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Human and Institutional Dimensions of Agroforestry

In Pinantan Lake, BC, Canada, Jennifer and Chris Cunningham manage Jay Springs Lamb Co., an evolving story of a four-family, three-generation farm business that mixes agriculture, forestry, agroforestry, and direct marketing (Valdivia, Gold, Zabeck, Arbuckle, & Flora, 2009). They produce free-range lambs from a silvopasture operation in the Southern Interior of British Columbia. Their journey began with Jennifer's parents, who purchased Jay Springs Ranch in 1964, evolving as livestock management progressed from a combination of pasture and relatively passive forest grazing systems to a mix of extensive and intensive silvopasture practices. Jennifer's parent, Geoff Boden, was one of the founding members of a local naturalist's group and an avid birder. Ecological and social values were an intrinsic part of their family life; thus, the concept of agroforestry found fertile ground with Jennifer and Chris as they became more involved with the operation. The original settler ranched with sheep because these were more economic and easier to handle for Jennifer's mom, Shirley, and the children could help. Jennifer and her two siblings, Jocelyn and Dean, grew up herding sheep on horseback in a very scenic part of the province, which ultimately contributed to their decisions to return to the farm and facilitated their current-day intimate knowledge of every corner of the ranch. In 1985, a woodlot license was awarded to Geoff, adding a forestry dimension to their agriculture business. The ranch consists of a mixture of private and Crown lands that require different management according to the land tenure. Jennifer and Chris, along with various members of the family at times, supplemented ranch income via off-farm jobs. A legal partnership created in 1993 formally brought Jennifer, Jocelyn, and Dean (and their families) into the management and operation of the ranch and woodlot. As happens frequently in many areas across North America, the children left the farm to pursue other careers; however, all three came back, driven by family, natural resources, aesthetics, and a tie to the land that would be hard to match anywhere else. Their education, experiences, and world perspectives contributed to shaping the family business in new ways while keeping the feel of "the way it was." This story was at the center of the human dimensions chapter of the 2nd edition of this book, developed by L. Zabeck (Valdivia et al., 2009).

Another story of a family farm and agroforestry is that of Early Boots Farm in Minnesota (Robinson, 2013a). Beginning farmer Tyler Carlson and wife Kate Droske started in 2011 on land purchased by family in the 1960s near Sauk Centre, MN. They are using silvopasture to raise gourmet, grass-fed and finished beef, as it was a relatively low-cost way to get started. The goals of the farm include: producing food in ways that are sustainable and regenerate

the land; managing risks by placing diversity back on the landscape; and using perennial cropping systems to mitigate drought, heat, windstorms, and other extreme events. Carlson is using an ultra high stocking density grazing system (aka “mob” grazing), where cattle are moved en masse multiple times a day, while working toward organic certification. He also planted thousands of red oak (*Quercus rubra* L.) and red and white pine (*Pinus resinosa* Aiton and *P. strobus* L., respectively) saplings in 8 ha of old crop fields. The trees will shade pasture to improve feed value and shelter a growing herd of Australian Lowline Angus beef cattle. He received cost-share assistance from USDA’s Environmental Quality Incentives Program (EQIP) to establish fencing for rotational grazing and help pay for trees; planting assistance information and mentorship came from the University of Minnesota Extension and the Land Stewardship Project. He is also involved in research on the benefits of agroforestry for producing food, managing risks, and increasing landscape resiliency. The latter is pursued by integrating trees, fields, and water with an eye to connecting habitat corridors for pollinators, other insects, and wildlife. Carlson is planning his landscape design to help reconnect a fragmented agricultural landscape, intentionally planting trees to link up areas of cover. His planning considerations also include managing the edge effects to create viable refugia, especially for birds.

Creating a new elderberry [*Sambucus nigra* L. ssp. *canadensis* (L.) R. Bolli] enterprise on a historic farm provides another example of how agroforestry fits the goals of a farm family seeking to identify new sources of income (Robinson, 2013b). East Grove Farms near Salem, IA, specializes in elderberry and other heritage crops and has further diversified by establishing a winery in 2014 and further specialized by focusing exclusively on mead production in 2017. This case highlights management practices, lessons learned, and the marketing and economic concerns of the operation.

East Grove Farms is a family business managed by Kurt Garretson on Iowa’s oldest continuously settled farm, established in 1837 by his ancestors. The goals are to create a viable and enduring business on historic family land and build community with family, neighbors, and other elderberry growers. Garretson started farming in 2009, working with other family members to create a farm business that initially specialized in elderberry products and other heritage crops. The family started out small to learn what works and to properly prepare the soil for planting. In 2010, Kurt started with about 1,200 elderberry

plants on about half a hectare, had 2 ha in production in 2013, and added more hectareage in subsequent years. Elderberry was also planted along property boundaries and in two new shelter belts, along with hazelnut (*Corylus americana* Walter) and wild plum (*Prunus americana* Marshall). The family worked with River Hills Harvest, a Missouri-based elderberry marketing and processing cooperative that also provides training and networking. They also worked on a license for wine making and organic certification. They worked off the farm when needed, providing farm-related services to others, cared for land and soil, and valued family and community. The Garretsons want to show people that farming is not all corn and soybean. Kurt chose elderberry as a native plant that grows well in his area, even in places where row crops won’t grow, liked that it’s a perennial that doesn’t require the ground to be plowed up every year, and is also a product with growing demand in the markets due to its health benefits (high in antioxidants, vitamins, and minerals). East Grove Farms also includes cultivars of white peach, native persimmon (*Diospyros virginiana* L.), and ‘Green Gage’ plum (*Prunus domestica* L.). Elderberry is in growing demand due to research that has shown the berries to have anti-viral, immunity-boosting properties. The family mead business sells in numerous market outlets across Iowa.

Initially, East Grove Farms’ products included elderberry juice, cordial, and jelly and elderberry and elderflower wines. By 2017, the focus shifted exclusively to selling mead from a variety of different fruit sources. As mentioned, their marketing outlets are diverse and include the Iowa grocery chain, Hy-Vee, and River Hills Harvest Co-op, as well as the winery, with a focus on farm-related ecotourism. They restored the 114-yr-old Victorian house on the land that serves as the farm’s headquarters and the winery.

Connections to government programs include the USDA Natural Resources Conservation Service (NRCS), EQIP, and the Conservation Reserve Program (CRP). Garretson says, “the philosophy is the more elderberries, the better. Elderberries are such a new thing that everybody’s learning. The more growers we have nearby, the more we can help each other, share equipment costs, and save by shipping together” (Robinson, 2013b).

The life stories of these family farms show how diverse the decision makers are in North America and share the common thread of how these landowners have been able to make the shift to agroforestry. They exhibit the four As: (a) an Asset-based approach; (b) Adaptability by

constant adjustments; (c) Awareness of alternative value webs and rules, regulations, and legislation; and (d) Associations—local, regional, national, and international (Cooperrider, Sorenson, Whitney, & Yager, 2000; Pirog & Bregendahl, 2012), and the process is dynamic, with the intermingling of the household and family and the business, taking into account family goals and relationships and how these shape the nature of the business (Glover, 2010).

These stories show family farms that look to diversify activities and increase income, expecting to be part of their community for many years; landowners who are not farming and may have never farmed, but are seeking to improve the landscape, address flooding concerns, and enjoy wildlife and the many non-economic services the land provides; those who are entering farming full time but focusing on alternative products for high-end markets, including tourism; and those seeking alternative markets and relying on family, networks, and new markets. These are recent experiences of agroforestry practices in North America, while there have been other experiences of indigenous communities that managed diversified landscapes and livelihoods, such as Native Americans in the United States and Canada, for millennia (see Chapter 1; Rossier & Lake, 2014). Indigenous communities in California managed landscapes for centuries as diversified, complex, and integrated systems of animals, plants, trees, and fungi (see Chapter 2; MacFarland et al., 2017).

How do we understand the decision maker(s) and what motivates them? How does agroforestry fit into their livelihood strategies? Are decisions made in a vacuum, or are they shaped by what we know and value and by what we possess? In which ways do markets and the knowledge of institutions, policies, and social relations influence decisions? This chapter addresses the human and institutional dimensions of agroforestry, framed by sustainable livelihoods, the assets that decision makers possess or can access, and the values and relationships that influence the decisions to adopt agroforestry practices that fit with the goals of farmers and family businesses. It also addresses how the field of social relations, institutions, and organizations emerges in support of the practice of agroforestry.

Agroforestry

With the changing structure of agriculture, concerns for the environment, and the need for new income opportunities, farmers in North America must continually search for new enterprises that contribute to their livelihood goals and

are consistent with their resources, assets, and values (Valdivia et al., 2009). Linking farmers and consumers in the local community, diversifying production away from commodity crops, engaging in organic farming, developing new niche products, and connecting with consumers seeking to enjoy the landscape are among the many alternatives available. Agroforestry provides commercial opportunities, conservation benefits, and aesthetic and environmental services in tandem with the concept of multifunctionality (Barbieri & Valdivia, 2010a, 2010b; Dobbs & Pretty, 2004; Godsey, Mercer, Grala, Grado, & Alavalapati, 2009; Holderiath, Valdivia, Godsey, & Barbieri, 2012; Lovell et al., 2017; Plieninger, Muñoz-Rojas, Buck, & Scherr, 2020). It also provides landscape and open space amenities linked to land use practices (Abler, 2004; Gao, Barbieri, & Valdivia, 2014b), as well as benefits to the environment, such as clean water and air, reduced erosion, and wildlife benefits. Agroforestry, consistent with these multiple functions and benefits, “seeks to help bridge the gap between production agriculture and natural resource management” (see Chapter 2). However, on-the-ground adoption of agroforestry in the United States remains limited according to available statistics from the USDA National Agricultural Statistics Service, which show that only 1.5% of farmers engage in agroforestry (Romanova, 2020).

In North America, agroforestry is defined as “. . . land use management that optimizes the benefits (physical, biological, ecological, economic, social) from biophysical interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock” (see Chapter 2). While commonly described as intentional, integrated, interactive, and intensive (see Chapter 2), the British Columbia and U.S. family farms showcased in this chapter provide scope for both extensive and intensive examples, expressions of the diversity of contexts shaped by landscapes, markets, and policies, and the goals of the family farm.

Understanding if an agroforestry practice will interest rural producers requires knowledge of the context in which farmers, operators, and landowners make decisions regarding the activities they pursue, as well as knowledge of the characteristics, benefits, and complexity of practices in order to determine how practices align with the landowner’s (or land manager’s) objectives. *Compatible management* (Haynes, Monserud, & Johnson, 2003; Titus et al., 2004) reflects a continuum of activities and intensities, from wild harvest through extensive and/or intensive forest farming, to riparian buffers (see Chapter 9) and

silvopasture (see Chapter 6). The more active phases of compatible management are consistent with extensive or intensive agroforestry practices, as both the timber and non-timber resources are explicitly co-managed (see Chapter 9). “Agroforestry is a way for landowners to manage scarce natural resources that balances environmental stewardship, financial feasibility, and social responsibility” (see Chapter 16).

Agroforestry can be adopted for multiple purposes that include production, protection, diversification to reduce risk or increase income, provision of ecosystem goods and services (improvement of air and water quality, for example), recreational uses such as hunting, bird watching, increased wildlife habitat, and enjoyment by tourists (Barbieri & Valdivia, 2010b). Ecosystem services accrue not only to the landowner but to society as a whole; but if no markets exist to value these services, tangible economic benefits can’t be accrued (Holderiath et al., 2012; Udawatta, Gantzer, & Jose, 2017).

Why are Agroforestry Practices a Potential Benefit?

Benefits from agroforestry can be realized at multiple levels. At the field, farm, watershed, regional, national, and global levels, agroforestry practices can help address public concerns about the impacts of nonpoint-source pollution in the waterways. This is why governments concerned with these problems develop programs to protect resources. In the United States, the USDA CRP and EQIP have been implemented to help protect against floods that threaten to erode prime cropland. Small family farms received 75% of CRP payments in 2018 (Whitt, MacDonald, & Todd, 2019).

Agroforestry has the potential to be a source of environmental and economic benefits in the United States, where more than 90% of farms are small family farms (USDA National Agricultural Statistics Service, 2020). The other 10% are farmers engaged in traditional monoculture cropping, such as corn (*Zea mays* L.) and soybean [*Glycine max* (L.) Merr.], requiring roughly 600 ha (1,500 acres) to be economically viable and even larger hectares to become more profitable (Westhoff, Meyer, & Zimmel, personal communication, 2020), often renting a large proportion of the land operated. Small family farms, on the other hand, are very diverse and include family farms with off-farm occupation, as well as low-sales farms, and “second career” retirement farms. To remain viable, these farms must find ways to incorporate new income-

generating activities into their farming activities. Agroforestry provides such an opportunity.

