

RURAL RESILIENCE: LOCAL AGRICULTURE AND ADAPTATIONS TO CYCLES  
OF CHANGE IN HAYFORK, CALIFORNIA

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## ABSTRACT

### RURAL RESILIENCE: LOCAL AGRICULTURE AND ADAPTATIONS TO CYCLES OF CHANGE IN HAYFORK, CALIFORNIA

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The interconnectedness of humans and nature exists within a social-ecological system, the resilience of which depends on the ability of humans and environment to respond and adapt to inevitable changes across scales. Rural communities are often natural resource-dependent, relying on extractive industries for livelihood. For the community of Hayfork, in Trinity County, California, agriculture has provided subsistence since European settlement, and still retains its function today, despite periodic boom-bust cycles. Using mixed qualitative methods of participant observation and semi-structured interviews with local land managers, the resilience of current agroecological practices was analyzed. Today, a trilogy of coexistent branches of agriculture has emerged – local food, forestry and *Cannabis*. The resilience of these agricultural types, along with a local propensity for collaborative planning and adaptive management, is strengthened by local knowledge and social capital. Local agriculture provides diversity of function within Hayfork and indicates an adaptive capacity for sustainability and transformation, yet an overreliance on *Cannabis* or scarce resources such as water, may threaten the community's resilience.

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## INTRODUCTION

This study explores the interconnected and interwoven relationships between rural communities, local agricultural systems and the resilience of one such community in response to local conditions of systemic change. Rural communities are often natural resource-dependent social-ecological systems, where community and environment are intrinsically linked, in part by industries that sustain them such as agriculture, timber, mining and tourism. Agricultural systems are diverse social-ecological systems, and often inextricably connected to rural living. The science of agriculture cannot be separated from the social and environmental context of the land and land manager, and thus agro-ecosystems must be analyzed from an interdisciplinary perspective that addresses their multilayered social and ecological functions.

With this research, I attempt to show the connection between local agriculture, rural livelihoods and resilience, through the case of one natural resource-dependent town. I examine factors that contribute to the social-ecological resilience of the community and the agro-ecosystems functioning within. I investigate agricultural practices ranging from home gardening, subsistence farming and homesteading, to market gardening and commodity farming, gathering evidence of locally-adapted, agroecological methods and landowners perspectives on personal values, barriers, opportunities, social capital and organizational capacity.

The purpose of this study is not to promote agricultural agendas, but to initiate a discourse around the role of agriculture in building resilience in a traditionally natural

resource-dependent community, and evaluate the role that agriculture and agroecology play in stewarding ecologically resilient land-based systems. This inquiry is inspired by my experience of living in the community in question and a personal desire to advocate for local sustainability, resilience and transformation. Various questions drive my inquiry. How have the changes experienced since the decline of the timber industry two decades ago led to a kind of agricultural renaissance, punctuated by the simultaneous rise of a local food movement and a *Cannabis* economy? What is the role of agriculture in the community of Hayfork, California, and what opportunities can sustainable agroecological systems bring? How can the community learn from previous adaptive cycles and plan for a resilient future? Given an overwhelming economic dependence on the *Cannabis* industry, how will the community fare in the wake of a systemic social change, such as legalization, eradication or extreme criminalization or if faced with ecological shocks, such as severe, prolonged drought?

I approach this research through a lens of resilience theory in an effort to flush out the relationships of humans and nature and the ability of communities to build resilience through a co-evolution of social and natural processes. I draw on agroecology, local agro-ecological knowledge and social capital in an effort to uncover ways in which community assets are applied to local efforts. I look at the history of the community's resource dependence and agricultural economy to look for patterns in local adaptive cycles and to illuminate the potential for social and ecological resilience in the future. I highlight the role of the timber economy in promoting a regional shift away from what was once a rich and productive agricultural economy and the current trends back to

agriculture in the wake of the deindustrialization of timber. A further understanding of the resources available to the community, and the potential for increased independence and resilience through local agriculture, may help inform how this community and others like it will be better equipped to understand the dynamic and layered process of planning for long-term social-ecological sustainability.

I probe these themes further using an exploratory case study, focused on the history of local agriculture, embedded in local, regional and global systems and changes. I use data collected in the field from eighteen local land managers and pursue emergent themes as they arise. In so doing, I discover a trilogy of local agriculture, consisting of local food, forestry and *Cannabis*, that together account for a large swath of the agro-ecosystems in Hayfork. I look into how local agroecological knowledge is applied in developing agricultural systems and local perceptions of how these systems can contribute to community sustainability and resilience. I explore the social and ecological dimensions of each prong of local agriculture. I investigate land use practices and local perceptions of the potential benefits of resilience planning through local agriculture.

## RURAL RESILIENCE EXPLORED: A REVIEW OF THE LITERATURE

### Rural Sociology

Generalizations are commonly made about rural living and the concept of community. The two are often linked by definition, where rural environments are assumed to foster a distinct and idyllic sense of community, based on geographic isolation, low population density, a perceived homogeneity and a sense of belonging to society and place (Brown and Schafft 2011, Woods 2011). “Community” however, can be used to define human groups bound by common social traits and belief systems regardless of location (Brown and Schafft 2011). Rural communities are often natural resource-based social-ecological systems in which humans and nature are linked, interdependent and co-evolving (Brown and Shaft 2011, Walker and Salt 2006). An innate human-nature connection is often manifested through agriculture and/or natural resource management (Woods 2011). For the purposes of this study, I use the term “rural” to define geographically isolated areas with sparse population density and a socio-economic reliance on natural resources and agriculture; and “community” to describe a dynamic entity with social and political dimensions, held within a specific geographical area, bound by census data, road systems, utility/school districts and public/private property boundaries; all shared by the people who live there.

Despite historical, cultural and geographical differences, commonalities such as isolation, insularity and reliance on natural resources define rural communities across the globe (Brown and Schafft 2011). On the other hand, the ways in which rural

communities are affected by societal changes can vary as much as the diverse communities themselves. Key development factors such as transportation and telecommunications can lead to the rapid growth and urbanization of some areas, while others, in the absence of stable industry and resources, may experience extreme poverty and major population decline (Flora et al. 1992, Byers and Nelson 2014). Furthermore, the experience of rural community life varies within a community, depending on the human experience of living within, only understating the dynamic nature of rurality and community (Woods 2011).

Approximately 15% of the United States population lives in “non-metropolitan” or rural areas (USDA 2014). Waves of population growth to non-metro areas have fluctuated, punctuated by macro-level societal shifts driving increased in-migration of quality-of-life seekers to some non-metro areas (Byers and Nelson 2014). However, rural population overall continues to decline nationally, due to slowed in-migration and increased out-migration (USDA 2014). While the majority of the nation’s population lives in sub-urban and urban areas, rural people and communities make substantial contributions to food security, land stewardship, natural resource extraction, biodiversity conservation and tourism (Flora et al. 1992).

Though typically isolated from mainstream society, rural communities are deeply impacted by broad social, political and economic interests. Rural communities provide a land resource and labor base on which industrial society depends, as well as attractive natural amenities, and so are characteristically interdependent with urban areas and vulnerable to regional, national and international influences. The natural resources that

these communities rely on are often the central focus of mainstream environmental policy and conservation legislation. Political shifts surrounding resource conservation on public lands can greatly impact rural industry (Castle 1993, Brown and Schafft 2011). Rural livelihoods that lack diversity and rely heavily on the production of one resource, struggle to withstand socio-economic shifts caused by resource exploitation, exhaustion or protection. On the other hand, rural livelihood strategies that incorporate diverse subsistence activities can be more resilient to such shifts (Brown and Schafft 2011).

Persistent cycles of rural poverty cannot be separated from the global economy and industrial pursuit of natural resources (Brown and Schafft 2011, Castle 1993, Travis 2007). Many rural communities have transformed to meet the demands of a global economy, abandoning traditional forms of subsistence for specialized forms of industrialized mining, forestry or agricultural extraction. Where industrial or political changes lead industry to abandon these enterprises, rural citizens and communities are often left with few economic alternatives and struggle socially and economically unless they experience gentrification, lifestyle migration (such as retirement) and/or tourism (Byers and Nelson 2000, McManus et al. 2011).

At the same time, rural communities such as these are often home to citizens with a strong sense of local pride and place-based identity. As deindustrialization causes an out-migration of people seeking work in urban or semi-urban areas, others stay put and try to make ends meet with what they have, creating subsistence strategies that combine wage employment, welfare, self-provisioning and inter-household exchange (Castle 1993, Sherman 2009). With diversified survival strategies, these rural people supplement

their need for currency, build reciprocal social relationships and develop political and economic independence (Sherman 2009).

Extractive natural resource-based industries, such as timber, mining, energy and agriculture, have attracted rural people to the Western United States and sustained rural communities over time. Today these industries play a declining role in rural economies, leading to increased out-migration of youth, lower rural incomes and the general loss of skilled and educated workforce or human capital (Measham and Fleming 2014).

Communities where oil and natural gas extraction are booming provide an exception, as such areas have experienced a population surge, especially of young workers in recent years (Brown and Schafft 2011, Measham and Flemming 2014, Travis 2007, USDA 2014). A “New West” has emerged where the environmental resources once exploited for industrial use, and lands once valued for their extraction potential, are now most valuable when protected and conserved (Brown and Schafft 2011, Travis 2007).

Technological and market changes have aided in the continued expansion of the western frontier, but for its high quality of life and abundance of environmental amenities rather than the availability of exploitable natural resources (Byers and Nelson 2000, Nelson et al. 2014, Travis 2007). In such communities, tourism and service-based economies take the place of once booming, resource extraction-based economies, and amenity migration sustains or increases local populations (Byers and Nelson 2000, Nelson et al. 2014).

However, not all rural communities can tout the availability of pristine landscapes and tourism infrastructure, especially those most influenced by resource extraction in the past, some scarred with severe ecological devastation and permanently changed social

and ecological landscapes (Travis 2007). For these, the amenity, lifestyle and tourism-based economies hold less promise and so alternative economies must be explored.

While cycles of change are inevitable, the way in which communities adapt in the face of these shifts illuminates the unique qualities of the communities in question. These rural communities face the singular challenge of rebuilding socially and ecologically resilient communities from within, with minimal external economic stimulus (Woods 2011).

Rural communities in the Western United States particularly, were settled by European immigrants with an independent and entrepreneurial spirit, fueled by rugged individualism and supplanting Native Americans and indigenous land management practices (Flora et al. 1992). Those who choose a rural lifestyle today, enjoy the freedom and space of the rural environment and often identify with a frontiersman attitude that prizes self-reliance, solitude and independence (Sherman 2009, Woods 2011). When faced with struggles and periods of transition, a sense of belonging to society and place, strengthens the ability of rural people and communities to adapt to change (McManus et al. 2011, Woods 2011). The struggle to survive, combined with a sense of belonging to community and place, contributes to rural people's ability to capitalize from alternative opportunities in a transitioning community. This propensity for adaptation gives rise to a new rural development paradigm that hinges on an intersection between amenity and lifestyle-based livelihoods (like tourism), local agriculture and conservation efforts (Brown and Schafft 2011).

In the Pacific Northwest, rural economies have been historically dependent on timber and forestry (Brown and Schafft 2011, Flora et al. 1992). In the 1990's, a period

marked by conservation-oriented forest management strategies and severely reduced timber harvest from the large proportion of federally managed public forest lands, the timber industry abandoned many northwestern towns, creating economic voids more pronounced in communities with limited amenities or tourism capacity. This brought a special set of circumstances based on an extreme dependency on natural resources, that challenged rural communities' capacity for social and ecological resilience (Brown and Schafft 2011). The socio-political and ecological climate in rural Northern California during this time was exacerbated by the struggle to survive through great economic hardship in one of the most economically privileged, amenity rich and environmentally protected states in the United States.

