we plan to produce a list of the characteristics needed in coppice species and what kind of data is needed on that.

- We also need people like our case study cooperators to play with species, management techniques, and systems designs on the ground to see what we learn from that. We need to support people to make as many mistakes as fast as possible so we can learn from those mistakes and propagate the knowledge gained from them to others, who can make newer and more interesting mistakes the next time.

Information Products

- Coppice Design Case Study 1 (Fact Sheet)
- Appendix Protein content of woody species (Appendix)
- Coppice Design Case Study 2 (Fact Sheet)
- Coppice Design Case Study 3 (Fact Sheet)

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