At the farm level, agroforestry practices can enhance crop yields (e.g., windbreaks), reduce costs of production (e.g., silvopasture), or increase profits by reaching growing niche markets, such as log-grown shiitake mushroom [*Lentinus edodes* (Berk.) Singer] (e.g., forest farming) or chestnuts (*Castanea mollissima* Blume) (e.g., alley cropping), with potentially lucrative profits per hectare (see Chapter 15). Many professionals see agroforestry not only as an approach for sustainable land management but also as a way to increase or stabilize farm income through diversification (Garrett et al., 1994; Gold & Hanover, 1987; MacFarland et al., 2017; Prokopy et al., 2020; Valdivia, Barbieri, & Gold, 2012; Valdivia & Konduru, 2003). While extension professionals may consider agroforestry practices to be sustainable land use strategies that are alternative or complementary to traditional cropping systems, it is only during the past 20 yr that attention has been paid to how landowners and operators view agroforestry (Keeley et al., 2019; Matthews, Pease, Gordon, & Williams, 1993; Raedeke, Green, Hodge, & Valdivia, 2003), and more recently, how potential consumers view it as recreation (Valdivia & Barbieri, 2014; Gao et al., 2014b).

The Decision Makers

In the two decades since the first chapter on social dimensions was written for the first edition of this book (Rule, Flora, & Hodge, 2000), many studies on the interest and adoption of agroforestry have been conducted (Jose, Gold, & Garrett, 2018; Rhodes, Aguilar, Jose, & Gold, 2018; Romanova, 2020; Trozzo, Munsell, & Chamberlain, 2014a; Trozzo, Munsell, Chamberlain, & Aust, 2014b). Several frameworks have been used to study landowners’ and farm operators’ attitudes about the concept of agroforestry and regarding specific agroforestry practices. Common to all are the social, cultural, environmental, organizational, and demographic factors influencing decisions (Romanova, 2020; Rule et al., 2000; Valdivia et al., 2009, 2012; Valdivia & Barbieri, 2014). Here we first discuss a *sustainable livelihoods framework* that identifies the assets and capital that decision makers manage and invest to develop strategies in pursuit of their multiple goals. *Capital* is assets invested long term to create other assets. Short-term use of assets to create new assets is speculation (Flora, Flora, & Gasteyer, 2016). Through the stories of family farmers, we learn about the

factors influencing decisions in diverse settings, from privatized to leased and licensed lands, introducing the context in which decisions are made (structures and institutions), adaptive capabilities of family businesses and their symbolic capital, and the social relations contained in the practice of agroforestry. For definitions and clarification of the terms used to describe the sustainable livelihoods framework see Table 17–1.

Sustainable Livelihoods

A seminal study by Chambers and Conway (1992) developed the concept of sustainable livelihoods as one of the “practical concepts for the 21st Century” to assess how individuals choose strategies to achieve well-being that include the environment as a resource in production and as an outcome through the services it provides. The decision maker—an

individual, household, or group—, the assets or capital accessed or controlled, and the context within which decisions are made (e.g., markets, policies, and social organizations) are elements of this framework (Figure 17–1) (Valdivia et al., 2009). A livelihood encompasses people and their capabilities, means of making a living, income, and tangible and intangible assets. The tangible assets include resources and stores of wealth, and intangible assets consist of the relationships or claims to access to resources. A livelihood is sustainable when it is able to maintain or enhance the assets on which it depends, and *sustainability* is defined in terms of “the ability to maintain and improve livelihoods while maintaining or enhancing the local and global assets and capabilities on which livelihoods depend” (Chambers & Conway, 1992), providing opportunities for the next generation.

Table 17–1. A primer on concepts in human dimensions terminology.

Term	Definition	References
Agency/human agency	the ability to act or negotiate with markets, organizations, institutions, and policies—the “hinge” between a livelihood and the structures	de Haan (2000), Bebbington (1999), Valdivia & Gilles (2001)
Capability	the ability of an individual, household, or group to use capital (tangible and intangible assets) in ways that produce a livelihood; the result of agency, negotiation with markets, organizations, institutions, and policies	Chambers & Conway (1992), Bebbington (1999)
Capital	tangible and intangible resources, owned or controlled, that can be accessed and used to create a stream of benefits	Bebbington (1999)
Diversification	<i>Farm</i> : the reallocation and recombination of farm resources (i.e., land, labor, or capital) into new unconventional crops, animals, practices (e.g., agroforestry) or into non-agricultural enterprises developed on the farm <i>Household</i> : along with on-farm diversification, it also considers off-farm income-earning activities	Barbieri et al. (2008), Valdivia et al. (1996), Ellis (1998)
Field	the dominant social relations in which the individual engages in pursuing a livelihood; the network of objective relations consists of social relations representing the external dimensions or the relations that make the “game” possible; describes the rules of the game	Raedeke et al. (2003), Bourdieu (1990)
Habitus	the set of values upheld in a field, the norms that influence human behavior, the “taken for granted” social processes, values, beliefs, and behaviors shared	Raedeke et al. (2003)
Household Portfolio	<i>Of activities and enterprises</i> : includes the set of productive or income-generation activities <i>Of assets</i> : consists of the various forms of capital and assets that the household commands	Valdivia (2004), Chen & Dunn (1996)
Institution	“regularized practices” or patterns of behavior in society, accepted norms (both formal and informal) that are part of the process of social negotiation, embedding power relations; the rules of the game; embeds social relations and power structures at any given time	Scoones (1998)
Livelihood	encompasses income-generating activities that the household members pursue, along with the mechanisms or means to accessing resources (assets and capital) through the life cycle (stages in the life of the family)	Ellis (1998), Valdivia (2004)
Multifunctionality	Recognizes that agriculture provides different services to society in addition to the production of food and fiber; a continuum ranging from weak to strong productivist action and thought; the strong end of the continuum promotes environmental sustainability, enhanced food quality and shortens distribution channels, fostering local or regional embeddedness, in spite of its reduced productivity	Barbieri & Valdivia (2010a); Marsden & Sonnino (2008); Ploeg et al. (2000); Wilson (2008)
Structure	includes three dimensions: (a) social, which consists of the rules that govern common norms, (b) economic, which is defined by the “rules of the game” that govern markets, and (c) political, which expresses existing power relations; often determines the outcome of the livelihood strategies pursued, although agency can change this	de Haan (2000), Scoones (1998)

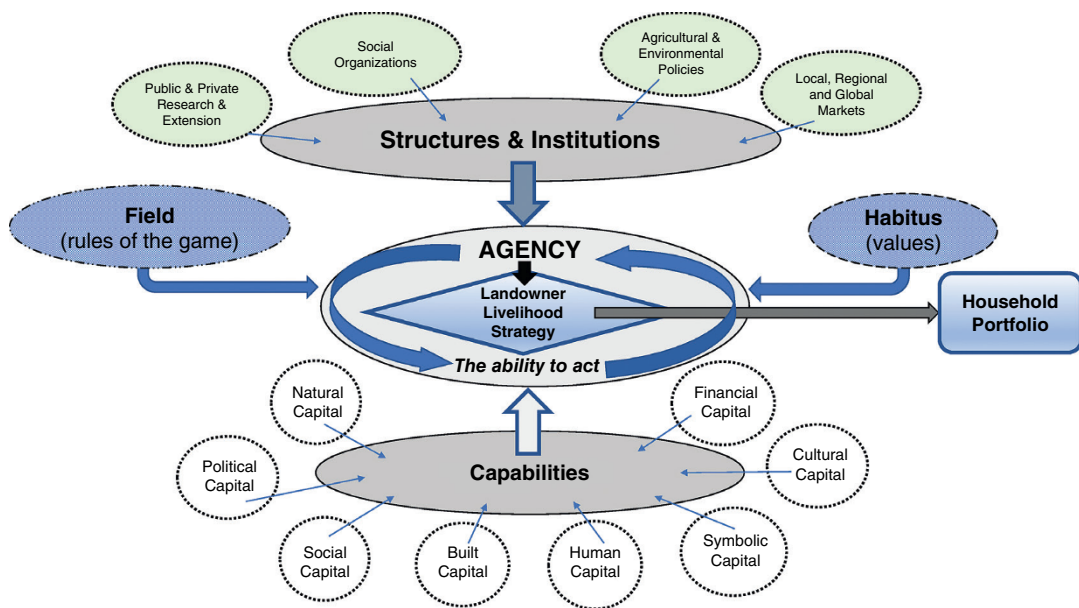


Fig. 17–1. Landowner capital, livelihood strategies, and the practice of agroforestry: Field, habitus, and agency.

The decisions people make do not happen in a vacuum. People use their capital and capabilities to implement their livelihood strategies (Bebbington, 1999; Valdivia, 2004) and negotiate within networks of social relationships as well as economic and political structures in a given “field” (de Haan, 2000), shaping the outcomes of the landowner strategy (Valdivia et al., 2009, 2012). The landowner’s capital and capabilities in the context of societal structures result in particular livelihood strategies, such as the cases of Jay Spring Lamb, Early Boots Farm (Box 17–1), and East Grove Farms (Box 17–2). Each family farm has unique characteristics and histories that have led to the development of diversified family businesses in which agroforestry plays a unique role, in line with their values and objectives.

Capital and capabilities (Figure 17–1, bottom) include human (the skills and abilities of people), social (social relations and networks involving trust and reciprocity), cultural (shared values and norms), symbolic, which “contains the prestige and renown attached to a family and a name” (Bourdieu, 1990), natural (soil, plant, and environmental diversity, resource stocks and services), financial capital (economic resources that can be invested) for investment in successful agroforestry practices, and political capital (Flora et al., 2016; Glover, 2010; Rule et al., 2000; Valdivia et al., 2009). The latter captures the influence that can be mobilized by producers to set the norms and values that lead to setting standards and

rules and their enforcement in both the public and private sectors. For example, the rules regarding the leasing structure of Crown land at Jay Springs Lamb (Valdivia et al., 2009) are a manifestation of public-sector political capital. The green label is an example of private-sector political capital in action. Landowners draw on these types of capital and their capabilities when they make decisions regarding investments and how they will develop their family farm business, including those who pursue agroforestry. Thus, *capital* refers to the resources potentially available to the decision maker.

Decisions are also influenced, and in many cases constrained, by structures and institutions (Figure 17–1, top). The public and private research and extension agencies, social organizations, markets (local and global) for products and inputs, and the agricultural and environmental policies established by governments constitute the *field*. The field of farming, especially commodity farming in the United States, is composed of mainstream organizations, policies, and markets that share similar values (Raedeke et al., 2003). Similarly, the field for forestry is also well defined, while agroforestry has been emerging (Valdivia et al., 2012). The field and the values define the practice and shape landowners’ decisions and, in turn, their livelihood strategies. In the case of Early Boots Farm (Box 17–1), young farmer Tyler Carson was able to connect with The Land Stewardship Project where he participated in the Farm Beginnings training course, was

Box 17–1. Silvopasture at Early Boots Farm

Early Boots Farm (<https://www.earlyboots.com>) is managed by Tyler Carlson in Minneapolis, with support from his wife Kate Droske. Tyler adopted silvopasture management—an agroforestry practice of incorporating trees into pasture settlements—on the farm and raises gourmet grass-fed and furnished beef. This young farmer, who began farming in 2011, benefited from a Farm Beginnings training course sponsored by the Land Stewardship Project, which resulted in the development of a business plan. He has also gained valuable information and mentorship from the University of Minnesota Extension that aided the design of his fairly complex farming system while also participating in their research on the benefits of agroforestry. In addition, Early Boots Farm has been a recipient of funding assistance from the Environmental Quality Incentives Program (EQIP) to undertake planting of trees and fencing.

Early Boots Farm has set out to accomplish the dual goals of producing food in a sustainable manner and regenerating land. Tyler Carlson has adopted a rotational grazing system known as ultra high stocking density or “mob grazing,” where he has high concentrations of cattle per hectare per day and targets about one to two moves per day. In that way an opportunity is provided for the restoration of grass health. In addition, he has planted thousands of red oak and white pine saplings on his field. However, prior to the trees growing big enough to hold off rubbing from the livestock, electric fences are being used on the farm to keep the cattle away. After maturing, the trees will provide shade for the livestock in the summer, as well as a windbreak and shelter in the winter. Furthermore, the shades will help the pastures stay cooler and extend the seasons for their prime growth, thus providing higher feed value for his livestock. In general, this perennial cropping strategy helps in mitigating the impacts of various environmental conditions.