### Boom-Bust Cycles in Rural Communities

Rural communities are often natural resource-dependent and land-based, reliant on extractive industries such as timber, agriculture, energy and mining (Flora et al. 1992, Sherman 2009). They often experience marked growth in an industry, followed by the exhaustion of that industry, leading to substantial social and ecological changes to the community and landscape. They are tied through industrial capitalism to the world at large and are vulnerable to cultural and economic shifts, broad socio-political changes and global industrial and environmental trends, leading to boom-bust cycles of rapid growth and rapid decline (Brown and Shaft 2011, Flora et al. 1992).

“Boom-bust” is a historic and economic term used to describe patterns of marked expansion and growth over a short period of time (the boom) followed by a period of

social crisis (the bust) often signified by serious economic change such as a drop in commodity price, a change in consumer preference or a catastrophic event of some type (Brown and Schafft 2011, Travis 2007). In respect to rural communities, boom-bust describes a period of economic growth often associated with the accelerated industrial pursuit and exploitation of natural resources, followed by a period of deindustrialization, caused by the exhaustion of extractable natural resources and the consolidation and relocation of industry (Brown and Schafft 2011, Travis 2007).

Historically, boom-bust cycles have been associated with nineteenth century mining, timber and cattle towns and images of the western frontier (Glaser 2010, Travis 2007). With mining, a period of rapid expansion in communities where mineral resources were abundantly available was followed by a recession as those resources were exhausted. A similar pattern existed with the post-World War II housing and timber boom, followed by the bust associated with environmental policies, resource exhaustion and timber industry consolidation in the 1990's (Fransworth 1996). Boom-bust cycles are also associated with housing and real estate trends, urban population swells and national economic trends. While industrial entities often drive the boom-bust cycle, they are not usually victim to it. The consolidation of large companies, the mechanization of operations and the centralization of production, provides opportunity for these companies to shift to new locations and expand, while the workers and rural communities that rely on them are left behind with the burden of the bust (Castle 1993).

In the Western United States, many rural communities whose economies were once based on subsistence living, shifted away from agricultural lifestyles towards

extractive boom economies in the mid 1900's. As agriculture became industrialized and centralized, rural people struggled to compete in a market economy and communities turned toward industry as a means to support the local economy (Brown and Schafft 2011). New industries were natural resource dependent, and when these resources were exhausted and industry departed, some rural communities experienced extreme economic hardship and poverty. Others have continued to grow and thrive based on amenity lifestyle and tourism economies that continue to boom in areas with attractive amenities (Nelson 2014, Travis 2007).

Have rural communities in the West moved beyond the legacy of boom-bust cycles toward a new paradigm based on their capacity for adaptation and resilience (Travis 2007)? Perhaps boom-bust cycles don't accurately describe the patterns of Western development? There are numerous examples in which booming industries have brought permanent changes to the landscape and culture of an area, without evidence of a true bust indicated by severe population decline or ghost town status (Travis 2007). Or, are we simply experiencing a "long boom" that started when humans first inhabited the western landscape approximately 15,000 years ago (Travis 2007)?

The linear nature of boom-bust thinking may be flawed or obsolete as we turn to community development theories that hinge on the abilities of communities to adapt and transform through social-ecological change, using diverse and multi-faceted development. The concept of boom-bust implies that every boom is followed by an end, a cycle existing in a vacuum devoid of a broader social context, only perpetuating the problematic linear thinking in rural studies. It may be more appropriate to consider such

shifts for what they are, cycles of change, characterized by periods of expansion and conservation, collapse and regrowth (Brown and Schafft 2011, Walker and Salt 2006). By simply re-characterizing the way we look at the cycles of change in rural communities, it is possible to frame patterns of growth and retraction in terms of community resilience and adaptive capacity and to plan for and embrace inevitable change.

### Resilience Theory and Adaptive Cycles

Resilience refers to the amount of change a system can undergo and still retain the same basic function (Holling 1973, Walker and Salt 2006). The same definition can be applied when considering the sustainability of relationships between humans and nature, intrinsically linked in a social-ecological system, and the ability for the system to absorb changes and disturbance while still retaining its basic identity (Gunderson and Holling 2002). There are two additional criteria for consideration when interpreting social-ecological resilience: the degree to which a system is capable of self-organization, and the degree to which a system can build and increase its capacity for learning and adaptation (Folke 2006). Based on this composite definition, resilience theory can be a valuable analytical tool for interpreting the abilities of social-ecological systems like small farms, agro-ecosystems and land-based rural communities to adapt to, and plan for, change.

One defining feature of adaptability is the capacity of people to “manage resilience”, or adaptive capacity (Walker and Salt 2006). Resilience thinking is particularly useful when addressing the human and environment interconnection and the

ability of social-ecological systems to adapt to social, political and environmental changes on multiple scales. The use of the adaptive cycle framework can be especially helpful in planning for and moving beyond the potential boom-bust cycles in resource dependent communities and for understanding the various, interconnected relationships at play in any social-ecological system, where the human-nature relationship is dynamic, interconnected and evolving. The adaptive cycle is defined by four phases in the life of a system: the rapid growth or exploitation phase (r); the conservation stage, characterized by rigidity and stasis (K); the release, collapse or creative destruction phase caused by a disturbance ( $\Omega$ ); and the reorganization and renewal phase ( $\alpha$ ). In the alpha phase ( $\alpha$ ), new ideas and strategies emerge that lead to another expansive (r) phase, perpetuating the system in a new adaptive cycle (Gunderson and Holling 2002, Holling 1973, Walker and Salt 2006, Folke 2006).

According to resilience theorists, when planning for sustainability and resilience it is useful to place current events in a historical context, to see what happened and why, what worked and what didn't. In understanding the cycles of the past, it is possible to evaluate the current phase of a system, to anticipate changes that may occur and create scenarios for desired, sustainable future outcomes (Gunderson and Holling 2002, Walker and Salt 2006).

The concept of rural resilience has become popular recently in response to the notion of rural decline and the ability for rural communities to adapt to, rather than succumb to, external forces (McManus et al. 2011). Rural communities can be seen as active, dynamic social-ecological systems, the resilience of which is based on the

intrinsic interrelation of economy, community and environment and can be measured by communities' ability to embrace change, capacity to adapt to exogenous events, or ability to absorb disturbance and still retain basic function (McManus et al. 2011). A sense of belonging, emerging through the emotional experience of being bound to others through social relations, identities, and local perceptions, forms the basis for action within a community and contributes to its resilience (McManus et al. 2011). Established networks of trust and social capital gained by the existence of leadership and the ability to mobilize resources through social relationships and networks, contribute to a rural community's resilience (Gunderson and Holling 2002, McManus et al. 2011).

In rural resilience thinking, rurality and agriculture are often inextricably connected, and certainly any treatment of rural agriculture must consider the multifunctional role that agriculture plays in rural resilience. Sustainable agricultural systems are, in practice, adaptive systems, wherein management is informed by social and ecological factors as they arise, and the success of the system depends on the farmer's ability and willingness to adapt to new, emergent information (McManus et al. 2011). Farmers play the crucial role of managing for social and ecological resilience, developing creative solutions to adapt to challenges and changes within the system and beyond. Conversely, conventional agricultural systems are traditionally managed with a one-sided emphasis on predictability and stability of monocrop production yields, where social and ecological changes are perceived threats and treated with command and control tactics intended to maintain consistency, and minimize variability (Darnhofer et

al. 2010). Resilience thinking requires that we move away from this equilibrium-based ideology (Darnhofer et al. 2010).

In agriculture, periods of change are marked by periods of stability, often punctuated with a sudden shift or a shock to the system. Such shocks can range from pest outbreaks to market changes to political changes. Persistent stresses such as prolonged ecological damage can present more predictable changes in a system, while a sudden, unforeseen shock such as a natural disaster is more difficult to plan for. Shocks and stresses are distinguishable and require different strategies to cope with each (Darnhofer et al. 2010). The adaptive capacity of a farm or agro-ecosystem is measured in the ability of the farmer to interact with these changes and respond with informed strategies that will maintain or increase function moving forward. Diversity and redundancy are important elements in a resilient system that is resistant to sudden changes (Walker and Salt 2006). For example, increased biodiversity may prevent pest outbreaks, crop diversification creates a buffer from market collapse, and diversified income streams such as off-farm employment or alternative energy production can provide stability for a farm in the event of a production crisis or environmental catastrophe such as drought.

Managing for resilience on a farm or in a rural community requires strategies that include both resistance to change and adaptive renewal, creating systems that can remain stable in the face of change and also adapt and transform when needed (Darnhofer et al. 2010). This is not a simple task and requires trade-offs. How these trade-offs are perceived varies as much as the personalities of the farmers or land managers making the decisions. Managing for short-term and long-term gain (profit) and resilience is as

complex a task as the farm is a system. Resilience thinking, as it pertains to agricultural and resource based systems, requires special attention to the social domain. Land management strategies are shaped by social and ecological context in which the land exists, and are decisively influenced by human preferences and tendency toward risk aversion (Darnhofer et al. 2010).

Sustainability and resilience are almost interchangeable concepts, both based on the ability of a system to function and adapt to change. A sustainable production system provides a decent standard of living and meets the needs of the present without compromising the needs of future generations (Jacob 1997, UN 2015). Sustainability refers to the “likelihood (that) an existing system of resource use will persist indefinitely without a decline in the resource base or in the social welfare it delivers” (Walker and Salt 2006). Given that the current “needs” of human society are based on an over-consumption of finite resources, by these definitions, human society is not currently sustainable and the resilience of the systems that sustain society is questionable.

Resilience theory offers an analytical framework to assess the sustainability and adaptability of social-ecological systems as well as to assess their potential to become more sustainable and resilient (Olsson et al. 2014). When adaptation is no longer socially or ecologically feasible, transformation may occur (Walker and Salt 2006).

### Transformation and Panarchy

Transformation refers to the creation of a fundamentally new system, when “ecological, social, economic and political conditions make the existing system

untenable” (Walker and Salt 2006). Sustainability transformations require dramatic, interconnected systemic shifts to occur on multiple levels (Olsson et al 2014). In resilience thinking, transformation of a social-ecological system is often associated with the collapse of that system, when the stable function of a system is no longer sustainable (Gunderson and Holling 2002). Social-ecological transformations can also be deliberate and actively managed to reach a balance between natural and social capital, that delivers eco-system health and human well-being, pre-empting catastrophic collapse (Moore et al. 2014). The application of transformation concepts to rural communities requires a dynamic approach, where multiple, interconnected cycles of change are considered across scales, between global, regional and local changes in social and ecological domains (Moore et al. 2104). In an idealistic rural society, the relationship between global and local changes can instigate transitions from resource extraction-based economies to new, transformed and sustainable rural systems (Brown and Schafft 2011).

Panarchy refers to the dynamic interaction between nested and interconnected adaptive cycles of various scales, that exist in a hierarchical relationship to one another (Darnhofer et al. 2010, Gunderson and Holling 2002, Walker and Salt 2006). The co-existence and interaction between cycles of varying scale have the potential to influence how humans interact with the environment (Gunderson and Holling 2002). When evaluating the role that change plays in a social-ecological system, resilience thinking requires that a number of dynamic variables be considered to accurately assess levels of stability and predictability in any system, especially when planning for effective policy and transformative action towards sustainable futures (Gunderson and Holling 2002). The

panarchy of adaptive cycles of change in nature and society must be considered when evaluating and planning for social-ecological resilience.