Early Boots Farm is working toward receiving organic certification. Initially, their sales went to family and friends, but they have expanded their marketing channels to include local area farmers’ markets and online sales. Early Boots Farm travels to the Twin Cities for farmers markets two to three times a month. In season, Early Boots Farm also sells honeyberry (*Lonicera caerulea* L.) and sour cherry (*Prunus cerasus* L.) fruit at farmers markets. Down the line, Early Boots Farm plans to trade some of its thinnings to producers of paper pulp and fence posts and eventually sell mature trees as timber.

The Early Boots herd of lowline angus has been born on pasture, rotationally grazed on a diverse sward of forage plants, and fed free-choice organic minerals and grass and legume hay in the winter months. The lambs come to their farm each spring to graze and grow until autumn. Animal welfare is very important to Early Boots Farm, and they believe in letting cows be cows and sheep be sheep, with their instincts and autonomy intact. They practice low-stress handling techniques, and their animals are never given subclinical antibiotics or kept in confinement conditions.

Lessons learned: During his farming years, Tyler has realized the importance of having larger trees because these have a better ability to withstand rubbing and browsing. He also notes the benefits of preparing pasture and soils prior to planting trees as well as providing sufficient spacing between trees for the smooth operation of farm machinery. Additionally, he sees the need for a landscape design that connects habitats of flora and fauna such as insects, birds, and wildlife—hence his strategic integration of trees, field, and water.

Source: Robinson (2013a).

mentored by the University of Minnesota Extension in the design of the farming system, and received funding assistance from the EQIP (Robinson, 2013a). In a similar way, the Garretsons’ East Grove family farm (Box 17–2) benefited from USDA–NRCS programs such as EQIP and CRP (Robinson, 2013b).

Capabilities refers to the ability of an individual, household or group to act, using capital in ways that produce a livelihood. Human agency captures this ability to act, to negotiate in markets and with organizations, institutions, and existing

policies. The latter are components of the field (Figure 17–1, top). This negotiation or ability to act, described as the “hinge” by de Haan (2000), is expressed or captured in the livelihood strategies the decision maker is able to pursue by exercising “agency” (Figure 17–1, center), through the adaptive (Glover, 2010) and dynamic capabilities (Alonso, Kok, & O’Shea, 2018) of the family farm business. Dynamic capabilities include sensing, sizing, and transforming (Alonso et al., 2018). The *values* of the decision maker (cultural and symbolic capital) and their relationships with other

Box 17–2. Elderberry business at East Grove Farms

At East Grove Farms, Iowa (<http://eastgrovemead.com/>), the Garretson family specializes in elderberry along with other fruits and serves as a grower for a processing and marketing cooperative, River Hills Harvest. The family farm was established in 1837, and Kurt Garretson started managing the farm in 2010. Kurt has benefited from participation in the EQIP and the CRP. He has also been able to secure funding from the USDA–NRCS.

The growing demand for elderberry due to its associated health benefits as well as its perennial nature gives the plant greater appeal to Kurt. Additionally, the plant grows well in his area. As a result, selected hectareage has been devoted solely to elderberry cultivation, but the plant has also been sown along the property boundary together with hazelnut and wild plum. Moreover, other crops are found on the farm such as cultivars of white peach and native persimmon. The farm has also experimented with *Aronia* berry [*Aronia melanocarpa* (Michx.) Elliott] and chestnut (*Castanea mollissima* Blume). The Garretsons have been able to identify local types of elderberry that meet their planting needs. The family often restores and maintains old farm machinery but has also invested in newer technologies like a mulch layer, a wheel planter, and a greenhouse.

Besides the profit objective of East Grove Farms, Kurt is passionate about preserving and creating topsoil. Furthermore, the business strives to build community with family and neighbors. In previous years, elderberry marketing was run through the River Hills Harvest cooperative, and elderberry products were sold through the Hy-Vee grocery chain in the state. However, East Grove Farms have evolved and now focus exclusively on mead production and sales.

The Garretsons' plans to establish a winery on their land in order to promote farm-related ecotourism were realized in 2014 when the East Grove Farms' winery opened for business. East Grove Wine specializes in a variety of honey wines (aka mead) made from various fruits including elderberry, persimmon, peach, apple, and grape. East Grove Farms has also expanded to include a tasting room and created a stage to host on-farm folk music and mead festivals.

Lessons learned: For Kurt Garretson, cultivating perennial crops has taught him the virtue of patience and the value of starting small and learning through the process. He also notes the importance of the cooperative model in which he is involved, highlighting that more elderberry growers within a cluster leads to greater potential knowledge spillovers, as well as more opportunities for sharing production and marketing costs. As the Garretsons moved into more diverse fruit production, they were faced with the question of how to maximize their return on a crop not normally associated with the corn and soybean fields of Iowa. They came up with mead in order to be able to take their fruit and turn it into a product that would offer the most return. In addition, there was no local competition for mead production.

Source: Robinson (2013b).

individuals and groups through shared norms of reciprocity (social capital) inform and shape the strategies expressed in the household portfolio of economic activities (Valdivia et al., 2009).

What are the determinants of a livelihood? How does a person, household, or family operation decide what to do for a living? For a farmer born on a family farm, their livelihood may be defined by what their parents and grandparents did (cultural capital), the history of place (symbolic capital), and the ability of those parents to provide the means to follow that occupation through education (human capital) and access to land (financial capital). Perhaps they view farming as a “way of life,” their livelihood. For Jennifer Cunningham, it was her parents’ farm business

(financial capital), her experience growing up on a ranch, and her belief that there was “no place like home” (cultural capital) that influenced her decision to go back to the family farm and build a business for her and her family’s livelihood. The choices people make about how they want to make a living depend largely on the types of capital (assets or resources) they possess, their ability to use them and negotiate, and on the economic and social relations and environment in which they live.

Figure 17–1 describes the individual characteristics and context that shape (incentivize and constrain) the strategy a decision maker may choose. The various kinds of capital or assets that the landowner or household possesses or can access

are indicated and coupled with the landowner capabilities, defining the livelihood strategies (Figure 17-1, bottom). The livelihood strategies are also shaped by the context, which includes the social, economic, and political structures within which decisions are made (top of Figure 17-1). In the case of British Columbia, for example, varying land tenures impact how the land can be used and managed. From the social side, the Jay Springs Lamb Co. case study (Valdivia et al., 2009) illustrates development of a viable livelihood consistent with family values and the diversity of families in the business. It is built on both social capital to develop the market networks to sustain a label and political capital to enforce the norms and values that the label represents in terms of ecofriendly production of lamb and timber. The producers decided to create business opportunities that would make the ranch and the woodlot work for them, focusing on financial viability and diversity. They targeted a niche market where sheep would not be a commodity but instead a branded niche product with a “face and place” (see Chapter 15; Gold, Godsey, & Josiah, 2004). But they did not accomplish that entirely by themselves. Without the links to other producers and consumers who looked for specific characteristics, they could not have implemented their livelihood strategy.

Similarly, East Grove Farms (Box 17-2) pursued an elderberry business in a historic family farm (symbolic capital), focusing on elderberries. Two key benefits, market demand for associated health benefits and the perennial nature of the plant, appealed to Kurt Garretson (Robinson, 2013b). Symbolic capital, sensing and seizing opportunities, and the relationships with the cooperative and community are examples of capital, agency, and institutions.

Decisions are made within a structure that includes a *social aspect*, the rules that govern common norms (social capital and cultural capital); an *economic aspect*, the rules of the game in markets, of supply and demand; and a *political aspect*, the power relations in government and markets, expressed in public policies and prices.

Four elements of structures and institutions impact landowner strategies (Figure 17-1) that incorporate an agroforestry practice as an activity. The elements are: (a) public-private research and extension, creating the information and knowledge for the practice to succeed; (b) social organizations such as informal or formal landowner groups (e.g., Chestnut Growers of America, River Hills Harvest marketing cooperative, farmers markets); (c) agricultural and environmental policies such as USDA-NRCS

program incentives for silvopasture or riparian buffers in the United States and the leasing rules and regulations for public lands in Canada; and (d) the local, regional, and global markets affecting agroforestry products, such as niche markets, and the markets for other products that compete for the use of assets such as land or labor.

The institutions and organizations that conform to the structure provide signals and often determine how successful are the livelihood strategies pursued. The decision maker's capabilities contribute the landowner's negotiation and ability to cut through red tape to get things done (i.e., their human agency) (de Haan, 2000). When discussing the human dimensions of agroforestry, the term *institutions* has a unique meaning. Institutions are “regularized practices” or patterns of behavior, the “rules of the game,” a manifestation of political capital (North, 1990, 1993). These are the accepted norms, both formal and informal, and part of the process of social negotiation, that contain power relations (Scoones, 1998). Institutions are important because these may serve as barriers or may provide opportunities for livelihood strategies to develop.

Picture human agency as the “hinge” (Figure 17-1, center) between the individual capabilities (or the households or the community) and structure (e.g., local market or government conservation programs). *Agency* (Table 17-1) defines the landowner strategy, as it enables individual capabilities or the ability to negotiate with structures and institutions (Figure 17-1). In the case of Jennifer Cunningham's family in British Columbia, their agency resulted in a specialty product that capitalized on a number of factors: (a) lamb raised and managed in a green-tag certified forest with sustainable management practices and no pesticides; (b) the political capital that produced the green-tag certification; (c) the ability to act with other like-minded producers on the knowledge developed, creating a valued product (the lamb); and (d) the ability to access information from sector organizations (structure). Thus, they created their own market linkages (agency) through direct marketing (structure), moving away from the notion of commodity production. For Jay Springs Lamb, it was important to develop a differentiated product from their sheep that embeds both the value of their natural capital and their own values regarding their way of life.

The ability to negotiate with others in the market and to capture profits through investment of human, social, cultural, financial, and political

capital in economically viable enterprises throughout life is shaped and mediated by culture, society, and policies, as well as local and global markets. The Jay Springs Lamb Co. evolved such that their products captured the concept of lifestyle, their *cultural capital*, which is shared by some other producers and, most importantly, their customers. In the process, they were able to capture the value of their labor by developing a niche and local concept for their product (agency), turning the concept of lifestyle into a business through a set of market relations (social and financial capital) and resulting in a viable livelihood. It evolved in terms of family involvement, developing cooperative approaches with other like-minded family farms selling under the Jay Springs Lamb label.

Livelihood Strategies

A livelihood encompasses the income-generating and expense-reducing activities pursued by a household and its individuals and the mechanisms or means to access resources through the various stages in life, defined as the *life cycle* (Ellis, 1998; Valdivia, 2004). Pathways are developed with time, conditioned on changes throughout the life cycle from young individuals and households to older households with children, those who do not have children, and the elderly. The activities are decided within the household or, in the larger context, the community, market, and society. This is apparent in the three examples, where there is a process of intergenerational households, with the land being passed on to the children, who are developing new pathways, identifying and sensing opportunities that distinguish them from other producers (Robinson, 2013a, 2013b), or multiple families working together in different aspects of the business in British Columbia.

In defining their rural livelihood strategies (Bebbington, 1999; Chambers & Conway, 1992; Ellis, 1998; Scherr, 1995; Shucksmith, 1993; Valdivia, Raedeke, Hodge, Green, & Godsey, 2000), households seek to maximize net returns or minimize costs, along with other noneconomic objectives (Scherr, 1995; Valdivia & Gilles, 2001). Important criteria shaping the activities, outputs, and outcomes are stages in the life cycle of the family, as well as specific objectives related to their life in rural areas, such as the importance of the environment, the quality of resources, wildlife, their children, and lifestyle.

In temperate regions such as North America and Europe, contingency markets for risky events exist, such as crop insurance, disaster

insurance, and government-provided safety nets to address price and yield risks. Natural resources, such as soils, trees, and streams, plus the household's or individual's access to assets, shape the types of agricultural and nonagricultural activities that may be pursued on or off the farm. While a motive for diversifying may be to reduce risk, another may be to make a living consistent with the values and capital of the decision maker.

Capital and Capabilities

When individuals, households, or groups access and use resources, these resources become capital that creates a stream of benefits (Valdivia & Gilles, 2001). Access gives individuals the capability (Bebbington, 1999) to build a livelihood. For Jay Springs Lamb, their human capital (education, knowledge, and search for new information), cultural capital (value of the way of life), and natural capital (the land and forest they manage), plus their social capital (e.g., industry associations) have been the means to a goal—"where a sustainable life style motivates our business." This capital and the producers' capability (ability to act) lead to the accumulation of assets (economic and noneconomic) that contribute to their target outcomes in life.

The literature has grown to include many forms of capital, including economic, human, social, cultural, and natural (see, e.g., Bebbington, 1999; Flora, 2001; Winters, Davis, & Corral, 2002). *Economic or financial capital* includes cash, credit and debt, savings, and other economic assets like basic infrastructure. *Human capital* includes skills, knowledge, ability, good health, and physical capabilities (Scoones, 1998). *Social capital* is described as "features of social organization, such as networks, norms, and trust that facilitate coordination and cooperation for mutual benefit; social capital enhances the benefits of investment in physical and human capital" (Putnam, cited by Flora, 2001). *Culture*, especially indigenous knowledge, has also been recognized as a capital valuable in the development of niche markets linked to biodiversity. This concept is revisited below in the presentation of *habitus* and *field*.

A critical capital, in terms of the practice of agroforestry, is the natural capital. *Natural capital* is defined by stocks and services of the environment (i.e., the natural resources in and around the farm), which include plants (including trees), soil, water, and air (Scoones, 1998). Natural capital heavily influences what types of practices are feasible.

The Household Portfolio and Farm Diversification

Households or individuals make decisions by allocating labor and other resources to farm enterprises and off-farm income-generating activities to make a living, to profit from a business, and for well-being motives. A portfolio of activities is pursued based on access and control of resources and assets, capabilities of the decision maker, and the enabling environment. This portfolio is useful to evaluate how a new practice or activity can be integrated into a livelihood strategy (Shucksmith, 1993; Valdivia, Dunn, & Jetté, 1996). The approach considers the household's multiple objectives in pursuing their livelihoods—some households engage in farming solely for commercial gain, while others seek to maximize net returns along with other objectives consistent with their life-cycle stage. These may include valuing the environment, concern for the quality of resources, wildlife, and lifestyle choices, such as enjoying the countryside or valuing rural life. Economics, along with other motives, inform the allocation of labor and other resources.

Diversity is closely linked with resilience in the context of human and biological systems, with the idea that having options available makes these systems the less vulnerable to the natural disasters and market fluctuations that often impact on farming and the rural landscape. To achieve resilience through agroforestry, it is necessary to understand how an agroforestry practice “fits” with a livelihood strategy, how it diversifies the household portfolio, and what are the multiple benefits it provides to humans and the environment.

Diversification

How agroforestry practices may contribute to the rural livelihoods of farm operators and landowners is based on their ongoing activities and use of resources. Diversification can be measured in several ways, such as within the farm pluriactivity (Loughrey, Donnellan, Hennessy, & Hanrahan, 2013) or farm diversification. Another form has to do with on-farm and off-farm diversification, defined as household diversification, also known as farm-gate pluriactivity (Loughrey et al., 2013).

Diversification can be studied through the household's portfolio of activities. There are many reasons why households make decisions to diversify. For instance, households may seek to reduce risk (Hoppe, 2001; Knutson, Smith, Anderson, & Richardson, 1998; Skees, Harwood,

Somwaru, & Perry, 1998). Incorporating new activities, different from existing ones, can reduce the risk of the portfolio. Off-farm employment also reduces the risk of a portfolio that includes agriculture because the risks faced by each is not the same. Markets and climate have very different impacts on agriculture than on employment—a reason why non-farm income reduces the variability in total household income (Mishra & Sandretto, 2003).

Diversification may also be a mechanism to maximize the use of all available resources (Ellis, 1998; Scherr, 1995). The different types of household labor used on and off the farm defines a livelihood strategy (Shucksmith, 1993). In areas where farming is highly profitable, the farm operator, and maybe family members, are employed on the farm. On the other hand, in areas where agriculture is not as profitable, the operator and spouse may be employed part-time or full-time off the farm. In the case of Jay Springs Lamb, four families and their differing labor skills, availability, and interests came together to address the varying farm needs. As it is a dynamic process, these responsibilities have and will continue to shift with the changing life-cycle stages of the various family members.

A study of the nature and extent of farm and ranch diversification in North America (Barbieri, Mahoney, & Butler, 2008) identified a lack of scientific information regarding the types of enterprises being developed. Policies in Canada and the United States have been enacted to support diversification, assisting small farms in the United States and promoting environmentally sustainable production in Canada through a renewal strategy that focuses on profitability, “value-added,” and networks of support (Barbieri et al., 2008). Diversification includes a multifaceted income or value-generating activity incorporating concepts of conservation, quality, locality, efficiency, and new marketing approaches.

Barbieri et al. (2008) found eight enterprises were being used by farmers and ranchers across North America to diversify the operation within farming and agriculture. These included:

- the introduction of nontraditional crops or livestock (reported by 71% of respondents)
- value added in processing and packaging (65%)
- new marketing and distribution strategies (53%)
- integration of recreation tourism and hospitality (50%)

- historic preservation and adaptive reuse (48%), placing a value on culture
- expertise, consulting, and education (30%), consisting of educational tours, workshops, and seminars relevant to new practices like agroforestry
- leases, easements, and time-shares of farm and resources (11%)
- contracting and services in holistic health counseling, plant breeding, boarding horses, training, composting, maintenance of orchards, and others (8%)

The study found that the more diversified respondents were the younger farmers (often second- and third-generation farmers), who hoped to keep the operation in the family and who listed farming or ranching as the primary occupation. Women farmers represented almost one-third of the diversified farms.

Understanding whether the differentiated livelihood strategies of households have an effect on the nature of the agroforestry practice of interest and how the enabling environment (social, economic, and political structures, institutions, and policies) shapes household decisions (de Haan, 2000; Valdivia & Gilles, 2001; Winters et al., 2002) can inform on pathways for adoption. These may include a new economic opportunity that may reduce risk in the enterprise portfolio, a practice to improve the environment (natural capital), and/or the generation of new income sources that complement ongoing rural and urban household enterprises. The motives are several, and the concepts of *habitus* and *typologies* (Glover, 2010; Raedeke et al., 2003; Shucksmith, 1993) provide a framework to identifying these pathways.

Pathways

Disposition to Act—Use of *Habitus* in Understanding Strategies

While commodity crops dominate market relations in farming, the Jay Springs Lamb Co. case study illustrates an alternative marketing strategy that allowed the producers to command a higher price for their product. They capitalized on the characteristics of the land they managed and the production methodology, creating a unique product consistent with both family values and customer lifestyle choices. Early Boots Farm and East Grove Farms (Boxes 17–1 and 17–2, respectively) also exemplify how values shaped the way these businesses incorporated agroforestry and the way these evolved. Present in these cases are sensing, seizing, and transforming, key

elements in the processes of change and adaptation of family businesses with time (Alonso et al., 2018).

An early study proposed that motives may trigger different rural household strategies of farmers in Scotland (Shucksmith, 1993) in response to a new agricultural policy in the 1990s. The behavior model developed in this study consisted of internal resources, the capital and capabilities, as well as the external context of the structures and institutions (markets and policies), and cultural and social values (Figure 17–1). *Behavior* is understood to be an outcome of the interplay between the disposition of the members to act, their material resources (cultural capital, life cycle, skills, land, and economic capital), and the external context (cultural and social norms, markets, and government policies) (Shucksmith, 1993).

The *habitus* concept of Bourdieu (1990) informed the “disposition to act,” a product of socialization and interaction. The individual internalizes the dominant mode of thought and experience to which he or she is exposed, providing the basis for practice or behavior (Shucksmith, 1993). Individuals making decisions have goals and interests and pursue livelihood strategies, but the freedom to act is constrained by *habitus*. Following this argument, Shucksmith (1993) stated that “many options potentially open to farmers (including many unusual forms of diversification) may never be seriously considered because they are literally ‘unthinkable’.” In other words, the ability to “think outside the box” may be constrained by *habitus*.

Three types of behaviors leading to potential paths of farm households were identified: (a) the *accumulator*, characterized as a risk taker, willing to engage and willing to depart from set ways (thinks outside the box); (b) the *conservative*, characterized by a traditional outlook, conservative in farming techniques, and resistant to change (stays firmly within the box); and (c) the *disengager*, characterized by a decreasing commitment to agriculture, such that this activity plays the residual role. Further research by Shucksmith and Herrmann (2002), using cluster analysis with the main components of *habitus* that included the initial circumstances of the farm and household, the farmer’s socialization, and the farmer’s attitudes, found more pathways to adapt to the changes brought about by policies. The greater diversity of strategies included hobby farmers, pluriactive successors, struggling and contented monoactives, potential diversifiers, and agribusinessmen (Shucksmith & Herrmann, 2002).

This framework was used to examine the potential for agroforestry practices in U.S. farming (Raedeke et al., 2003; Valdivia, 2007), arguing that considering new activities like agroforestry practices requires that farmers be interested in identifying new markets and learning new methods. Farmers who view farming as a way of life may express different behaviors, looking for opportunities to pursue their rural lives by increasing the number of activities on the farm. This may include alternative farming activities, such as agritourism, providing hunting leases, carbon sequestration, and managing new crops or animals, or it may include off-farm activities, a new network of social relations, a new *field*, with new institutions and organizations, rental and familial relations, and their corresponding values. Off-farm employment is an example of an external source of income that allows a family to remain on the farm or a means to gradually move out of farming. This type of diversification is possible as the interaction with other *fields* increases.

Agroforestry practices can incorporate new economic opportunities that entail benefits, markets, and production risks different from commodity farming (Barbieri & Valdivia, 2010a, 2010b; Gao, Barbieri, & Valdivia, 2014a; Gold et al., 2004). These practices may also be a combination of environmental improvement (natural capital) and commercial venture or the appreciation by consumers of the environment through agritourism (Gao et al., 2014a, 2014b). Alley cropping, forest farming, urban food forests, and silvopasture are viewed as commercial, profit-seeking practices, while windbreaks and riparian buffers have been traditionally thought of as environmentally focused practices. While this is true, depending on the policy environment, the latter practices can also be designed to yield short-, medium-, and long-term economic benefits. For agroforestry practices to realize multiple benefits, these must be part of the possibilities contemplated by a decision maker, and for this to happen, existing networks and relations play a critical role.

Practice and Field in Agroforestry

The practices of farming, forestry, and/or agroforestry in Bourdieu's framework embody the give-and-take (dialectical) relations of *habitus* and *field* (Raedeke et al., 2003; Valdivia et al., 2012; Valdivia, Hodge, & Raedeke, 2002). Again, *habitus* is the taken-for-granted social processes, values, beliefs, and behaviors shared. *Field* is the network of social relations representing the rules of the game (institutions).

These concepts were applied to assess how agroforestry can be integrated with farming or forestry or as a new practice in Missouri (Arbuckle, Valdivia, Raedeke, Green, & Rikoon, 2008; Dorr, 2006; Flower, Valdivia, & Dorr, 2005; Raedeke et al., 2003; Valdivia et al., 2012; Valdivia & Poulos, 2009) in studies that included operators and landowners contemplating practicing agroforestry, as well as more recently a study of farmers engaged in agroforestry through the USDA Sustainable Agriculture Research and Education (SARE) program in the United States (Romanova, 2020). When landowners progressively decrease their reliance on an income and livelihood from farming (because the existing market does not secure enough income to make a living from farming), decision makers are more open to other alternatives and thinking outside the box (Robinson, 2013a, 2013b; Shucksmith & Herrmann, 2002).

The field of farming is defined by the economic, family, and rental relations, as well as the buyers, equipment dealers and input suppliers, financial institutions, past and future generations, and current and future landlords (Raedeke et al., 2003). These relationships also include different positions of power; for example, bankers and landlords have positions of influence and impact farmers' attitudes and behaviors when they are seeking loans or securing land for farming. Raedeke et al. (2003) found that landowners and bankers had a large influence on farmers' decisions in Missouri.

The field of forestry is defined by the government agencies, timber buyers, forest product companies, loggers, and forest professionals. Farmers have expressed concerns about getting fair prices in this field (forestry) from the entire industry. Commercial buyers and timber loggers were listed by farmers as their least trusted source of information about trees, while they trusted university extension, with its history of serving the field of farming (Raedeke et al., 2003). The *habitus* in farming differed from that of forestry. To the farmer, farming was active and was about farming the land, producing crops. In contrast, forestry was seen as passive, leaving the land idle, with trees in the landscape. "Planting trees in farming space conflicts with the *habitus* of farming" (Raedeke et al., 2003). The underlying logic relates to maximizing profits within the practice of farming, and decisions about the use of farming space are consistent with, and constrained by, the values in this field. However, a forester would view forest management as both active and economic.