### Agroecology and Sustainable Agriculture

Rural people have been deeply impacted by systemic changes in agriculture across scales and domains (Brown and Schafft 2011, Flora et al. 1992, Sherman 2009). The advent of industrialized agricultural systems and a globalized food market have caused the centralization of agricultural production and the marginalization of small-scale and subsistence-level farms who previously comprised much of the nation's rural population (West 2011). The post-World War II "Green Revolution" was an attempt to address poverty and hunger issues worldwide, by intensifying agriculture for increased efficiency and yields using an industrialized scientific model that requires substantial external inputs and technological resources, thus decreasing the capacity of resource-poor farmers to compete in the food market economy (Altieri et al. 2011, Brown and Schafft 2011, Perfecto et al. 2009). The Green Revolution encouraged the use of petrochemicals in the agricultural process by promoting fertilizers, pesticides and mechanized tools in an effort to maximize food yields per unit of labor input. The industrialization of agriculture came at high social and environmental costs, such as the disenfranchisement of rural agricultural communities, exploitation of agricultural labor, and severe ecological degradation characterized by diminished soil fertility and water quality, decreased water availability, desertification, deforestation, loss of biodiversity and an over-dependence on fossil fuels (Altieri et al. 2011, National Research Council 1991, Perfecto et al. 2009).

The concept of sustainable agriculture emerged in response to the social and environmental impacts of wasteful conventional agricultural practices aimed towards minimizing labor costs through inefficient, mechanized practices that result in low production per unit land (Perfect et al. 2009). Sustainable agriculture promotes the renewal capacity of agricultural eco-systems, or agro-ecosystems, by focusing on interactions between social and ecological components within the system. Sustainable agriculture provides for the agricultural needs of current and future generations by applying the following characteristics: long-term maintenance of natural resources and agricultural productivity, minimal adverse environmental impacts, adequate economic return to producers, optimal crop production per unit of land with minimized chemical inputs, satisfaction of human needs for food and income, and provision for social needs of farm families and communities (National Research Council 1991).

As environmental and personal health movements evolve, and local food movements progress, sustainable practices that benefit the agro-ecosystem and produce healthy products have become increasingly popular. Most research on sustainable agriculture focuses on the reduction of harmful environmental impacts in the farming process. Yet, environmentally-friendly methods alone may not offer social and economic sustainability for farmers and communities (Darnhofer et al. 2010). An agricultural system is dependent on the interconnection between humans and the environment; a social-ecological system, with agro-ecological, economic and socio-political dimensions, the sustainability of which, can only be measured by the resilience of the system and its capability to adapt to inevitable changes and transform when adaptation is no longer

feasible (Brown and Schafft 2011, Darnhofer et al. 2010, Moore et al. 2014). Resilience thinking provides a theoretical basis for sustainability planning, yet the challenge remains to put theory into practice on the ground, while maintaining a triple bottom line of social, economic and ecological sustainability. Agroecology takes resilience thinking a step closer to praxis, providing a practical and scientific platform for adaptive and resilient sustainable agriculture that is based in resilience.

Agroecology is essentially the science of sustainable agriculture. With the environmental movement came the rise of ecological thinking and the application of ecological theory to agricultural systems. Agroecology provides an environmentally and socially sensitive approach to agriculture that focuses on the sustainability of a productive system (Altieri 1995). Based on the precept that agricultural systems are inherently biological, social and environmental, agroecology focuses on the ecology of farm systems through soil and pest management, species diversity, nutrient cycling as well as social dynamics such as local knowledge, economic pressures, land tenure and family politics. Intrinsic to the study of agroecology is the experiential knowledge of the farmer, and in agroecological research, the farmer's perceptions and understanding of problems and solutions must be taken into account.

The social inequities and injustice associated with the industrial agricultural model have come to the foreground in the Global South<sup>1</sup> as social movements such as La Via Campesina gain momentum around the concept of social justice and food sovereignty

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<sup>1</sup> Global South refers to poor nations and colonies in the sub-tropical and tropical regions of the world, directly or indirectly dominated by richer nations in the Northern Hemisphere (Perfect et al. 2009).

through small-scale, localized agriculture (Altieri et al. 2011, Perfecto et al. 2009, Via Campesina 2011). Food sovereignty refers to a human right to access healthy and culturally appropriate food produced through sustainable methods, and to define their own food and agriculture systems (Via Campesina 2011). The concept of food sovereignty differs from the concepts of food justice and food security, which underscore local food and anti-hunger movements in the United States (Alkon and Mares 2012). Food security and justice movements focus on the human right to access safe, culturally appropriate, nutritious and sustainably-produced food, while the food sovereignty movement prioritizes local food production (Alkon and Mares 2012) and hinges on opposition to the “corporate food regime” and “the destructive neo-liberal process” associated with the global food system (Via Campesina 2011).

As public awareness rises around agricultural issues, increasing attention is brought to the need for a conservation paradigm that incorporates ecology, agriculture and the needs of rural farmers (Altieri and Toledo 2011, Perfecto et al. 2009). Amid widespread environmental and social changes, agroecology has emerged as a scientific, methodological and technological basis for a worldwide “agrarian revolution” drawing from the traditional knowledge of rural farmers and providing support for social movements aimed toward self reliance through food, energy and technical sovereignty (Altieri and Toledo 2011, Woods 2011). As a science, a practice and a social movement, agroecology has the potential to address ecological and socio-political dimensions of a global paradox: food *vs.* the environment. Agroecology engages an interdisciplinary analysis of biological principles of biodiversity, emphasizes the efficiency of context-

based land use systems and promotes the livelihood of the rural farmer (Altieri et al. 2011). Agroecology merges contemporary ecological and social sciences with grassroots social movements to manifest an alternative solution that serves the needs of marginalized rural people, conserves biodiversity and provides food security (Perfecto et al. 2009).

Agroecological systems maximize crop yields and energy efficiency as a necessary and appropriate response to the imminent threats of major systemic shifts and widespread food insecurity, especially in developing nations (Altieri et al. 2011). For some, an agroecological paradigm is the “only viable option” to address the social and ecological needs of peasant communities, the support for which is evidenced by social movements that have emerged around these concepts worldwide (Altieri and Toledo 2011, Perfecto et al. 2009). Local, regional, national and international movements and organizations are changing the face of agricultural society, by promoting and supporting agroecology (Perfecto et al. 2009). Agroecology offers ecological and social benefits to peasant communities by increasing the capacity for sovereignty, conservation and long-term resilience in the context of global warming, multi-national agribusiness and peak oil (Altieri and Toledo 2011).

The features of agroecology include high levels of biodiversity, innovative use of indigenous systems and technology, and a diversified and resilient system supported by traditional knowledge and collective socio-cultural organization. These features aid and empower rural communities to survive and compete in the agricultural sector, maintaining and improving eco-system function, while increasing food security by

employing traditional methods that have proven successful over time. When comparing the total agricultural output of these systems to the conventional measure of yield per unit area, total net yield can be higher in agroecological systems where functional diversity is encouraged (Altieri 1999, Franco et al. 2015). Plant diversity and species richness, encouraged by intercropping and companion planting, increase the social-ecological function of an agro-ecosystem by enhancing the biological function of the land as well as serving the needs of the farmer. These benefits manifest through decreased dependency on costly external inputs, the co-existence of subsistence and market crops, and increased resilience to systemic shocks. For example, if many nutritional crops are inter-planted, the loss of one to disease or a weather pattern will not cause economic or nutritional devastation because it can be replaced by another crop.

Evidence of the social and ecological benefits of these systems to agrarian peasant communities, strengthens the argument that agroecology is the most appropriate course of action for addressing the pressing dilemmas of agricultural land use, natural resource conservation and community self reliance in the Global South and beyond (Altieri and Toledo 2011). These concepts have been widely applied to studies in Latin America and developing nations in general, in efforts to remediate the extreme marginalization of poor farmers, and the increasing reliance on the global food system in once subsistence-based cultures. Ecological factors in the Global South compel much inquiry, since the southern hemisphere is home to a majority of the planet's biodiversity and ecological function is easily measured in diverse and rich eco-systems (Perfecto et al. 2009). Rural peasant farmers in the Global South also face a challenge to attain productive yields with minimal

inputs on small pieces of land, making agroecological yields fundamental to their survival (Franco et al 2015).

There are many parallels between marginalized rural populations worldwide and the historically impoverished, isolated and industrially-exploited rural populations of the United States that should be included in a global discourse, yet agroecological methods have not been widely studied here (Franco et al 2015). In the United States, an emphasis on food security and food justice, without addressing food sovereignty and direct opposition to the corporate system, leaves local food systems vulnerable to the influences of the global food market and transnational corporate governance of food production (Alkon and Mares 2012). Further studies are needed to probe the driving factors behind local and sustainable agricultural movements in the rural and urban United States and the barriers and opportunities these movements face.

As social-ecological systems, agro-ecosystems have varying degrees of resilience and stability. The resilience of a system is affected by both social and environmental factors. Pressures such as serious drought, pest outbreak, market fluctuations or land ownership changes can greatly affect the stability or resilience of a farm system. An agro-ecosystem's ability to withstand or adapt to these social and environmental impacts, can be a measure of its overall resilience and sustainability. There is a well-defined link between agroecology and resilience through the long-term benefits of these highly diversified systems, proven by their ability to adapt to major climatic events such as global warming and extreme weather patterns (Altieri et al. 2011).

The convergence of the environmental movement with rising social awareness

about the global food system and the de-industrialization of rural communities has created an opportunity for the development of sustainable and local agricultural systems across the United States and the developed world. Meanwhile, in the Global South, social movements around peasant farming rights have gained momentum and given way to a new kind of green revolution that promotes local, sustainably produced, healthy agricultural practices, while advancing rural communities towards food, energy and technological sovereignty (Koochafkan et al. 2012). The development of a new agricultural paradigm that serves the food needs of a growing population, while employing ecological management and creating resilient systems is an “urgent and unavoidable task” (Koochafkan et al. 2012). Agroecological thinking has played a critical part in highlighting the importance of balancing the social and ecological dimensions of agriculture while refining the concept of sustainability.

### Local Food Movement

Local food movements have sprouted up throughout the United States as a response to public awareness surrounding the industrial food complex and the dependency of the agriculture industry on petrochemicals and fossil fuels. Recently, local food movements have garnered more attention from the federal government. In 2013, the U.S. Department of Agriculture (USDA) released a report on food hubs and local food marketing. According to the report, food hubs facilitate the aggregation, marketing and/or distribution of products from local farmers and ranchers to consumers by developing scale efficiency and improving distribution. The report provided a

comprehensive look at the economic role, challenges and opportunities for food hubs in the nation's growing local food movement. USDA programs such as the Rural Business Enterprise Grant, Rural Business Opportunity Grant, Value-Added Producer Grant and USDA Rural Cooperative grants were cited as state and federal initiatives designed to support local food systems (Matson et al. 2013). In a press release regarding the report, USDA Deputy Secretary of Agriculture Kathleen Merrigan explained, "At USDA, we are committed to food hubs because we believe that they offer strong and sound infrastructural support to producers across the country" (USDA 2013). She goes on to reference the Obama administration's support for rural communities:

President Obama's plan for rural America has brought about historic investment and resulted in stronger rural communities. Under the President's leadership, these investments in housing, community facilities, businesses and infrastructure have empowered rural America to continue leading the way – strengthening America's economy, small towns and rural communities. USDA's investments in rural communities support the rural way of life that stands as the backbone of our American values. President Obama and Agriculture Secretary Tom Vilsack are committed to a smarter use of Federal resources to foster sustainable economic prosperity and ensure the government is a strong partner for businesses, entrepreneurs and working families in rural communities (USDA 2013).

The support for local food systems by the current administration is promising and offers public encouragement to small-scale and rural food producers. However an over-reliance on the national political climate and federal funding could pose problems over time, leading to vulnerable local food systems in the event of a regime change or funding re-allocation. Still, the value of local food systems is increasingly apparent. Local food systems (LFS) help farmers add value to their produce by eliminating "profit-taking intermediaries" or middle-men from the food supply chain (Mount 2011). Perhaps

federal recognition and encouragement of food hubs can help enhance channels for local, small-scale producers to participate in the food chain with minimized intervention from distributors, thus retaining an integral connection between producer and consumer.

Producing food and selling it in close proximity to the farm through a food hub or in a direct sale format, (such as a farmer's market or Community Supported Agriculture (CSA)<sup>2</sup>, with minimal processing, adds value to the product and allows the farmer to profit while keeping prices reasonable for the consumer. There are also valuable yet intangible qualities of LFS that are generated by the direct exchange between the farmer and the consumer, such as trust, security and confidence (Mount 2011). The fundamental principles of a local food system are: 1) a reconnection of producer and consumer, 2) direct exchange and 3) shared values and goals. Local food is more than a commodity; it is a culture. Any attempt to scale up local food efforts, requires careful consideration of the intangible qualities, as they are harder to maintain at a larger scale and become more akin to conventional systems, to which LFS are attempting to provide an alternative (Mount 2011).

Local food systems offer a potentially viable and flexible economic option for rural people, whether farmers work full time on the farm or whether they rely on some

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<sup>2</sup> Community-Supported Agriculture (CSA) is a concept describing a community-based organization of producers and consumers. The consumers provide direct, up-front support for the local growers and in turn the producers agree to provide a sufficient quantity and quality of food to meet the expectations of the consumers. Within this general CSA arrangements vary, depending on the resources and desires of the participants (Lamb 1994).

amount of off-farm income to supplement their farming activities (Brown and Schafft 2011, Mount 2011). If small farms and local food producers scaled up their ventures to have broader systemic impact on the food supply chain, they would inevitably incur higher costs and a loss of the fundamental principles that drive the successful culture of LFS. This presents a predicament for rural food producers who wish to engage with the market and sell their product, as isolated local markets may not be enough to economically sustain the farming activities (Mount 2011).

Local food movements have gained momentum in response to social and ecological injustices in the industrial food system, and offer a partial solution to the economic challenges faced by small-scale producers, competing in a globalized economy. However, an over-reliance on localism in “reversing the global ecological crisis and achieving global economic justice” may not be the panacea some tout it to be (Cox 2014). While progress has been made towards small business development, alternative currency systems, community-based energy and local food systems, the sociopolitical reach of the localism movement (local-foods included) may be limited (Cox 2014). Still, the movement persists and the proliferation of local food systems appears to provide local and individual benefits as well as counter-systemic social action against the status quo.

### Local Knowledge

Local knowledge refers to the knowledge generated through observations of the local environment and held by a specific group of people (Berkes and Folke 2002). Local knowledge differs from indigenous or traditional (ecological) knowledge in that these

refer to a body of knowledge developed and transmitted over the course of generations (Berkes and Folke 2002). Local knowledge on the other hand, does not require a long-term connection with management traditions, but rather tested and shared experienced on a social and/or geographical community level.

Local knowledge is fundamental to the resilience and sustainability of any social-ecological system. The ways in which local institutions and organizations respond to local feedback and use local ecological knowledge to learn and develop resilient systems is crucial for the management of these systems (Berkes and Folke 2002). In agro-ecosystems, a farmer or land manager's knowledge is key to the quality of human interaction with the ecological domain and informs the adaptive capacity of that system to maintain or enhance system function. Local knowledge can compliment resource management throughout the adaptive cycle by offering qualitative monitoring in exploitation and conservation phases, building resilience during release and reorganization, and providing long-term observation and memory regarding changes in a system (Berkes and Folke 2002). Organizations, institutions and community groups that recognize, utilize and incorporate local knowledge into management objectives, generate potential in the form of human, cultural and social capital that can strengthen their capacity for adaptability and resilience, through individual knowledge and the exchange of that knowledge in the public sphere (Flora and Flora 2008).

### Social Capital and Organizational Capacity

Social capital refers to resources that can be mobilized through social relationships and networks (Scheffer et al. 2002). Bonding social capital is built through

alliances between people with similar interests for collective action. Bridging social capital is built through the formation of links between groups of diverse actors (Flora and Flora 2008). Both types of social capital are necessary for achieving transformation (Scheffer et al. 2002). Social capital is indicated by the presence of social norms and bonds and refers to the ability of a community or social group to accomplish a communal goal. Social capital is measured by the degree to which collective action and organizational assets are utilized to accomplish goals and solve important and complex problems (Pretty and Smith 2004). In agroecology, the ability of farmers to form networks, share information, and build social capital is paramount to the success of conservation and sustainability efforts, including agro-ecological development within communities. Social networks are central to alternative agricultural movements, as the exchange of information between farmers produces experiential and peer-reviewed knowledge that is lacking in agronomic science and standardized conventional agriculture (Goulet 2013).

Requisite to the success of agroecology as both an alternative conservation paradigm and sustainable agricultural management system, is the level of social capital that exists in participating communities. Community networks built on trust, reciprocity and shared norms that utilize the knowledge and skills of local people, can facilitate productive and sustainable resource management practices. As groups bond based on similar objectives, social capital is increased within communities, making long-term social and ecological sustainability more feasible (Pretty and Smith 2004). A community's ability to create and enforce social norms voluntarily is an integral

component of social capital. Without these norms, important community initiatives such as biodiversity protection measures or conservation of water resources could be compromised. While participation is an integral part of developing programs that utilize and maintain social capital for ecological benefit, passive or compensated participation may hinder the development of social capital by creating community dependence on external influence that, once removed, may decrease the groups' capacity to continue sustainable resource management practices (Pretty and Smith 2004). Therefore, it is important that social capital is constructed from the ground up, by willing and committed community members.

#### Adaptive Management and Collaborative Planning

A collaborative approach to sustainable agriculture and natural resource management is fundamental to any development strategy that intends to meet the needs and challenges of changing societies and environments (National Research Council 1991). Adaptive management is a method for systematically and continuously learning by the experience of doing, through monitoring, evaluating, adapting and modifying management strategies according to the experience (Miles 2013, Stankey 2005). A collaborative approach to adaptive management combines problem solving tactics with the principles of adaptive management and is a viable tool for strategic planning when there are multiple jurisdictions, resource users and viewpoints (stakeholders) involved in managing a social-ecological system (Miles 2013). In a collaborative process, stakeholder interests are identified and the diverse knowledge of the participants is

utilized to ascertain fine information on change, and to create solutions for social-ecological issues and adaptation strategies (Knapp 2014).

Adaptive and collaborative management strategies have been widely employed in public forest management. In 1994, the Northwest Forest Plan allocated substantial resources to ecological forest management on federal lands and in previously timber industry dependent communities in the Pacific Northwest (Baker and Middleton 2002, USFS 2002). During this time, ten Adaptive Management Areas (AMAs) were formed as experimental grounds for new strategies in eco-system management that included science education, watershed restoration, inter-agency and agency-community outreach, and developed new economic models that utilized local skills for ecosystem restoration in post-timber economies (USFS 2002).

Upon first glance, one might question how this pertains to a study on agriculture and rural resilience as forestry is not commonly viewed as agriculture or treated with the same management strategies. However, The USDA is responsible for the management of a large percentage of federal public lands through the United States Forest Service. Until relatively recently, when an environmentally sustainable and collaborative approach has been applied to forestry, timber lands were managed very much like industrial farms, characterized by mono-cropping of timber varieties for the market place such as Ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*). The advent of adaptive management strategies for managing social-ecological resilience in forests and forest communities has paralleled similar approaches in agriculture with sustainable agriculture and agroecology. Nested alongside each other in rural forest communities,

within global, national and local systems of governance, forestry and agriculture have the capacity to compliment each other in multifunctional and multi-pronged resilient social-ecological systems.

A core aspect of agroecology is the attention to context-based practices that address the specific needs of human and biotic communities anywhere. As such, the basic principles of agroecology and the treatment of the agricultural matrix (Perfecto et al. 2009) can be applied more universally to various types of eco-systems and socio-political contexts, including sustainable and organic agriculture, local food production, community forestry conservation efforts, and even the cultivation of illicit crops in forest systems.

#### *Cannabis* – Politics, Economics and Culture

The *Cannabis* plant (*Cannabis sativa*) is best known as the recreational drug “marijuana”, and its federal classification as a Schedule I Controlled Substance makes the cultivation, possession and consumption of it illegal in the United States (NIDA 2014). According to the National Institute of Drug Abuse (NIDA), “Marijuana is the most commonly abused illicit drug in the United States” (2014). According to the federal classification, the plant has no medicinal benefit. Scientific research on the medical benefits of *Cannabis* is discouraged by national agencies such as NIDA and the DEA (MAPS 2012). The term “marijuana” identifies *Cannabis* as a drug, and does not distinguish between various types of *Cannabis*, many of which are believed to be highly medicinal and nutritious. The use of the term “marijuana” conjures the popular image of the psychoactive varieties of the plant. The use of non-botanical, drug terminology is

deliberate and presents an identity frame useful for “medical marijuana” activists, seeking to legitimize psychoactive *Cannabis* for its medical uses, and to highlight the medicinal qualities of the drug (General Election 1996).

For the sake of this discussion, I have made a conscious choice to use the botanical term *Cannabis* as a general term for any medical, recreational or nutritive, legal, peri-legal or illegal use of the plant. In part this decision is based on a personal desire to de-stigmatize the plant by avoiding the use of terminology such as “marijuana”, “weed,” “pot,” “ganja,” etc. that conjure distinct drug-related cultural and political connotations in United States society. Moreover, the use of the term *Cannabis* highlights my focus on *Cannabis* as an agricultural commodity, and its role in the social and ecological fabric of some rural communities.

In 1996, California paved the way for medical *Cannabis* legislation as the first state to legalize *Cannabis* for medical use via voter initiative. Proposition 215, “The Compassionate Use Act” (CA Health and Safety Code 11362.5), made it legal for patients and their designated primary caregivers to possess and cultivate *Cannabis* for personal use given the recommendation or approval of a licensed California physician (NORML 2012). In 2003, a legislative statute known as SB 420 (CA Health and Safety Code 11362.7-.83) was passed in an effort to broaden the scope of Proposition 215 to include guidelines for cultivation, transportation and the formation of medical cultivation collectives. SB 420 set a standard statewide limit of twelve immature plants, six mature plants and up to eight ounces of processed *Cannabis* per patient, and stipulated that local

governments could increase local limits, but could not lower the limits below state-sanctioned limits.

In 2010, a California Supreme Court case, *People vs. Kelly*, set the precedent that patients cannot be prosecuted simply for exceeding the state limits and would have the opportunity to defend themselves based on medical need (NORML 2012). Also in 2010, an attempt to further legalize *Cannabis* in California was put to a vote. Proposition 19, The “Regulate, Control and Tax Cannabis Act” framed *Cannabis* as a commodity, an economic driver and tax base that local governments could regulate and benefit from. Proposition 19 did not pass, with 53.5% of California voters casting a “No” at the ballot box.

In California today, the possession or cultivation of any form of the *Cannabis* plant, including medical marijuana, remains a federal drug crime punishable by law. As of 2014, 23 states and Washington D.C. had enacted some form of medical marijuana legislation, allowing for the use of the “drug” for medicinal purposes, and two states, Colorado and Washington, had legalized the plant for recreational use.

It has been estimated that the *Cannabis* industry in California is worth up to \$31 billion dollars annually (Brekke 2014). Legalization activists tout its economic viability as an incentive to legalize, tax and regulate for statewide benefit (MCLR 2014, NORML 2015). Legislative analysts claim, while fiscal impacts of legalization initiatives are uncertain, the legalization of *Cannabis* could lead to hundreds of millions of dollars in state revenue by reducing criminal justice costs and generating state and local tax

revenues (LAO 2014). Given these estimates, there is no doubt that a legal *Cannabis* industry could be a legitimate contributor to the California economy.