The field of agroforestry on the other hand, has been developing through relationships for more than 20 years, such as the University of Missouri Center for Agroforestry, the Savanna Institute, the Leopold Center for Sustainable Agriculture, the regional agroforestry working groups, and the SARE program funded by

the USDA National Institute for Food and Agriculture. These centers, in collaboration with programs such as the NRCS EQIP, have provided technical and financial assistance for agroforestry and the establishment of woody crops (Box 17–3). In 2010, to increase support for agroforestry, the USDA–NRCS, U.S. Forest Service, and many

Box 17–3. The evolution of an NRCS EQIP special funding pool for agroforestry and woody crop establishment: A Missouri case study

The USDA–NRCS is responsible for assisting landowners in addressing resource concerns on private land to improve our soil, water, air, plants, and animals (both domestic and wild) and improve energy efficiency. The vision of NRCS is to ensure productive lands in harmony with a healthy environment.

In 2010, the USDA–NRCS and U.S. Forest Service, along with other partners and stakeholders, developed the USDA Agroforestry Strategic Framework to increase awareness and support for agroforestry across the country. In Missouri, a multiyear set of intersecting events lead to the establishment, in 2017, of an NRCS “dedicated funding pool for Agroforestry and Woody Crop Establishment within the Environmental Quality Incentives Program (EQIP)”. It is instructive to document the key set of individuals and events, stretching back more than 20 yr, to understand how this change in policy occurred in the state of Missouri.

In the late 1990s, a group of University of Missouri, and University of Missouri Center for Agroforestry, and Missouri State University researchers and extension staff initiated an elderberry improvement program to develop better local cultivars and explore the market opportunities to support future growth of a regional elderberry specialty crop industry. Terry Durham, a long-time local organic vegetable grower, recognized the opportunity, began collaborating with the research and extension team, and eventually became the leading force promoting the growth of this specialty crop to local growers. By about 2010, many area farmers began to establish elderberry, research continued, and local training events were underway to support the growth of this “new” niche crop. From this time onward, farmers across Missouri began to contact their local NRCS offices seeking cost-share funding for the establishment of elderberry. These calls were often redirected to Lauren Cartwright in the NRCS state office. Responding to these calls, two extension publications were released by the Center for Agroforestry, *Using NRCS Technical and Financial Assistance to Establish Elderberries* (Cartwright, Goodrich, Cai, & Gold, 2017) and *Growing and Marketing Elderberries in Missouri* (Byers et al., 2014).

Three key events took place in 2013. First, University of Missouri researchers convened an international research conference and farmer workshop to pull together the most up-to-date body of scientific and practical knowledge on elderberry (Thomas et al. 2013). Second, the Center for Agroforestry established a weeklong “train the trainer” crash course known as the Agroforestry Academy. Third, a multiday elderberry workshop was hosted at Lincoln University, led by Durham, Thomas, Byers, Godsey, and Gold. Lauren Cartwright, the NRCS state economist in charge of EQIP funding program, attended all of these events and was inspired by the potential to assist Missouri farmers interested in both new crops (e.g., elderberry) and new production approaches (i.e., agroforestry practices).

By 2013, a small number of successful EQIP contracts supported elderberry growers, but these growers competed directly with commodity producers (the core NRCS constituency) for EQIP funding. Calls to the state office from elderberry growers increased in frequency. In 2016, Cartwright approached the Missouri NRCS state technical committee with the idea of creating a special funding pool, using 1% of the general EQIP allocation, directed specifically to support niche crop producers. Because agroforestry and woody crop establishment is consistent with NRCS goals and vision, the special funding pool was approved starting in 2017 and an updated Center for Agroforestry extension guide was created (Cartwright et al. 2017) to support these landowners. The core conservation practices associated with the EQIP Agroforestry and Woody Crop Establishment funding pool are: alley cropping; multi-story cropping; riparian forest buffers;

silvopasture; tree/shrub establishment; and windbreak/shelterbelt establishment. These conservation practices may be utilized individually or in combination in different parts of the landscape depending on the landowner's goals.

Applications to and financial commitments from the agroforestry and woody crop establishment funding pool have increased each year since 2017, growing from \$42,000 in 2017 to \$95,000 in 2019. Landowners interested in agroforestry and woody crop establishment on their property have many resources at their disposal through the NRCS Conservation Technical Assistance and EQIP financial assistance opportunities.

Lessons learned: A combination of producer interest, knowledge acquisition and subsequent motivation and responsiveness by key NRCS staff, and support from the state technical committee and partners led to the successful establishment of a dedicated EQIP special funding pool for agroforestry and woody crop establishment.

partners and stakeholders developed the USDA Agroforestry Strategic Framework 2011–2016 (updated for 2019–2024). The University of Missouri Center for Agroforestry (UMCA) has been collaborating with many institutions since its establishment in 1998. In 2013, with USDA SARE support, UMCA and a network of collaborators supporting the practice of agroforestry established the Agroforestry Academy train-the-trainer program. Concurrently, UMCA collaborated closely with the Missouri NRCS to develop funding programs through EQIP inclusive of agroforestry practices. In 2017 these agents of change (Cartwright, Goodrich, Cai, & Gold, 2017) formalized EQIP funding for multistory cropping, riparian buffers, silvopasture, tree and shrub establishment, and windbreak and shelter belt programs. These significant changes have contributed to existing organizations and institutions in support of agroforestry practices, finding a path to address the challenge agroforestry faced of being neither solely forestry nor solely farming (Valdivia et al., 2012).

Along with the creation of an institutional setting in support of the practices, there is also a need for understanding the multifunctionality of agroforestry and its economic benefits, such as agritourism. This was identified by East Grove Farms in Iowa as important, recognizing the value of scenic beauty, the symbolic capital of the historic farm, and the interests of consumers who look for tourism experiences in the countryside (Box 17–4).

Additionally, producer attitudes and views are regionally influenced, depending on individual exposure to both farm and timber management opportunities. In British Columbia, the woodlot license program originated in 1948 (Federation of British Columbia Woodlot Associations, 2007), designed to allow farmers to acquire farm woodlots of limited land area, and involved

specific management requirements and data collection of the licensees (Valdivia et al., 2009). The program evolved such that there were 826 woodlot licenses throughout British Columbia in 2007, forming a small (~1.5% of the province's total annual allowable cut) but integral component of the British Columbia forest sector. Because being a farmer is no longer a requirement, many of the licensees are involved in other activities such as ranching and other businesses (Federation of British Columbia Woodlot Associations, 2007), thereby influencing the awareness and knowledge of both agricultural and forest producers about each other's sectors. In addition to the deliberate retention or introduction of trees and/or shrubs in agricultural production systems, an equivalent opportunity for agroforestry in BC arises from the introduction or enhancement of other crops or livestock to forest production systems (Valdivia et al., 2009). Currently, agroforestry has expanded all across Canada, and there is interest in the contributions this practice can make to carbon sequestration (Baah-Acheamfour, Chang, Bork, & Carlyle, 2017).

During the 20 years since the first agroforestry interviews with landowners and farm operators were conducted in Missouri, the number of farms has decreased. The Agricultural Census of 2017 listed a total of 95,320 farms, with 33% of operators selling less than \$10,000 annually and 32.6% selling between \$10,000 and \$100,000. In terms of hectareage, 64.6% of operators manage less than 73 ha. Several landowner perspectives and strategies have developed as a result of the changes in agriculture, including social relations and values that are making it possible to explore new alternatives, such as practices involving planting trees on land. According to the 2017 Census of Agriculture, the number of operators in Missouri practicing silvopasture and alley

Box 17–4. Maximizing landowner's gains from agroforestry: The consumer's perspective

Ample evidence indicates that agroforestry brings many benefits to landowners (e.g., income diversification) and the entire society (e.g., landscape beautification). It is critical that landowners capitalize on these benefits when placing their products in the market, especially when interacting directly with consumers (e.g., farm visitors). Strategic marketing requires understanding consumers' product awareness and preferences. Thus, residents from Missouri, Pennsylvania, and Texas (250 per state) were surveyed to gauge their awareness of agroforestry. These states were selected because of their distinctive landscapes and different levels of on-farm direct sales (lowest in Missouri and highest in Texas) while holding similar agricultural (e.g., farm size distribution) and demographic (e.g., household income) attributes. Two primary takeaways stemmed from survey results that landowners can use in their marketing and managerial decisions.

Landowners should deliver the message of agroforestry benefits in their marketing strategies. Survey results showed that consumers have little awareness of the environmental (e.g., wildlife conservation) and socioeconomic (e.g., maximization of agricultural land use) benefits of agroforestry. Yet, the increasing number of consumers willing to support sustainable agricultural systems, such as agroforestry, through purchasing behaviors indicates a competitive advantage for landowners practicing agroforestry in selling their products. To account for this growing market, landowners should incorporate messages related to agroforestry benefits in their product promotion efforts (e.g., brochures, ads). Results also showed that women and young consumers are the most aware of the benefits that agroforestry farms deliver to society. Thus, landowners implementing agroforestry should strategically promote their products to these market segments. This is particularly important because women tend to be the decision makers of household purchases, and millennials are more socially and environmentally conscious in their purchasing behaviors.

Landowners should capitalize on the visual appeal of agroforestry when receiving farm visitors. The number of individuals visiting farms for education, recreation, or direct purchase, commonly referred to as *agritourism*, has increased over the past few years. Likewise, the number of landowners offering agritourism has increased due to the many benefits this activity produces (e.g., increased profits, branding of farm products). Enhancing the farm visual appeal is key to strengthening agritourism offerings and enticing visits. Study results indicated that farm animals and planted trees or shrubs are consumers' favorite agricultural features to see when visiting a farm, and wildlife is their most favored natural feature to encounter. In addition, women like very much seeing native plants, flowers, or grasses in the farm landscape. These results indicate that key agroforestry elements (e.g., incorporating animals and trees or shrubs) and its ecological benefits (e.g., conservation of wildlife and native flora) can enhance the farmland's visual appeal. Thus, landowners should (re) design their managerial practices (e.g., attracting wildlife with feeders, propagating native plants or grasses) to capitalize on and augment these aesthetic benefits to better serve current visitors and attract more potential visitors.

In conclusion, adopting agroforestry practices adds more values to the farmland and creates more assets for landowners who sell directly to final consumers. To capitalize on these values and assets, landowners should strategically stimulate the purchase of their products by communicating agroforestry benefits to consumers, making a great effort to reach female and young consumers. Furthermore, landowners seeking to diversify through agritourism should also emphasize the aesthetic gains of agroforestry.

cropping grew from 141 in 2012 to 1,311 in 2017 (USDA National Agricultural Statistics Service, 2020). Missouri and British Columbia highlight the unique nature of each practice in terms of the values, institutions, and rules. In a similar way today, Early Boots Farm with silvopasture in Minnesota and East Grove Farms with elderberry in Iowa are examples of new pathways for family farms that involve agroforestry (Robinson, 2013a, 2013b).

The Changing Practice of Farming—Agroforestry

In the agency-structure dimension, non-productivist action and thought is a key element in understanding change (Barbieri & Valdivia, 2010a; Burton & Wilson, 2006; Raedeke et al., 2003; Shucksmith, 1993; Wilson, 2008). The practice of farming, which revolves around the institutions and organizations in farming, rental and familial relations, and the corresponding

values of farming, may be changing because at present farming is the main or sole source of income for a few large and very large farmers, while 86.24% of the privately owned lands in Missouri are in the hands of “small” farmers, operators with sales of less than \$100,000 a year (USDA National Agricultural Statistics Service, 2020). As individuals increase their participation in more than one field, they are more likely to accept new fields such as agroforestry.

In predicting change toward inclusion of agroforestry, Raedeke et al. (2003) proposed three possible paths. First was incorporation of agroforestry into farming practices that complement the field by protecting natural resources, land, water, and production through windbreaks, riparian buffers, and silvopastoral systems. Farmers’ attitudes toward conservation correlate positively with the adoption of conservation practices (Dorr, 2006; Ervin & Ervin, 1982; Valdivia & Poulos, 2009). In a second path, other practices remain in the field but with different approaches, and the third path consists of a new field, where those engaging would define a new activity with new technologies and sets of relations, a spectrum of possibilities that can lead to multifunctional agriculture (Raedeke et al., 2003; Romanova, 2020; Wilson, 2008).

The use of environmentally friendly practices doubled between 1991 and 2001 in Canada, as did the value placed on ecological goods and services by producers and consumers (Barbieri et al., 2008). This suggested a possible pathway for agroforestry, as Barbieri et al. (2008) found that “diversification was associated with the propensity to be engaged in environmental and cultural resource stewardship,” services that agroforestry provides.

The Multiple Benefits and Functions of Agroforestry

Product diversification, environmental impact mitigation such as carbon sequestration and water quality improvement, land rehabilitation, land use conversion, food production, protection of marginal lands through sustainable use or set-asides for enhanced wildlife habitats, and scenic beauty are among the multiple services provided by agroforestry (Buck, 1995; Jose et al., 2018; Kremen & Merenlender, 2018; Williams, Gordon, Garrett, & Buck, 1997). Some of the economic benefits may be direct, while others are indirect. For example, forested riparian buffers can be designed to provide harvestable products for economic returns along with the environmental benefits they provide (see Chapter 8). Indirectly,

agroforestry can enhance the farm appeal to draw visitors to the farm (Gao et al., 2014a). Household decision making is at the center of the success of adopting new technologies in agroforestry, as the examples of Early Boots and East Grove farms show (Robinson, 2013a, 2013b). Learning what motivates the decision makers is essential to design effective policies (Cartwright et al., 2017; Mercer & Miller, 1998; Romanova, 2020) (see Box 17–3). Despite the many benefits of agroforestry, Gao et al. (2014b) suggested that landowners put more effort into increasing the public awareness of these benefits to entice direct purchase of farm products (see Box 17–4).

Interest and Adoption in Agroforestry

Understanding the perceptions and knowledge about agroforestry practices contributes to defining possible pathways for the adoption of agroforestry (Dorr, 2006; Fleming et al., 2019; Flower, 2004; Fregene, 2007; Mattia, Lovell, & Davis, 2018; Raedeke et al., 2003; Romanova, 2020; Valdivia et al., 2012), which differs from its individual components of agriculture and forestry (Raedeke et al., 2003). The discussion above on habitus and field revealed that it is not simply a combination of both individual fields, as each has distinct values as well as social relations in the economic and social spheres. A full-time commodity farmer with a high degree of investment in the field of agriculture, in assets and relationships with farming organizations, will be less likely to be interested in agroforestry. Households with more experience or interest in conservation practices, on the other hand, would be more likely to be interested in resource conservation or wildlife and therefore likely to be interested in practices that enhance ecological goods and services. Decision makers who are less able to make a living solely from commodity farming and prefer to remain in a rural community may also be more likely to pursue other activities and include agroforestry in their portfolio of household activities. Educated children returning to the farm bring with them new perspectives and skills as well as values about thinking differently about the family farm. It means, as the examples have captured, a process of learning different values and ideals and a field for the practice that brings together organizations and policies in support of the innovators (Romanova, 2020).

Knowledge Gained during Two Decades

Several studies of the adoption and interest in U.S. agroforestry have been completed in the past 20 yr (Garrett, 2009; this volume). Here we review

the lessons learned, particularly related to temperate agroforestry. Figure 17-1 also depicts the factors that have been hypothesized or found to influence interest in and adoption of agroforestry practices. The concepts of sustainable livelihoods, such as capital, structures, field, and habitus, are significant factors in the ability to act. Human capital, including life-cycle factors, are considered along with social, economic, and natural capital. Individual motives, values (*habitus*), and attitudes of the decision maker are internal factors, while structures, institutions, and the field are external to the individual and constitute elements of the *field* (Raedeke et al., 2003; Valdivia et al., 2009).

A study of the adoption of agroforestry (Pattanayak, Mercer, Sills, & Yang, 2003) identified five critical factors: (a) farmer preferences, (b) resource endowments, (c) market incentives, (d) biophysical factors, and (e) risk and uncertainty. Adoption and diffusion of agroforestry practices depend on a complex set of factors, such as the physical characteristics of the natural resources (natural capital), social and economic characteristics of the decision maker, culture, and policy incentives and institutions (Pattanayak et al., 2003). Awareness of innovation, perceptions of feasibility and worthiness, and consistency with the decision maker's objectives are conditions required for adoption. The new practice must be more profitable, and any uncertainties that exist must be addressed (Pannell, 1999). A number of studies have shown that profitability continues to be important (Romanova, 2020; Borremans et al., 2016; Faulkner, Owooh, & Idassi, 2014; Rois-Díaz et al., 2018; Tsonkova, Mirck, Böhm, & Fütz, 2018). Monetary and non-monetary factors have been shown to be significant for landowners whose livelihoods depend on agriculture (Barbieri & Valdivia, 2010a, 2010b; Koontz, 2001; Romanova, 2020). Environmental motivations were also significant in multiple studies (Arbuckle et al., 2008; Dorr, 2006; Romanova, 2020; Trozzo et al., 2014b; Valdivia & Poulos, 2009).

Offsets of up-front costs and cost sharing were more effective in encouraging adoption than increasing rental rates in the case of riparian buffers in Chesapeake Bay (Lynch & Brown, 2000). In Pennsylvania, existing production practices, reasons for owning land, and issues in land management were used to identify farmers' adoption potential (Strong & Jacobson, 2005). Several of the motives identified related to the importance of the knowledge of institutions as well as the costs involved in changing to a new economic activity (Valdivia et al., 2012).

In the tension between agriculture and forestry, transaction costs and profitability are two important factors. Transaction costs are the costs of adjustment to a new practice, of access to information, and of negotiating, monitoring, and enforcing contracts (Valdivia et al., 2012). These can represent a barrier to adopting a new agroforestry practice. Profitability is also an important motivation, as seen in previous studies. Using these two concepts, the importance of transaction costs and profitability factors, an analysis of data from farm operators in Missouri resulted in dividing those operators into three groups: environmentalists, agriculturalists, and the disengaged (Valdivia et al., 2012).

The results of other variables that capture stage in the life cycle, such as type of farm operation, age, gender, and farm size, have been mixed. Studies have found gender (female) and age (younger) to be positive significant factors in diversification and interest in new practices (Barbieri et al., 2008; Valdivia & Poulos, 2009) and in farmer potential for adoption (Strong & Jacobson, 2005).

Attitudes, such as the importance of land stewardship to the landowner, had the strongest effect on a willingness to adopt agroforestry practices in Ontario (Matthews et al., 1993). Noneconomic motives (Fleming et al., 2019; Koontz, 2001) and non-farming opportunities (Lynch & Brown, 2000) were also criteria in land-use decisions. In British Columbia, the factors deemed most important in decisions to plant trees and shrubs for harvest or to adopt agroforestry practices were primarily socially and environmentally oriented (Thevathasan et al., 2012). However, factors preventing these activities were of economic nature.

The awareness of agroforestry in Pennsylvania was low (Strong & Jacobson, 2005). Farmers had difficulty accessing specific information and, therefore, assessing if agroforestry practices would fit and be profitable. The reasons for owning land was a useful question to identify farmers with adoption potential. Windbreaks and riparian buffers, aligned with conservation, have been integrated successfully into the field of farming. In British Columbia, there was generally low to moderate knowledge of agroforestry practices but a moderate to high level of interest in implementing them (Thevathasan et al., 2012). Producers were most familiar with riparian management systems and silvopasture. These systems also garnered the greatest degree of interest in adoption, followed by windbreaks and forest farming systems.

Values and motives also significantly impact adoption. Differences in the values and motives of landowners, compared with the institutions that work with or for them (e.g., extension), can lead to ineffective programs. Research on the perceptions of landowners and extension workers about agroforestry in the southeastern United States found differences between the objectives and concerns of these two groups. Extension professionals were more concerned with water quality, while the landowners' interest was in aesthetics (Workman, Bannister, & Nair, 2003). In contrast to this experience, recent work of the USDA with indigenous communities (MacFarland et al., 2017) found multiple reasons for their interest in agroforestry, such as sustaining culturally significant food and fiber systems, diversification of operations and income sources, increased food security, and economic development. The study also highlighted lessons learned from the adaptation strategies of native communities in the United States.

Factors that limit agroforestry adoption have included farm size, age of the decision maker, education, lack of information and technical assistance about the practice, lack of networks and institutions of support, and lack of knowledge about markets. For example, the British Columbia survey indicated that market-oriented support services were high priorities for stakeholders, and barriers to adoption included both a lack of market-related resources and the degree of labor intensity required for production (Thevathasan et al., 2012). These adjustment costs are some of the transaction costs in shifting to agroforestry. Pattanayak et al. (2003) highlighted factors that needed more attention, such as biophysical characteristics, resources, and risk and uncertainty, while preferences and resource endowments had been often included in adoption studies. While Pattanayak et al. (2003) included only two studies in North America, many of the findings and areas of research recommendations were consistent with studies about the interest and adoption of agroforestry in Missouri (Arbuckle et al., 2008; Dorr, 2006; Flower, 2004; Flower et al., 2005; Fregene, 2007; Valdivia & Poulos, 2009).

Building on these studies, a profile of "typical" potential adopters seeking to diversify would include the following characteristics: younger, female, educated, and informed through trusted sources and networks. Economic issues and the existing degree of investments and profits in ongoing economic activities are also factors that weigh in decisions about new enterprises.

Considering *habitus*, the field of farming and the field of agroforestry may increase our understanding of which households are interested in agroforestry as a new diversification strategy. Landowners who are not traditional commodity farmers may have a greater interest in exploring this new field. Lifestyle farmers (Valdivia et al., 2000) are a group interested in new enterprises that include trees. These landowners seek livelihoods in rural areas that combine farming with off-farm full- or part-time employment. They are often conservation oriented, interested in new commercial opportunities such as niche markets, and have nonfarming capital to invest. The Early Boots and East Grove farms are examples of innovative young farmers with new ideas, and farms that have been in the family for many years, interested in the environment and building relationships to grow new products.

Studies about interest in and adoption of agroforestry, framed by *habitus* and field (Shucksmith, 1993), explore these values and attitudes, along with other factors. Three major areas that contribute to understanding interest in and adoption of the practice of agroforestry in North America include: (a) attitudes and values reflecting *habitus* along with individual characteristics captured in the human and social capital; (b) the social relations, networks, and information in the fields of farming, agroforestry, forestry, and conservation; and (c) the physical properties of the natural and symbolic capital.

Landowners and Adoption Research

Landowner and farm operator surveys in Missouri elicited information about land use practices, household characteristics, attitudes toward trees, and perceptions and values of farming. The surveys also asked specific questions about interest in, knowledge of, and adoption of the initial five agroforestry practices. Both operator and nonoperator landowners were surveyed in several regions of the state at two different times. In 1999, the survey included a high proportion of farm operators. In 2006, the survey included a larger proportion of landowners who did not farm, reflecting structural changes taking place in the United States.

Attitudes and Values: Interest and Disposition to Change

Shucksmith (1993) and Shucksmith and Herrmann (2002) argued that the actions of farm

households may be understood not only in terms of the structure (markets and policies) but also as an expression of the values and motivations that underlie behavior (habitus). Figure 17-1 captures the habitus effect on strategy and depicts the individual characteristics that have an effect on interest and adoption. The five studies conducted in Missouri, quantitative analysis models of interest and adoption of agroforestry practices, sought to determine which motives are related to interest in the concept of agroforestry and in specific agroforestry practices (Arbuckle et al., 2008; Dorr, 2006; Flower et al., 2005; Fregene, 2007; Valdivia & Poulos, 2009). These studies operationalized the concepts of habitus or attitudes informed by values and social networks that pertain to the various fields (Raedeke et al., 2003; Valdivia et al., 2012), i.e., farming, forestry, and conservation. Three general groups of variables were identified in a study by Flower et al. (2005): attitudinal (habitus), internal, and external variables. Internal variables include the social, psychological, economic, and personal characteristics and the assets of the decision maker (cultural, economic, human, and social capital in Figure 17-1). External variables include institutional and market incentives (structures related to the concept of field), and ecological and biophysical factors (the natural capital) in Figure 17-1.

Valdivia and Poulos (2009) and Arbuckle et al. (2008), studying operators and non-operators (landowners), respectively, included the five types of factors affecting interest, defined in the framework of the capital in sustainable livelihoods (Figure 17-1), informed by field and habitus. Valdivia and Poulos (2009) studied the relationship between diversification and how attitudes influence interest in two specific agroforestry practices: riparian buffers and forest farming. A logit model to study interest in riparian buffers and forest farming among farm operators included variables that measured economic and non-economic motives. The former were part-time farming and diversification measures, and the latter included concerns with scenic beauty and the environment for future generations. Those with environmental concerns and with more education were more interested in riparian buffers and forest farming, consistent with the case studies from British Columbia. Older farmers were less interested, while being a part-time farmer and the level of diversification had no effect on interest.