*Cannabis* is big business, the fiscal impacts of which are difficult to quantify based on the “illicit, black market nature” of the industry (Greenson 2011). However, the proposed impacts of a legalized *Cannabis* industry statewide, barely add up to the estimated profits of the peri-legal industry. Uncertainty surrounding the potential impacts of legalization on *Cannabis*-dependent communities leaves many hesitant to promote legalization, for fear of a local market collapse (Daly 2014). With legalization in nearby states such as Colorado and Washington, legalization may be imminent in California as well. The “green rush” is an entrepreneurial wave attracting investment interest to the industry (Vekshin 2014). However, there may be limited profit in producing a legal agricultural commodity, as prices are driven down in a competitive marketplace (Vekshin 2014). No matter the legal status of *Cannabis*, it is a widely produced agricultural commodity, the production of which is prolific in the mountainous, forested regions of Northern California.

There are many examples from around the world that mirror the timber example in Northern California, where a combination of extractive industry, neo-liberal policy and conservation efforts create a rift in rural communities. Rural people are forced to diversify their means of income, establish food security and find a place in the market. In the absence of wage employment and profitable legal farming, many rural people turn to the cultivation and sale of illegal drug crops. In Bolivia, following the implementation of neo-liberal policies that led to the consolidation of the mining industry, miners moved

back to the land and began to farm coca (*Erythroxylum coca*) (Sanabria 2004). In Lesotho, rural people dependent on the seasonal availability of diamond mining in neighboring South Africa integrate *Cannabis* into their subsistence agriculture in order to survive the pressures of the global economy (Bloomer 2009). In the Appalachian region of the eastern United States, as coal mining ventures exhaust their supply and vacate rural communities, “hard luck entrepreneurs” turn to *Cannabis* farming as a means of economic survival (Alford 2009). In Northern California, residents of disenfranchised forest communities turn to *Cannabis* farming as well.

The 1970’s proliferation of *Cannabis* farming in the “Emerald Triangle” region of Humboldt, Mendocino and Trinity counties in Northern California was a direct result of national policies and social movements. The surge in migration of young, middle-class urbanites to rural areas was a direct response to the political climate of the United States, an act of resistance to capitalism and a celebration of the emergent environmental movement (Jacobs 1997). The Mexican marijuana trade was under attack by the U.S. Drug Enforcement Agency (DEA), opening a market for the domestic production of *Cannabis*. The politically and culturally liberal social climate created by the anti-war and environmental movements, combined with optimal geographical and temporal conditions of the remote and wooded Emerald Triangle region, made it an opportune spot for such clandestine farming activities to take root (McCoy 2004).

### Minding the Gap

Natural resource and agricultural-based rural communities are complex social-ecological systems embedded in a multi-layered context of adaptive cycles of change.

Resilience thinking provides tools to address rural capacity for adaptation and transformation. Sustainable agriculture, agroecology and collaborative adaptive management put theory into practice, addressing ecological and social well-being of land and community. However, rural communities defined by perpetuated boom-bust cycles, are vulnerable to development strategies that attempt to replace one industry with another. Boom-bust cycles in resource-dependent communities have illustrated the peril of over-reliance on one industry, and resilience thinking shows us that redundancy and diversity can strengthen the adaptive capacity of social-ecological systems.

A gap has been created in rural communities where traditional methods of subsistence are replaced with extractive natural resource-based industries. As these industries vacate, opportunities for amenity and conservation economies emerge in some places, while other less amenity-endowed communities face uncertain, questionable futures. Simultaneously, we see the emergence of a trend in local, sustainable agriculture, a product of ideological and economic shifts on global, regional and local scale. In the midst of transition in rural society, communities strive to find a new social identity and economic viability through ecologically informed practices.

The literature suggests that a new management paradigm that incorporates social wellbeing and ecological conservation may hold promise for rural communities. Resilience thinking may not offer a panacea for all rural issues on all scales, but evidence points towards the diversification of activities and industries as key components in creating more resilient local systems, and local agriculture may be one strategy within a multipart solution to do just that. Sustainable agriculture, by nature of its operational

engagement in social welfare and ecological conservation, surely holds promise as one variable in the transformation of rural economies. Yet, I have been hard pressed to find case studies of previously extraction-based communities, who have turned to sustainable agriculture as a viable response to the gap created by transnational industry.

Furthermore, studies on sustainable agriculture tend to focus on food issues, and studies in agroecology have been focused predominantly in the Global South, where food security, sovereignty and biodiversity conservation are considered in direct correlation to peasant populations who depend on subsistence agriculture to survive. In the United States, rural communities face similar issues. In the case of Hayfork, local agriculture extends well beyond food farming and so must be recognized for the multifunctional role it plays in the community.

Perhaps as we turn to resilience thinking for rural communities, there cannot be only one solution. Functional diversity is key to a resilient and productive agro-ecosystem or community. With this in mind, I have chosen to engage with this work in an effort to provide one case study that addresses this transition and the multi-faceted role that agriculture plays as part of a multi-pronged rural resilience strategy in one Northern California community, highlighting the importance that local agro-ecological knowledge plays in planning for sustainability, resilience and transformation.

## RESEARCH DESIGN AND METHODOLOGY

The research design for this study employs a grounded theory research methodology, using mixed qualitative methods that combine in-depth, semi-structured interviews, participant observation, secondary data analysis and a literature review. The research is presented in an exploratory case study format, the narrative presentation of which embodies my intention for community advocacy. The emergent qualities of this design are inherent, as research informs the inquiry. I intended for the study to be shaped by a mutual, collaborative learning experience that encouraged the co-creation of meaning between the participants and myself.

Paramount to the methodological process has been a clear analysis of my position going into the research. I have carefully considered the opportunities and limitations of my methodological approach and proceeded with caution, creativity and reflexivity. As a self-identified member of the community studied, self-reflexivity was a necessary and important aspect of my research, directly impacting each decision that I made. I am not an un-biased observer, but I sought to put any pre-conceived ideas aside and to learn from the research experience.

### The Case Study

A case study can be used as a methodology, a strategy of inquiry as well as the product of that inquiry (Creswell 2007). The case study format provides flexible and useful guidelines for research and is well suited for a study that explores a particular community within a sustained period of time (Creswell 2003, Creswell 2007). An

exploratory case study allows the researcher freedom to investigate themes of interest, while remaining open to unexpected, emergent themes. A case study format presents a “creative alternative to traditional approaches to description, emphasizing the participant’s perspective as central to the process,” and facilitates the weaving of a story about my hometown, while maintaining the centrality of community perspectives throughout (Zucker 2009). Rather than simply describing a case, an exploratory case study probes deeper theoretical themes as they are presented in the case.

#### Grounded Theory: Framework or Methodology

Grounded theory was founded on the fundamental property of emergence, and encourages researchers to pursue unanticipated, abductive themes as they are revealed in the research process. Grounded theory accounts for surprises in the research and invokes the creative interpretation of emergent themes (Hesse-Bieber and Leavy 2008).

Grounded theory provides a framework that allows for the construction of a theory and proposes that theories should be grounded in data from the field and move beyond description to generate a theory (Creswell 2007).

As a methodology, the emergent qualities of grounded theory have applications that may not include theoretical discovery (Hesse-Bieber and Leavy 2008). I did not seek to construct a theory with my research, but instead relied on emergent and iterative methods throughout the research process. The open-ended nature and broad scope of grounded theory proved especially useful to me throughout the process of gathering data and interpreting it, while adapting the study along the way (Grinnell 1997).

### Mixed Qualitative Methods

A variety of qualitative methods were required to gather information and engage community participation. Data collected through qualitative interviews and participant observation were framed and strengthened within an analysis of the social and historical context of the case. The initial data collection process revealed the next appropriate method to utilize. I adjusted often and proceeded accordingly, without limiting myself with strict guidelines, allowing the study to drive the course of the research and concepts to emerge through the process (Creswell 2003).

### Observational Research

During the course of over two years in the field, whenever opportunities arose, I engaged in observational research. I attended approximately 20 community meetings, and numerous workshops focused on local agriculture topics. I engaged in local groups, participated in community activities and attended local events. I also observed and participated in various casual conversations in and around the community, as people conversed and shared relevant information.

As a community member, participant observation methods proved the most effective and comfortable for me and offered rich learning experiences on both academic and personal levels. Participant observation is especially compatible with a grounded theory methodology in the interactive and iterative treatment of patterns, differences, similarities and generalizations as they arise from the research (Adler and Clark 2005). As I engaged in the community, I participated actively in some groups and passively in others. I practiced both thin (focused) and thick (dynamic) observation, sometimes

taking head counts and doing a quick demographic analysis, other times simply observing the dynamics of the situation (Adler and Clark 2005). During observations, I took notes if appropriate, or in some cases, chose to privately record my observations afterwards.

In observational research, researchers may risk “going native” or becoming so immersed in the group dynamic that the researcher’s objectivity is compromised (Adler and Clark 2005). I find this concept problematic, mainly in that it presupposes that a researcher can be fully objective or neutral in the first place. Regardless, I don’t believe “going native” was a primary concern of mine as I am in fact, already there. I did find however, some hesitancy to begin my fieldwork with the interview process. I made a conscious decision to take a step back, participate and observe, introduce my topic to community members and develop my research questions based, in part on these experiences. I was able to solicit support and generate interest in my study through conversation without immediately requesting participation from anyone. By the time I was ready to schedule interviews, participants were quite willing to meet with me and speak openly, which I believe was in part a result of the time taken to develop ideas and relationships prior to initiating the interview process.

### Interviews

I began by conducting a series of three preliminary, unstructured interviews with local informants from whom I sought guidance on the direction of my research. Through these interviews, I was able to determine what issues they felt were of the most concern locally and which topics they felt had been under-researched. The information and

support gleaned from these interviews directly informed the way in which I proceeded with designing my study.

The bulk of my data were then collected using in-depth, semi-structured qualitative interviews that included both closed and open-ended questions (Berg and Lune 2004). I sought to ascertain “deep” information on the experiences, values, ideology and perspectives of the interviewees (Johnson 2002). This interview format is flexible and conversational and provides “opportunities for data to emerge from the social interaction between interviewee and interviewer” (Adler and Clark 2005). I prepared questions to ask during the interview, but had the freedom to improvise, digress or modify the order or wording of the questions in keeping with the flow of the conversation (Adler and Clark 2005). This provided an opportunity to probe the participant in the direction of the research topic, while remaining available for unexpected, unprompted themes to emerge. The semi-structured interview method provided a context of structure, while allowing the interview to unfold naturally, creating a learning experience for both researcher and participant.

In addition to the three preliminary interviews, I conducted 14 interviews with 18 individuals. In total, I interviewed 21 individuals and 14 households. All interviews were with residents of the Hayfork Valley area, with the exception of one expert participant, who holds a county-wide agricultural position. I sought participants on a voluntary basis, through word of mouth and direct inquiry. I attempted to interview a balanced range of participants that represent the population of the community where age, gender, socioeconomics, land use practices and duration of residency were concerned. I

recruited participants who actively engage in agriculture on various levels from home gardening to market farming and ranching. I scheduled the interviews at times that were convenient for the participants and held them in safe, comfortable locations chosen by the participants. I required verbal consent only and did not audio record the interviews. Instead, I took hand written notes during and after each interview.

I chose the risk management procedures mentioned above for two reasons. First, based on the small town nature of the community, I wanted to insure the highest level of confidentiality possible to the participants. Second, due to the fact that I identify as a community member, I wanted to minimize the level to which the interview process created separation between the participants and myself. I believed that the seemingly standard and simple procedures of signing ones names on a form and being voice recorded, could affect the quality of the information I was able to gather. As part of a risk management strategy, I also chose not to ask any questions directly pertaining to *Cannabis*, leaving the topic open for participants to bring up on their own if so inclined.