The study of landowners (Arbuckle et al., 2008) who were not farming the land included attitude/habitus variables to capture values in

the field of farming and how these influenced their interest in agroforestry using ordinary linear regression analysis. Nonfarming landowners who maintained relationships in the field of farming and those who had economic reasons for owning land were not interested in agroforestry. On the other hand, landowners who had recreation and environmental reasons for owning land were interested in agroforestry. These findings show the relationship between values and belonging to a field.

The research of Flower (2004) focused on interest in riparian buffers and forest farming among farm operators using logit analysis and attitudinal variables in the vein of Shucksmith (1993): (a) landowners invested in the field of farming ("conservatives"), (b) landowners who enjoy the environmental and aesthetic values of the land ("lifestyle"), and (c) those who are willing to develop new ventures ("accumulators") in their livelihood strategies. The three attitudinal variables were developed using survey responses about preferences related to trees. Flower found that "lifestyle" and "accumulator" were significant attitudinal variables that explained interest. "Conservative," on the other hand, was not significant. Other studies of attitudes in the context of habitus and field include Dorr's (2006) study of agroforestry practices, with a sample of landowners who were operating or not operating a farm. This study found that the percentage of assets invested in farming had a negative effect on the likelihood of being interested in riparian buffers, forest farming, silvopasture, and alley cropping. In other words, the more invested in traditional farming, the less likely a landowner would be to have an interest in agroforestry. In contrast, landowners who valued trees for scenic beauty and future generations were more likely to be interested in these four agroforestry practices (Dorr, 2006). Fregene (2007) also found that landowners who perceive economic benefits from agroforestry practices are adopting this practice. On the other hand, landowners concerned with the costs of establishing and managing trees are less likely to adopt this practice, highlighting the fact that transaction costs are a barrier.

On-the-ground adoption of agroforestry remains limited (Romanova, 2020). Findings from research on the perspectives of those who are early adopters of agroforestry and participate in SARE programs, using the diffusion of innovation theory, consider several stages in the adoption process from early adopters. The characteristics of early adopters in the SARE sample analyzed by Romanova (2020) include

partial engagement in farming, with off-farm income, and land ownership for some time (29 years); tenure was important in the establishment of trees. She found that both economic and noneconomic factors are equally important. Internal personal factors are a driving force and include belief in sustainable agricultural practices, conservation, and visual aesthetics.

Social Relations: Knowledge Networks and Information

Pattanayak et al. (2003) pointed to knowledge and information as a mechanism to reduce risk and uncertainty. At the same time, human capital (i.e., knowledge of agroforestry practices) was also a very powerful variable in all the studies in Missouri for both farming and nonfarming landowners. The effect of prior knowledge of agroforestry practices on increasing the likelihood of interest and adoption was positive, large, and always statistically significant. College education has also been found to be significant but not with the same consistency (Dorr, 2006; Flower et al., 2005). Knowing someone who is implementing agroforestry has a profound effect on agroforestry interest and adoption (Flower, 2004; Fregene, 2007). Other forms of building human capital are seeking professional advice (Arbuckle et al., 2008) and advice from other farmers, which also implies that networks exist among farmers and are important. Social networks or capital is significant in accessing information for riparian buffers (Flower, 2004), for alley cropping (Dorr, 2006), and for adoption of agroforestry (Fregene, 2007). Social capital within a field is defined as the relationships with other farmers and connections to institutions that provide information, such as university extension services, and it has a positive effect on both interest and adoption. Finally, in the field of human capital, landowners who subscribe to magazines about conservation and alternative farming have also been more likely to be interested in riparian buffers (Flower et al., 2005) and adoption of agroforestry (Fregene, 2007).

As an illustration, Jay Springs Lamb Co. was born from the ideas, knowledge, and education of the family members (human capital), who assessed the capital they possessed and their values. They sought further information through workshops, joined industry-related organizations, and learned about government programs and the policies and regulations relevant to their business (social capital). Thus, they used knowledge and information as a mechanism to assess and manage risk and uncertainty and continue to do so in an iterative process. Similar relationships

have been established in other cases, such as the examples of the elderberry farm and silvopasture.

It is through the cultivation of relationships to develop the field of agroforestry that a new field for the practice of agroforestry is developing. Romanova (2020) found that on-the-ground adoption is still limited. Farmers engaged in agroforestry practices in 2017 (according to the USDA–National Agricultural Statistics Service, 2020) compose 1.5% of U.S. farmers (Romanova, 2020). Findings from survey research on the actual perspectives of those who are early adopters of agroforestry and participate in USDA SARE grant programs have shown that personal views are more influential and drive adoption, while economic benefits may be more important for early and late majority groups (Romanova, 2020).

Given the current early stage of U.S. agroforestry adoption, more practitioners need to be involved to set the stage for wider adoption by majority groups. To promote further adoption, relevant agencies need to promote agroforestry messages to targeted groups of people who share similar traits with agroforestry early adopters. The recommended strategy for agroforestry adoption agents would be to provide agroforestry information and involve groups of landowners and part-time farmers who value productive conservation and enjoy landscapes with trees. Targeted messaging should include information not only on the economic and noneconomic benefits of agroforestry adoption but also its relation to personal values. Highlighting personal gratification from working with trees and teaching others sustainable ways of living can help motivate adoption decisions (Romanova, 2020).

Physical Properties: Biophysical Characteristics and Problems

Landscape characteristics and specific problems also play a role in creating interest in agroforestry. Dorr (2006) found that the presence of managed timber on the landowner's land increased the likelihood of interest in forest farming for landowners in general. Valdivia and Poulos (2009) found the same for farm operators. Dorr (2006) also found that unmanaged timber increased interest in silvopasture and that landowners who perceived erosion as a problem were more likely to be interested in windbreaks. Surprisingly, in the case of riparian buffers, Dorr (2006) did not find soil erosion to be a motivating factor. This contrasts with Flower's (2004) findings for farm operators and Valdivia and Poulos' (2009) findings for farming landowners concerned with stream bank erosion.

Field

Recall that *field* refers to the social relationships established among different actors in the practice. For example, farmers may be members of co-ops for the purposes of marketing their products and purchasing inputs. Various studies have identified the effect of social relations among farmers, between farmers/landowners and professionals in conservation at the local and federal levels, and with professionals in the field of forestry. Relations in a field are not necessarily equal (horizontal). They may be unequal (vertical) where there are differences in power relations. For instance, if a farmer is seeking to participate in a federal program, he or she will have to comply with the requirements, as happens with farmers seeking loans or cost sharing or renting land from other landowners (Raedeke et al., 2003). Incentive programs reflect knowledge and contact with institutions in the field of farming and conservation. However, farmers who participated in these programs did not show more interest in or adopt agroforestry more readily than farmers who did not participate in cost-share programs. This is consistent with the results of a study by Valdivia and Konduru (2003), who found no differences among part-time and full-time farmers in relation to interest in agroforestry practices. Batie (2001) found that participation by farmers in government programs was constrained by inadequate funding, targeting problems, complexity of the programs, and reduced capacity of agencies. Arbuckle et al. (2008) explored the influence of the field of farming on interest in agroforestry, especially the influence of the landowners, bankers, and other farmers' opinions. They found that the only potential influence was from bankers, which had a positive effect on interest in agroforestry. Valdivia et al. (2012) identified transaction costs and profitability concerns as the main barriers for adoption.

While adoption of agroforestry remains low (Romanova, 2020; Tsonkova et al., 2018) adoption rates are higher in regions that have organizations actively engaged in agroforestry education and extension, as is the case of Missouri. While recent studies only found adoption rates of 1.5%, in Missouri adoption rates were higher. This is also where UMCA and the University of Missouri research experiment stations were conducting research about agroforestry practices. Related to the field, factors affecting adoption also include the role of social support and individual resources to adopt a new technology (Francesconi et al., 2014; Hayden, 2014; Martini, Roshetko, & Paramita, 2017; Romanova, 2020; Stutzman, Barlow, Morse, Monks, & Teeter, 2019).

Diverse Agroforestry Practices and Decision Makers

Here we elaborate on agroforestry practices from the perspective of the decision maker. Can the technology adjust to the needs and resources of the landowners? Does it blend with the portfolio of activities and characteristics of the household or family farm? Does it match the landowner's goals? Will the technology require a certain amount of land and labor to be viable? Will it yield the environmental benefits or aesthetic values the landowner seeks? Does it require a certain level of investment to be operational? And finally, are the institutions and information available to support the practices?

Characteristics of Agroforestry Practices

Is there a minimum amount of land and investment required? Are there risks to establishment and mechanisms to protect against these risks? Does it require intensive management? Can it generate income streams throughout the life of the practice? Are there institutions and policies to support implementation? Are there markets to sell the products? These are some of the questions about the nature of the technology, and the answers are critical in adoption decisions.

Environmental benefits (services to society—e.g., climate, carbon management, biodiversity, and water quality), scenic and aesthetic beauty, and personal or individual benefits (e.g., from economic returns to a sense of place, values, and well-being for future generations) are among the multiple potential benefits of agroforestry. How does the decision maker benefit, what are the costs, and how does it “fit” in his or her livelihood strategy? This knowledge, accessed by the decision maker, also has an effect on interest and adoption.

Possible Barriers

Four broad categories of barriers to the widespread incorporation of agroforestry practices can be described:

Economic. The availability of specific financial information for multi-enterprise agroforestry practices is often lacking, including known returns for specialty crops and the impacts of the complementary and competitive interactions on the yield of both the tree and non-tree components (Van Vooren et al., 2016). This is further complicated if the enterprise includes specialty crops lacking in readily accessible market information (see Chapter 15).

Landowners will often face barriers in accessing credit to launch these enterprises.

Cultural. Because agroforestry practices run against the monoculture tradition of North American farmer beliefs, values, attitudes, perceptions, and knowledge, ingrained resistance (and healthy skepticism) is found among “traditional” farmers who have farmed for generations (Mattia et al., 2018).

Policy. Lack of incentives and, where present, poorly designed and/or promoted incentives remain major barriers to wider incorporation of agroforestry practices. Until recently, incentive programs have often been too rigid to actually promote the practices that are permitted under their purview; however, this is evolving and incentive programs are becoming more flexible (USDA National Agricultural Statistics Service, 2020; Box 17–3). For example, to successfully establish trees and shrubs, areas of surrounding vegetation must be controlled for at least the first 3 yr. Some federal incentive programs often restrict follow-up management, and agroforestry practices suffer as a consequence as the plants do not thrive and fail to achieve their intended purposes. In addition, incentive programs may also dictate specific numbers of trees per unit area, which often requires planting too many trees for agroforestry practices. Furthermore, incentive programs can prohibit landowners from earning income within the areas set aside for incentive payments. However, agroforestry practices almost always require active management throughout, conflicting with the incentive guidelines and damaging the productivity of the agroforestry practices. Additionally, national incentive programs are administered at the state level (Box 17–3), and if the individuals in charge do not place a high priority on agroforestry, the resulting incentives can be too small to attract the interest of landowners. Finally, professional field-level staff are often unaware of or unfamiliar with agroforestry practices and thus fail to recommend their use to landowners when evaluating options for the application of incentives on the farm. While changes are underway, this may help to explain how these institutional program payments have failed to promote interest in agroforestry until very recently.

Technical Assistance. Knowledgeable social networks must be created to break through the above barriers. Farmers, university extension agents, natural resource professionals, seed and implement dealers, Farm Bureau personnel, loan officers, land appraisers, state

conservationists, and crop, animal, and forest commodity groups must all become much better educated with regard to the potential of agroforestry practices. How? Education takes many forms and needs to include a stronger research base, better economic data, better market information, and more on-the-ground demonstrations on landowner property tied together with substantial targeted outreach events (see Chapter 19).

The decision-making process of agroforestry adoption requires examining all costs—along with benefits—together. According to Valdivia et al. (2012), adoption barriers can be due to transaction costs (related to information access and perceived establishment costs) and profitability concerns (associated with perceptions of the effects of agroforestry on farm profitability and agricultural production). Although transaction costs appear to be a greater barrier to implementation across all landowners, environment-concerned landowners are more likely to adopt agroforestry.