The final version of my interview guide contained seventeen core questions. Most questions were open-ended and included prompts to assist in probing topics further during the interview. Over the course of the interviewing process, I made revisions to the interview guide and often improvised during the interview, following the course of conversation more closely than the questions themselves. After I had completed a few interviews, I was able to follow up on themes others had brought up and investigate certain topics in more detail. The process of hand recording my notes, allowed me to initiate the coding process during the interview as I listened for key words and concepts

and began to refine the concepts in the moment. Please see Appendix A for a full version of my interview guide.

### Data Analysis and Reporting

In grounded theory methodology, data collection and analysis are iterative by nature. Data is collected in the field, then brought back to the drawing board, coded, interpreted and used to inform the next iteration of the process. This process is commonly referred to as “zigzagging” (Charmaz 2005). Qualitative data analysis is interpretive, literal, reflexive and artistic, and requires close interaction between researcher, participant and content (Schutt 2001). The constant and iterative interpretation of the data was central to the efficacy of my research. Zigzagging back and forth between data collection and analysis, I revisited the data, discovered patterns as they emerged, and followed leads as they presented themselves. This process is referred to as progressive focusing, or the “process by which the qualitative analyst interacts with the data and gradually refines her focus” (Schutt 2001).

I did not use recording devices during interviews or observations, and therefore my coding methods were not as systematic as those outlined in the literature. My data appeared in the form of hand written notes on an interview guide work sheet. Following each interview, I sequestered myself, took notes and wrote memos on the interview process and content. This recording method lent itself to an initial coding phase during and directly after the interview. This process became more refined as I gained confidence in interviewing and note taking and completed more interviews. I adjusted my questions and interview strategies each time as recurring themes and code categories emerged.

Upon completion of my data collection, I began to actively compile results using measures and categories established throughout the process. I tried different methods of articulating themes from the volume of information I had collected. This part of the process was very organic and quite challenging, as I returned to the drawing board repeatedly in an attempt to describe the vastness of descriptive data I had collected, while relating back to the theoretical framework I had chosen and supported in my literature review, which was in turn also developing and changing based on my interview findings.

### Reflections

As my topic became more focused, I found new information that guided my methodological decisions. At each fork in the road, I made difficult choices, leaving some paths unexplored, at times excluding valuable questions, theories and methods better suited for another study. The process of refining my research strategy has been rooted in the emergent qualities of grounded theory and a reflexive and iterative process that suits my natural learning style very well. Throughout the research process, everything I read and every conversation I had gave me reason to revisit my ideas, reflect on the process and refine my goals, which in turn created a space for ideas to emerge, grow and evolve.

## THE CASE: HAYFORK, CALIFORNIA

Located in the heart of Trinity County and nestled in the mountains of the Emerald Triangle region of Northern California, lies the rural mountain valley town of Hayfork, California. Hayfork sits at an elevation of 2,310 feet and is surrounded by Shasta Trinity National Forest land. As of the 2010 Census, the Hayfork designated census area of 72 square miles was home to 2,368 people, 85% of whom identified as Caucasian or white, approx. 7% Native American and 8% Asian American, African American, Hispanic or Pacific Islander. The town of Hayfork is unincorporated with no municipal government beyond the elected school, fire, water and park district boards.

### A History of Agriculture

The Hayfork Valley area was originally home to the Nor-el-Muk band of the Wintu tribe and named Norilpom or Nor-El Pom, meaning large valley at base of Mountain or south upland village (Baker and Middleton 2002, Trinity County Historical Society (TCHS), 1955). European settlement of the valley began in 1851, when a group of settlers first staked out ranches and planted in the “virgin soil” (TCHS 1955). At this time, the town was called Hay Town, quite literally because of the volume of wild oats or “hay” observed in the meadow areas of the valley. By 1853 a number of ranches were established and families began to move to the valley to join the settlers. In 1854, the town was renamed Hay Fork, referring to the North Fork of the South Fork of the Trinity River, now Hayfork Creek, that runs through the center of the valley (Baker and Middleton 2002, Letton 2013, TCHS 1955).

Since the settlement era of the 1850's, the local economy and culture of Hayfork has been based on agriculture, timber and mining - all natural resources-based industries, extractive in nature. During the settlement era, livelihoods in the remote and isolated valley depended on self-sufficiency, trade, and participation in a booming agriculture market supporting the mining industry in the nearby county seat of Weaverville and along the main stem of the Trinity River (Danks 2000). Hayfork grew rapidly, and by 1854 most Native Americans in the valley had been killed, driven away, starved or migrated to other hunting and fishing grounds (Baker and Middleton 2002). In 1859, a road was built between Hayfork and Weaverville, which assisted with the delivery of agricultural product to a bustling market center.

By 1860, the white population of Hayfork totaled nearly 1,200 (TCHS 1955). At this time, farms and ranches in the Hayfork Valley were producing "sufficient quantities of grain, potatoes, beans, butter, eggs and livestock to furnish the rest of the Trinity County population" (TCHS 1955). The Hayfork and neighboring Hyampom valleys had the largest tracts of tillable land in the region (Danks 2000, Egilbert 1913). Hayfork was known as the "granary" or "bread basket" of Trinity County and was considered especially suitable for mixed farms, consisting of cultivated crops, orchards, livestock and timber (Danks 2000, Egilbert 1913). By 1860, fourteen thriving businesses had been established in Hayfork, including two grocery stores, two hotels, one hardware store, two blacksmith shops, one drug store, one feed store, three saloons and two dancehalls. At the Hayfork Hotel, most of the fresh produce, butter, eggs, milk and cream used were of local origin, with some staples carried in from Red Bluff by pack train (TCHS 1965). By

the 1880's, the livestock industry, especially cattle, had become prominent in Hayfork in response to the high demand for meat in the mining camps nearby (Danks 2000).

On April 25, 1905, the Trinity Forest Reserve was established by presidential proclamation and the name changed to the Trinity National Forest by President Roosevelt in 1907. The Forest Homestead Act of 1906 opened the forest to homesteading on lands within the forest boundaries with agricultural value that outweighed its usefulness for other purposes (TCHS 1965, Travis 2007). This led to a wave of settlement by homesteaders and agriculturalists in the Hayfork area, which was surrounded by national forest lands.

In the 1920's and 1930's, the Hayfork Valley was full of small farms and ranches and nearly everyone had a garden (Letton 2013). Most ranches and farms had orchards with apples, peaches, pears and plums, and canning over a woodstove was a common household activity. Most households had flocks of chickens for eggs and meat and some raised turkeys, hogs and dairy cows for household use and sale on the market. At that time, most of the water for irrigation of the ranches and farms came from diversions from Hayfork Creek, and some of the smaller producers used water from small creeks, springs and gulches (Letton 2013). Summer crops such as tomatoes, corn, peppers and melons were harvested in the summer and root vegetables such as potatoes, carrots and turnips were harvested and stored throughout the fall and winter (Letton 2013). In 1921, the first Trinity County Fair, an agricultural exposition, was held in the central location of Hayfork and has been held there ever since.

Grain crops continued to be grown in the valley and as the town's name indicates, hay and alfalfa were very commonly grown for use as horse and cattle feed. From the 1920's through World War II, wheat was the primary grain grown in the valley and was used as a food source for people and small livestock (Letton 2013). During this period, dry beans were also commonly grown as a staple food crop. With only a couple of mechanized threshers in the valley, cooperative threshing was common, and community members would contribute to getting everyone's grain and bean crops threshed (Letton 2013). The alluvial, sandy loam soils in the Hayfork Valley have minimal nutrient content. Poor soil quality, coupled with inconsistent water availability due to drought and irrigation allocations, often led to lower than desired grain and hay yields. Farmers often supplemented the soil with animal manure, but without ample water still struggled with soil fertility and low yields.

During the Great Depression of the 1930's, the subsistence living and culture the community was founded on, was still feasible in Hayfork. During this time, when cash was limited, farmers would frequently cut and sell timber off the lands to diversify their income potential and pay the property taxes. Through the Depression and into the World War II period, farmers nationwide were encouraged (with subsidies) to keep agricultural production high enough to sustain local and global feed supplies. Though Hayfork's exports were minimal, the reaches of federal subsidies still impacted local farms and ranches. After the war ended, subsidies continued for those required to reduce and intensify crop production, even when the value of the production outweighed the value of the subsidies (Brown and Schafft 2011). In the post-war period, many Hayfork farms and

ranches were unable to keep up with operating costs and forced to liquidate livestock, equipment and land. Others diversified income streams by leasing agricultural land to mining operations along Hayfork Creek (Letton 2013).

Until World War II, the population and economic mainstays of the community of Hayfork had not fluctuated much. Agriculture was a thriving economy and vehicle for rural subsistence living, supplemented by mining and timber ventures. Logging and sawmilling had co-existed with agriculture since settlement, and like agriculture, supported the mining industry by supplying building materials and fuel. By 1858, there were nineteen sawmills in the county, the greatest concentrations of which were located in the Hayfork Valley (Danks 2000). In the years following World War II, the increasingly restrictive federal agricultural policies, combined with a post-war timber boom, brought the mainstream timber industry to Hayfork and shifted the community's economy to an industrial economy based on timber. The number of saw mills in Trinity County peaked in 1949 (Danks 2000). The local knowledge and expertise of the work force in Hayfork was well suited for work in the forest, and the development of large mills in the valley drew a substantial influx of migrant mill workers from outside areas. In 1955 it was estimated that there were nine billion feet of merchantable timber "within reach" of the Hayfork Valley, the harvesting and processing of which was considered a great opportunity for the community (TCHS 1955).

Simultaneously, in post-World War II United States, the industrialization and centralization of agriculture and food supply was taking place. The industrial model of agriculture promoted intensified production and focused on high yields for less labor,

thus requiring the use of machinery, pesticides, herbicides, high nitrogen synthetic fertilizers and heavy irrigation (Brown and Schafft 2011, Perfecto et al. 2009). The model further distinguished traditional subsistence scale farming from the quickly globalizing system of industrialized agriculture (West 2011). In the modernizing commodity chain, the producer was further separated from the consumer, with many costly processes in between, creating difficulties for small, local operations wishing to compete with the subsidized oligopoly of the global food system (Perfecto et al. 2009). In rural communities like Hayfork, where farming and agriculture was a way of life, a means of survival and deeply embedded in the culture of the community, the shift away from a local food system to an industrialized economy meant that local agriculture was supplemented heavily, if not replaced entirely by subsidized food products delivered to the local grocery stores by food trucks and paid for in large part by timber dollars.

#### The Environmental Movement and Back-to-the-Landers

In 1962, Rachel Carson wrote a book titled *Silent Spring*, which first cited some of the problems associated with industrialized agriculture. She suggested that the intense use of pesticides in agriculture was causing a dramatic effect on the environment (Perfecto et al. 2009). *Silent Spring* inspired popular thought pertaining to environmental pollution and was a pivotal piece of literature spurring the environmental movement of the late 1960's and early 1970's (Perfecto et al. 2009). Counter-systemic movements of the late 1960's signified the beginning of a national shift in consciousness in response to the hegemonic power of government, the oppressive and expansive reach of industry, and the inequity of human and civil rights. The influence of structural oppression on human

beings was mirrored by ecological devastation caused by the same structural influences. Environmentalism emerged as a response to the increasingly aggressive industrial pursuits by transnational corporations and the resulting effects on the natural environment (Bevington 2009, Brown and Schafft 2011).

The mainstream environmental movement gained momentum in the United States following the first Earth Day in 1970 (Bevington 2009). As the movement grew, people questioned the pollution and toxicity associated with the petrochemicals used in agriculture. Questions arose surrounding the population boom and the strategies being employed to feed a growing population using scarce energy resources such as oil. These concerns helped spur a movement in the United States that drew young people out of the cities, into rural areas, in search of an environmentally sound, peaceful and healthy way of life, centered around self-reliance, subsistence and sustainability. Urbanites headed to the hills to homestead, in search of simplicity and in resistance to the capitalist, war-mongering drive of mainstream America and the widespread suburbanization of agricultural lands. They sought a way of life that, in many cases, was traditional to the areas they were homesteading, but had been displaced by the industrialization and centralization of agriculture and the insurgence of resource based economies, such as timber and mining.