Multifunctionality

Valdivia et al. (2012) was based on the lessons learned from more than a decade of research focused on understanding decision makers and the adoption of agroforestry, as well as the culture and values of landowners in rural communities where farming is still an important way of life. The article acknowledged the clearly defined habitus and field institutions of both agriculture and forestry. The question focused on agroforestry—was the practice well defined? At the time the answer was “not yet.” The what, how, and why is agroforestry becoming a pathway in farming were answered and multifunctionality and transaction costs were key concepts in the answer. Data for the research came from 360 landowners in Missouri with concerns about the costs of establishing and the time to manage trees. Lack of experience in terms of implementing agroforestry on the farm was also an important concern. Using principal component factor analysis about the barriers perceived by landowners related to transaction costs, the barriers were associated with the economic expenses derived from planting trees. In terms of profitability concerns, the barriers associated with low profitability were connected to multiple factors about producing trees. Transaction costs included: lack of tree management experience, the costs of establishing and managing trees, lack of access to technical information, the time required to manage trees,

and the amount of effort needed to clear the land. The profitability concerns included obstacles in the use of farm equipment, long time lags to obtain returns to the investment, the negative effects that trees have on crops, and inadequate market prices for timber. The concerns with transaction costs were greater than those of profitability. The notion of *field* relates closely to transaction costs because it captures the difficulties in access to information, missing institutions (rules or norms), and organizations that can support the practice of agroforestry. Transaction costs capture these institutional barriers in the implementation of agroforestry. Profitability concerns relate to *habitus*. Using cluster analysis with these two concepts, the study identified three types of landowners: environmentalists, agriculturalists, and the disengaged. Environmentalists had moderate concerns about transaction costs and profitability in their decision to plant trees, although transaction costs are more important. Environmentalists were more concerned with scenic beauty and wildlife conservation, while carbon sequestration was more important for agriculturalists, who had greater transaction costs and profitability concerns than the other groups. Those that were called the disengaged did not have either of these concerns and perceived lower benefits of planting trees than the other two groups. In terms of incentives to support planting trees, environmentalists preferred cost sharing and exhibited the lowest preference for rental and incentive programs, which relates to conservation practice programs like EQIP and the Wildlife Habitat Incentives Program (WHIP).

These three landowner types exhibited different perceptions about barriers to agroforestry adoption. These differences were related to the attributes of their farmlands, multifunctionality indicators, and their advantageous resources for the adoption of agroforestry. Environmentalists appear to be the group most likely to adopt agroforestry, and as the case studies have shown, this concern informed how families would pursue their businesses, such as Early Boots Farm, incorporating silvopasture management because of the benefits of trees for the pasture in terms of shade during the summer heat and shelter from cold temperatures and wind in winter. Early Boots Farm is also marketing at local farmers' markets and online, selling a product that is unique.

In terms of established networks and access to information, the institutions and businesses to which these three groups relate, and economic or

business factors facilitating information access to reduce transaction costs and/or capitalize on the values that are important, the disengaged group had significantly less contact with conservation agencies. Landowners in the disengaged group also had fewer established connections with federal agricultural agencies, e.g., the NRCS and Soil and Water Conservation Districts, compared with the other two groups. The disengaged group also networked less with other farmers in contrast to the environmentalists and agriculturalists. A smaller proportion in this group (7.6%) participated in agribusiness field days, while 18% of environmentalists and 23% of agriculturalists did. Environmentalist landowners preferred university extension and state agencies for information about planting and managing trees compared with the other groups. Agriculturalists preferred federal agencies and other farmers as sources of information. The disengaged were less interested in contacting agencies to learn about planting or managing trees as well as the lowest interest in obtaining that information from other farmers.

Valdivia et al. (2012) used a multifunctional framework that took into account the multiple motives and goals a landowner places on their land, recognizing a diversity of interests and knowledge about the functions of agriculture ranging from weak to strong multifunctionality (Wilson, 2008). For example, part-time farmers had a lower time commitment in agriculture and were therefore only moderately multifunctional. Lifestyle farms were often in the strong end of the multifunctionality spectrum, as their livelihood does not depend on the land as a production asset. The diversity of relationships to the land is captured in the role of farming in their income generation and in the different types of barriers to the adoption of practices, as Barbieri and Valdivia (2010a) found, with different types of landowners having varying levels of understanding and willingness to adopt agroforestry practices.

Agri-Environmental Policies and Agroforestry

Studies on the adoption of agroforestry practices have increased in the last decade, in tandem with changes in government policies that have included a diversity of agroforestry practices in their programs. The 2017 U.S. Census of Agriculture reported that about 1.5% (30,853) farms self-identified as using one or more agroforestry practices (USDA National Agricultural Statistics Service, 2020). The accuracy of the results, however, should be viewed

with reservations due to possible misidentification, given that only brief descriptions of agroforestry practices were provided in the Census of Agriculture forms.

In the study of barriers and incentives to adopt agroforestry practices in Missouri (Valdivia et al., 2012), environmentalists and agriculturalists shared values about the market that reduce transaction costs (i.e., trustworthy buyer, established relationship, reputation, and highest price) that were not shared by the disengaged. Environmentalists and agriculturalists also shared similar values, such as their support of the local community, and both have more established relationships with public conservation and education agencies and social networking. Overall, landowners in these clusters were more connected and had higher social capital bonding and bridging than those in the disengaged cluster, which is consistent with their different levels of involvement in the practice of farming. It is important to highlight that the environmentalists trusted not only horizontal (farmer-to-farmer) but also vertical (organizations) information sources to learn about innovations and technologies related to trees. Horizontal and vertical relationships in social networks, rather than information, have been suggested as contributing to the decision to adopt innovations and management practices (Prokopy, Floress, Klothor-Weinkauf, & Baumgart-Getz, 2008), which points to the importance of investing in programs that foster connections with others.

In sum, the socio-economic characteristics of environmentalists and agriculturalists in terms of farm size and acres farmed, portfolio diversity, overall awareness of environmental problems, and their horizontal and/or vertical social networks suggest that policies fostering agroforestry adoption should target both groups, as these characteristics appear to be determinants of incorporating trees on the landscape among other conservation management practices (Prokopy et al., 2008). However, it is also necessary to recognize differences between different types of landowners in diffusion efforts, as has been suggested (Barbieri & Valdivia, 2010a). For example, although environmentalists and agriculturalist landowners are well networked and share values related to the benefits of trees and their concerns about conservation, it is imperative to recognize that more landowners in the agriculturalist cluster are actively farming compared with their environmentalist counterparts.

Current and Future Farm Bill Policies: Implications for the Practice of Agroforestry in the Landscape

Incentive structures are powerful motivators for changing practices. According to the findings of Romanova (2020) and Valdivia et al. (2012), access to information and cost-share programs would reduce the barriers to increased adoption of practices that incorporate trees on the landscape. For those more engaged in farming, incentives must consider reduction of costs and increased profitability. Widespread adoption and use of agroforestry will require multiple, integrated, deliberate, and opportunistic approaches including: market-driven and targeted funding, top-down (government) and bottom-up (landowners) efforts, high-tech (research breakthroughs) and high-touch (one-on-one technology transfer) efforts, and active partnerships (Jose et al., 2018). There are a number of promising trends in support of the growth of agroforestry including consumer-driven demand for healthier food and a healthier environment, national efforts to reduce nonpoint-source pollution and increase wildlife habitat, the reality of climate change, and the cost and insecurity of a dependence on fossil fuels (Jose et al., 2018).

Nationwide efforts to reduce nonpoint-source pollution and increase wildlife habitat are supported by national policy through Farm Bill programs (e.g., CRP, EQIP, and WHIP) that support the use of agroforestry practices like riparian forest buffers, windbreaks, and alley cropping. Climate change is causing a shift in interest toward long-term carbon storage, increased use of perennials, and agroecosystem resilience. Despite huge fluctuations in fossil fuel prices, the U.S. military maintains a strong interest in the long-term potential of lignocellulosic biomass and bioenergy as alternative energy sources for reasons of national security (Lovell et al., 2017).

Continued policy changes are needed in future U.S. Farm Bill programs to further stimulate landowner adoption of agroforestry through market-based incentives. A “new generation” of incentive programs is needed in which landowners are expected to pursue alternative market opportunities made available through the establishment of agroforestry practices (Chenyang et al., 2021). Policies should be developed that support perennial crop establishment (Box 17–3), allowing and encouraging landowners to generate income from the trees, shrubs, or alternative crops, as incentive payments are reduced accordingly. Programs that reduce up-front establishment

costs and provide income while alternative crops come into production will increase their appeal to landowners who are seeking to earn on-farm income. In turn, such programs will reduce long-term costs to the federal government as landowners are weaned off cost-share programs and become financially self-sufficient.

The Way Forward: Using Agroforestry to Transform the U.S. Landscape

Agroforestry will play a part in a re-envisioned midwestern landscape. It can balance sustainability goals, build the adaptive capacities of rural communities, and strengthen resiliency against “system shocks,” e.g., COVID-19 (Prokopy et al., 2020). Wider application of agroforestry will also help to address climate variability and changing consumer demands. This wider application is made possible on the one hand by the changing relationships that have an effect on the rules of the game, as expressed in the way policies change to facilitate the integration of agroforestry practices (Box 17–3). It is also made possible by the values that are in line with sustainability, including work with indigenous communities to support their traditional practices, valuing culture, along with the new generation of family farm businesses such as those profiled in this chapter.

In times of transformational changes, new pathways are identified by the agency of individuals and the development of relationships and values that create the *field* of agroforestry as seen in the changes in public policies in support of agroforestry practices. To transform our landscape, the diversity of agricultural systems at farm, landscape, and market or supply chain levels must be increased to become more resilient for farmers, rural communities, and the environment. Multifunctional working landscapes should include strategic deployment of an array of agroforestry and other continuous living cover practices on large swaths of flood-prone and highly erodible landscapes, while at the same time being a source of income, such as tourism and carbon sequestration. To be successful, landscape diversification must be paired with the development of local and regional processing infrastructure and direct farm-to-consumer markets that enable farmers and food businesses to be financially viable. Reliance on lengthy commodity supply chains and consolidated markets must be curtailed. Finally, governmental and nongovernmental policy tools that incentivize diversification and de-prioritize the current culture of monocropping will be essential (Prokopy et al., 2020).

Summary

Agroforestry practices are very diverse and must be applied strategically across an equally diverse biophysical landscape. Of equal importance, such diversity is a strength in a context where family farms and households in agriculture are also diverse. When individuals, households, or groups access and use resources, these resources become capital that creates a stream of benefits. Access gives individuals the capability to build a livelihood. For Jay Springs Lamb, Early Boots Farm, and East Grove Farms, their human capital (education, knowledge, and search for new information), cultural capital (value of their way of life, and how the seen is connected with the unseen), natural capital (the land and forest they manage), and social capital (e.g., industry associations) have been the means to similar goals. For Jay Springs Lamb, silvopasture was consistent with the goals of the family . . . “a sustainable lifestyle motivates our business.” For Early Boots Farm, silvopasture was consistent with their dual goals of “producing food in a sustainable manner and regenerating lands.” For East Grove Farms, perennial fruit crops were consistent with their goals of “profit, soil preservation, and building community.” These forms of capital and the producers’ capability (ability to act) lead to the accumulation of assets (economic and noneconomic), where agroforestry contributed to their target outcomes in life. The field of agroforestry is developing in ways that are supportive of a diversity of farmers who are seeking new ways of making a living or keeping their sustainable traditions, as is the case for indigenous communities in North America. The changing policies emergent from experiences of working together facilitate learning, adoption, and adaptation. *Agency* is at the center of this process.

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Study Questions

1. What did the owners of Jay Springs Lamb Co. do to help realize their personal and business goals?
2. What did the owners of Jay Springs Lamb Co. do to strengthen their direct marketing approach?
3. What factor(s) led Jay Springs Lamb Co. to begin practicing silvopasture and shift to direct marketing?
4. Identify three factors that shape or influence human livelihood decisions.
5. Describe what is meant by capital and capabilities in the context of landowner decision-making. What other factors influence decision-making?
6. Describe the four elements of structures and institutions that impact landowner strategies with regard to agroforestry practices.
7. Explain the major differences that exist between the structures that influence decisions in rural livelihood strategies in North America compared with developing countries.
8. What are the roles of diversification relative to livelihood strategies and agroforestry?
9. What is meant by the term *field* relative to human dimensions and agroforestry?
10. Identify barriers that can influence more widespread use of agroforestry practices.