This period was appropriately named the “back-to-the-land movement” (Jacobs 1997). Driven by a rejection of urban life and the romantic pursuit of a rural lifestyle, back-to-the-landers found their homes in many Northern California towns (Keith 2011).

The movement brought cultural changes to rural communities, most notably, a sustainability ethic, fueled by environmentalism and eco-consciousness. This was the beginning of a shift away from rural dependence on industry and toward a culture of self-sufficiency and ecological sustainability (Jacobs 1997). Many “back-to-the-landers” found their mountain home in Hayfork and began to homestead, growing their own food and medicine. The geographic isolation, natural beauty and low land prices offered incentives for this new wave of settlers. With this in-migration, the agricultural way of life was reinforced with an ethic of responsibility to the land and community.

#### The Timber Environment

For the better part of the 20th century, the timber industry in the Pacific Northwest boomed and in turn provided many jobs in the forest, in mills and in all sectors of community. This profitable period for timber companies provided solid employment for many people, but was a period of devastation for the forests. Soon American environmentalists came to understand the severity of the ecological crisis of deforestation and were motivated by a sense of urgency to slow the pace of timber harvesting on federal public lands. As the movement gained momentum in the 1980’s, environmental groups became aware of the rampant harvest of old growth timber in the Pacific Northwest and took action to stop it (Bevington 2009).

The environmental movement targeted industrial practices nationally, making it harder for extraction-based companies to operate on public lands. In the Pacific Northwest, efforts to stop timber extraction on public lands and increase regulation on private lands using litigation tactics and injunctions slowed timber operations

substantially (Bevington 2009). Federal legislation and forest management policy shifts outlined in the 1994 Northwest Forest Plan brought increased federal influence on forest communities region-wide. The timber industry consolidated regionally, closing mill sites and relocating milling operations to more centralized locations. Incremental environmental victories for national forests and the concurrent consolidation of the timber industry, led to the gradual loss of many timber jobs, causing significant economic and social changes in timber dependent communities like Hayfork. What had been a boom since World War II, was now, fifty years later, a bust, and rural timber communities were left to shoulder the burden. This was a period of great hardship and extreme conflict in Hayfork (Danks 2000).

The environmental movement has been both credited and blamed for major shifts in federal environmental policy, limiting resource extraction on public lands. However, resource exhaustion and corporate consolidation by the timber industry was equally to blame (Draffan 2006). The impact on rural communities, illustrated by increased unemployment rates, abject poverty and population decline, especially in communities where mill closures took place, were visible region-wide (Johnson 2014). The notoriously eco-centric environmental movement worked tirelessly to set up conservation plans around the world, while globalization persisted to centralize industry, neither considering the impacts on rural communities and people that had sustained these industries and stewarded the natural environment all along (Brown 1995).

In 1996, the only remaining sawmill operating in Hayfork, owned by Sierra Pacific Industries, closed (Danks 2000). With 160 jobs on property and many more

associated contracting jobs, the mill had been the largest employer in Hayfork. Upon its closure, the community of Hayfork suffered a major economic and cultural loss. Hayfork was a federally recognized, timber-dependent community with intimate and complex social and economic relationships with the surrounding federally-managed forest lands (USFS 2004). The mill closure signified a period of great social conflict and economic hardship for the community. The deindustrialization of timber left a disempowered community and a window of opportunity for either drastic rural decline or the growth and expansion of other industries. It was assumed that Hayfork would either transition to a tourist-based economy or diminish and fade away. Surprisingly, neither phenomenon occurred (Sherman, 2009). Instead, the convergence of three agricultural sectors have led in part, to the town's survival in the wake of the timber industry, only further exemplifying the resilience and adaptive capacity of the community of Hayfork: 1) collaborative forest management, 2) a local food movement, and 3) the *Cannabis* industry.

### Collaborative Forest Management

In response to the waning timber industry, a considerable movement towards collaborative community forestry and adaptive management developed in the Hayfork area. Efforts were spearheaded by the Trinity Bioregion Group, a multi-stakeholder community collaborative that worked tirelessly to develop a forest policy that both sides of a divided community could support. In 1993, to further activate these efforts, a non-profit organization, the Watershed Research and Training Center (WRTC) formed with a mission to “rebuild the economy based on an ethic of stewardship and restoration”

(WRTC 2014). The transition was also facilitated by President Clinton's 1994 Northwest Forest Plan, which directed federal land management agencies to transition timber-dependent communities using adaptive forest management strategies. The initial work of the Trinity Bioregion Group is credited in part for the formation of the 400,000-acre Hayfork Adaptive Management Area, the largest of ten AMAs formed in the Pacific Northwest, encompassing Hayfork and seventeen other Northern California towns in four counties (USFS 2004).

WRTC worked on preparing the local work force for a new type of natural resources economy, through a formal worker-retraining program focused on conservation and eco-system management. Considerable research and attention was placed on the viability of non-timber forest products (NTFP) as part of a solution to diversify the community's economy that would utilize the job skills and ecological knowledge of the local people. A growing national and international demand for wild foods, herbal medicines and special woods found in the public lands surrounding Hayfork, offered an attractive economic incentive for gatherers, wild-crafters, artisans and entrepreneurial enterprise (Everett 2001).

Special emphasis was placed on collaborative planning between federal agencies and local communities. When the Northwest Forest Plan passed in 1994, programs were implemented to help ease the transition of timber communities from extraction sites to community-based, adaptive management areas (Danks 2000). This was a great idea, but the social and institutional capacity of public agencies to manage these programs on a local level had already been diminished by the conflicts and disenfranchisement this

transition had caused (Danks 2000). It was soon realized that reliance on federal agencies to promote and manage for collaborative community forestry was ineffective and that community based collaborative efforts would be crucial moving forward.

Local collaborative groups that formed during the period that followed the mill closure had notable organizational capacity that enhanced the development of social capital in the community (Baker and Middleton 2002, Danks 2000). Even though forestry issues affected the entire region, many groups were based in Hayfork and largely focused around issues having to do with national forest management in the Hayfork Adaptive Management Area (AMA) (Danks 2000). The emergence of local groups in such a pivotal time, showed the existence of social capital and capacity for resilience through organizational initiative to adapt in the face of serious changes in the community. However, support and participation on the part of the public agencies with funding and decision making power was still questionable. While the existence of horizontal social capital and organizational capacity was evidenced by the groups' ability to convene in a grassroots manner, a limited capacity for vertical integration with the public agencies and governing entities led to limited success working within the constraints of local agency structure. However, the work of local collaborative groups has been very influential on community forestry policy on a regional and national level (Cromley et al. 2005).

In late 2012, nearly 20 years since the Northwest Forest Plan's initial call for collaborative adaptive management in forest communities, a new opportunity for a vertically integrated multi-stakeholder collaborative group emerged and the Trinity County Collaborative Group (the Trinity Collaborative) was formed. During a visit to

Trinity County in November 2012, USDA Secretary Tom Vilsack publicly recognized the unique challenges facing Trinity and solicited community support for a new regime of collaborative planning and rural development. Though the momentum and local capacity for such an effort had been building for some time, this visit served as an impetus for transformation within the resource management culture surrounding public lands. Revitalized support from local, regional and federal government made collaborative planning a real possibility in Trinity County once again.

The Trinity Collaborative is a formal, multi-stakeholder, volunteer-based advisory group to the County Board of Supervisors and convened by the Trinity Resource Conservation District <sup>3</sup>(Merwin 2013, Miles 2013). The group began to meet in the spring of 2013, with monthly meetings alternating between Hayfork and Weaverville. The group's consensus-building process, vision, mission and goals, were all created collaboratively. The mission of the Trinity County Collaborative is:

*To create and recommend for implementation, natural resources, land management and economic development strategies driven by local values and goals that: 1) acknowledge the interrelation between community, economy and ecology; 2) provide solutions for sustainable and resilient economic and ecological practices and projects; 3) foster a culture of stewardship; 4) improve our community, economy and ecology; 5) create a better place for future generations” (Trinity Collaborative 2013).*

With two years in operation and approximately 55 active members, the group has demonstrated successful collaborative action, due in large part to the diversity of local knowledge represented in the group and the rich experience of past collaborative

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<sup>3</sup> A Resource Conservation District is a quasi-federal organization with federal funding status and a local board of directors.

participation (Merwin 2013). In addition, the active and willing participation and engagement of federal agency land managers from local, regional and state levels has created a collaborative environment for bridging social capital, unprecedented in the past. With approximately 76% of Trinity County land, federally managed by the United States Forest Service (USFS) and Bureau of Land Management (BLM), it is no wonder that organization and planning has been centrally focused around public land management issues and the rural development outcomes of effective resource management. The management of public lands, and the communities embedded within, them is fundamental to the county's social-ecological well-being. The way in which private lands are used and managed is also important for local economies and culture. In Hayfork, home to historically independent entrepreneurs and homesteaders, private land use for agriculture plays a major part in the social and ecological fabric of the community, and is most visible through the local food movement and the *Cannabis* industry.

### Local Food Movement

Once upon a time, Hayfork produced enough food to sustain the local population and export to neighboring counties. In the mid 20<sup>th</sup> century, the influence of the industrial timber economy, combined with national trends towards a consumer culture, led many to rely on externally-produced and processed foods sold in the grocery store. In this period there was a sharp decline in small-scale and subsistence farming in Hayfork. In the 1970's, the back-to-the-land, organic food and sustainable agriculture movements brought some subsistence culture back to life. Now, 40 years later, the local food

movement is making another, stronger comeback.

In 1990, a group of Trinity County farmers organized to start what would eventually become the Trinity Growers Association. They recognized the need for a venue that would provide access to each other, seeds and support their ability to grow things, survive and thrive. And so, in 1996 the Hayfork and Weaverville Farmer's Markets were formed. At first, when the Hayfork Farmer's Market opened, few vendors participated, but the market offered a venue to purchase produce directly on Main Street and offered an alternative to the limited food options offered by the struggling local grocery stores. In addition to the development of the farmer's market, many households who chose to stay through a period of out-migration after the mill closure in Hayfork turned to subsistence gardening and farming to off-set food costs and supplement household incomes.

At first, the Weaverville market saw incredible success, marked by the presence of many local vendors and strong community support. Weaverville, albeit rural, has a larger population, and as the county seat, serves a greater cross-section of the county. It is also located on a major state highway that connects the Central Valley to the coast, making it a destination for regional farmers and tourists alike. Weaverville's socio-economic status also differs significantly as it is home to thriving local government, service and tourism sectors and boasts a much higher employment rate than Hayfork (Baker and Middleton 2002). The Hayfork Farmer's Market got a slower start initially, and in the years that followed both markets experienced a sharp decline in both producer participation and customer base. Despite efforts to combat the economic downturn of the

post-timber era, the community of Hayfork struggled economically and socially, and every business in town was impacted, many shutting their doors in the late 1990's.

One family held fast as the most consistent vendor at The Hayfork Farmer's Market through these times. These self-proclaimed "back-to-the-landers" from the 1970's, having farmed on a household level for over twenty years, were faced with a predicament when the mill closed down. They had relied on the husband's income as a mill worker for years and rather than re-locate to find more work in the timber industry, they made the conscious choice to remain and put their homesteading skills, and belief in the benefits of healthy, organic foods, to use in the marketplace as a means of financial necessity.

Today, nearly two decades later, the market continues to operate Tuesdays and Fridays, May – October, and has seen considerable growth and increased local support. According to a 2013 article in the local newspaper, *The Trinity Journal*, the Trinity County Grower's Association membership and participation in the local markets had spiked in the last "couple years." The article attributes this upturn to a cultural shift, felt by both farmers and consumers, of a "growing awareness of the inadequacies of the commercial food system and the innate value of growing your own food" (McDaniel 2013). Even with the shift in consumer preference toward local food, the Hayfork market still struggles for support. The aforementioned local family farm still participates and has been a steadfast pillar of local food since 1996, but others producers have been less consistent. The Hayfork market struggles with maintaining producer participation as well as a customer base to support the vendors. The markets are not very well supported

overall as “people are so used to doing what they are doing, to having a one-stop-shop where they can get everything” (McDaniel 2013). Echoing this point, one Hayfork farmer recites his experience standing at his market stall and watching friends and neighbors make a choice to buy the same produce in the store across the street for the same or higher price.

Competition with the status quo and the convenience offered by the conventional food system, still challenge the development and evolution of the local food system in Hayfork. However, broader cultural shifts and awareness of problems associated with the industrial food system, the emergence of local organizations focused on local foods such as the Trinity Grower’s Association, and the cultural legacy of sovereign living and local food production in Hayfork, have combined to create some momentum around the farmer’s market and other local food initiatives (McDaniel 2013). The changing economy and demographics of Hayfork have also assisted in the growth of the local food movement.

On Friday May 16, 2014, the first Hayfork Farmer’s Market of the season took place in a brand new location, the Hayfork Park. This kick-off boasted a sizeable increase in the number of vendors from prior years as well live music performances. A new market manager had taken over operations of the market, making it easier for vendors to focus on producing and selling, without the hassle of managing market logistics. In an effort to boost the market culture even further, the Hayfork Farmer’s Market combined forces with “Summer in the Park,” a monthly outdoor event that hosts local vendors and live entertainment in a festival format. Market activists anticipated

better attendance, information sharing and general community enjoyment with the new location and format of the market and hoped to provide outreach and education to a broader cross-section of the community.

In order to vend at the Hayfork Farmer's Market, items must be homegrown or homemade by local producers. All producers must have a seller's permit, available from the County Agriculture Commission for just \$7.50. Ten percent (10%) of proceeds, up to \$20 per vendor, are paid to the market for infrastructure and insurance costs. The 2014 market provided local (organic) produce, nursery starts, vegan treats, homemade personal care items, baked goods, eggs and more. In summer 2015, Friday markets will continue in the park location and planning has already begun to continue the trend towards a diverse, affordable and well-attended market.

Aside from the Hayfork Farmer's Market, the availability of local foods for purchase in downtown Hayfork is very limited. The town boasts three grocery stores, one of which specializes in health food and organic products, and one market carries locally raised, grass and grain fed beef. However, none of the three carry local produce. According to one store manager, the inconsistency of local food supply and the lack of certification among local growers are the biggest barriers to carrying local foods. The economics of running a small, family-owned business require that shelf space is utilized to supply products that the community demands. It is also inefficient for a purchaser to engage with multiple producers in order to supply short-term, seasonal products, so working with designated distributors is more desirable. Food safety and liability concerns also inhibit stores from engaging with unlicensed or uncertified producers

selling unregulated food locally. In this store manager's opinion, the farmer's market, in addition to the three year-round markets, provide a balanced supply for the local consumer base.

Farmers who have considered selling to local markets find the wholesale rates too low, and would rather sell directly at the farmer's market to receive fair market value for their produce. The local beef producer butchers and sells directly through a family-owned business, so there is no intermediary to absorb the profit margin. Otherwise, the production expenses involved with long distance slaughtering hauls and USDA requirements could outweigh the profit potential of selling local beef. The direct sale potential in Hayfork is not limited to the farmer's market and local grocery outlets. There is an underground food economy as well, which consists of private direct sale as well as trade. Meat, eggs, produce, cheese, preserves, baked goods and herbal products can all be found locally by consumers who wish to buy or trade directly with local producers.

A couple of local groups have brought additional focus to agricultural issues in Hayfork: Trinity Homegrown Foods (THF) and the Hayfork Cooperative. THF is an informal organization with a goal to "come together, exchange information and share in a culture of self sufficiency, community and good food" (McDaniel 2013). THF is a countywide organization whose membership grew quickly to over eighty people in just two short years. The popularity of this group's hands-on activities and spirited meetings was an indication of a local demand for such a group. The group focuses on nutrition, localism, food security and sovereignty. Their brochure states that "locally grown produce is not only fresher but more nutritious" and it is "unwise to depend on global

food delivery system,” and that “money spent on local food recirculates through the local economy.” (THF 2013) The southern chapter of THF was located in Hayfork and hosted monthly meetings and various workshops throughout the years. In late 2013, the Hayfork chapter was absorbed into the countywide chapter and activity in the Hayfork area began to slow. The Hayfork Cooperative meets monthly to discuss issues such as water conservation, sustainable farming, permaculture, Native American values and global topics. The group provides a seed exchange and book library and often shows films and hosts presentations on a variety of subjects including but not limited to local agriculture. Since the dissolution of the local chapter of Trinity Homegrown Foods, the Hayfork Cooperative has seen a slight increase in meeting attendance and has taken a sharper focus on agricultural and local and global food related issues from gardening techniques to food sovereignty and concerns around Genetically Modified Organisms (GMO).

### GMOs

Genetically Modified (or engineered) Organisms (GMOs) are a hot topic in the food safety discourse. The prevalence of the use of GMOs in conventional agriculture, combined with a lack of data on the potential health and environmental impacts, leaves many farmers and consumers concerned. Trinity County put itself on the map in the GMO debate when it became the second county in the United States to ban GMOs by ordinance in 2004. The ordinance was supported broadly by county residents of diverse backgrounds and was voted in 3-1 by the County Board of Supervisors (Farm Progress 2004). The purpose of the ordinance is to “protect our agricultural industry, our natural

environment, the private property rights of our citizens and the health and safety of our people by restricting the introduction into our county of genetically engineered crops, livestock and other organisms” (Trinity County 2004). The progressive nature of this ordinance provides yet another example of the importance of agriculture and environmental protection, combined with a spirit of activism and independence that is prevalent throughout Trinity County and in Hayfork.

The progressive and proactive GMO policy, the growing local food movement and renewed participation in collaborative resource management, all indicate a community with potential for increased resilience through a multi-pronged approach to sustainable agriculture. However, the growing local, agro-ecological knowledge surrounding these trends must be applied to a discourse regarding the number one agricultural commodity being produced in the Hayfork area, *Cannabis*. Complexities surrounding the nebulous legal status of *Cannabis* cultivation, the lack of regulation around it’s production, and the unique social and economic influences of the *Cannabis* industry on a community, cannot be omitted from a sustainable agriculture discourse.

### *Cannabis*

The socio-political and economic context of the 1990’s influenced a major expansion in the scale of *Cannabis* production, particularly in the Emerald Triangle. Though the area had long been home to *Cannabis* production, the vacuum created by the departure of the timber industry, combined with a desirable natural environment, remote location, availability of cheap land and limited law enforcement capacity, left the area prime for a surge in *Cannabis* cultivation. *Cannabis* farming had been common practice

already in the Hayfork area since the 1970's, but had mainly provided families with supplemental income and personal supply. The timeliness of the 1996 "Compassionate Use Act" opened the door for a surge in outdoor *Cannabis* production in Hayfork and surrounding rural communities.

Under Proposition 215, medical patients could cultivate or possess any amount of *Cannabis* deemed appropriate by their physician. Then in 2003, SB 420 set a standard statewide limit on cultivation but also stipulated that local governments could increase local limits, but could not lower the limits below state sanctioned limits. In the period that followed the passing of SB420, Trinity County struggled to establish local *Cannabis* ordinances that complied with state and federal policy, while protecting local communities and the environment. For some time, the county allowed a 12-plant maximum, double that of the state allowance. This comparatively lenient county law, combined with state legislation and a culture of lawlessness and private property rights, aided in a notable increase in the scale of *Cannabis* production in the Hayfork area in the mid 2000's. Soon the *Cannabis* boom or green rush was obvious to residents, visitors and prospectors alike. A 2009 *LA Times* article identified Hayfork as a "hotbed for medical marijuana farming" and "Northern California's Pot Paradise", and cites evidence of the influx of "big-city refugees" and the up-bidding of real estate with "sun-soaked southern exposure" (Samuels 2009). A local op-ed writer waxed over how "marijuana farming has swept over our county like a tsunami – on a huge scale and lightning fast", and lamented "the unfriendly takeover of our lands, our environments and our

communities” by overdevelopment, deforestation and general lack of awareness of Hayfork culture or natural resource protection (Seronello 2010).

The end uses of the *Cannabis* produced in the Hayfork Valley area are medicinal and recreational. With limited legal channels for distribution via patient collectives, *Cannabis* products are mostly being sold on the open market, through underground economic channels. To date, there has not been a careful survey conducted in Trinity County on the fiscal impacts of the *Cannabis* industry. However, in nearby Humboldt County, it is estimated that approximately 25% of the county’s economy is dependent on *Cannabis* (Daly 2014, Greenson 2011). Many don’t pay taxes or use banks for revenue generated with *Cannabis*, but local services and organizations are maintained in large part by *Cannabis* money (Daly 2014). Based on my observations, the same is true for the *Cannabis* industry in Trinity County, the epicenter of which is the Hayfork Valley.

The *Cannabis* industry has quickly boomed and become a major driver of the Hayfork economy. New local businesses have opened and longer standing businesses have adapted to cater to a “growing” population. Home to one nursery and one hardware store just ten years ago, Hayfork now supports four separate nurseries & gardening supply enterprises, one local feed and livestock store, one building supply, one hardware store and one electrical/ plumbing supply shop. Each of these businesses carry materials specifically geared for farming *Cannabis*, and a wide variety of general agriculture and homesteading supplies, such as soil, compost, nutrients, amendments, fencing, water system and irrigation supplies, and alternative energy supplies. The three grocery outlets, that once struggled to maintain a diverse inventory of goods, now bustle with business

and have branched out to carry more products like organic foods and harvest implements that are desired by a changing demographic. Commercial properties that were boarded up after the mill closed have re-opened and businesses are generally thriving. A coffee house/live music venue, an art gallery/head shop, a gym, yoga studio and two restaurants have opened to provide for local demands.

Real estate sales have increased dramatically and prices have skyrocketed, especially for raw land with access to sun exposure and an established water source. Real estate data for one Hayfork subdivision shows that from 1998-2002, only seven total properties were sold, and at the very low price of approximately \$2,000 per acre. The following year, the volume of properties sold jumped to sixteen in just one year. Between 2003-2008, prices steadily increased. In 2009, as national real estate values plummeted in a post-recession market crash, there was a sharp spike in both price and number of properties sold in Hayfork with 36 parcels sold at an average price of \$10,000/acre. This upward trend was punctuated with another spike in sales and values in 2012 and has continued steadily through 2014, with properties in this same area, now selling for \$30,000/ acre and more (Equal Housing Opportunity 2014, Trinity Outdoor Premier Properties 2014).

The *Cannabis* culture in Hayfork is complex and controversial. The direction of the industry in Hayfork is generally vulnerable to social and ecological shifts such as market changes, regulation and policy changes, environmental regulations and drought. The potential impacts of legalization could include a dramatic decrease in wholesale prices, the industrialization of production, increased regulation and taxation. Higher

production costs for small-scale farmers could cause an out-migration of producers from clandestine Hayfork, where input and transportation costs are already high. The possibility that the value of *Cannabis* could plummet or “crash” is a very real concern for a community like Hayfork that may have developed an over-dependence on the economic stimulus the industry has provided. With statewide legalization on the horizon, a *Cannabis*-dependent boom-town like Hayfork could be on the verge of a “bust” without preparation for such a shift. Active diversification of the economy on a household, community and regional level is essential in preparing for such an impact. A focus on developing a niche market for sustainably-grown, medicinal and recreational-grade product could also be helpful for small-scale producers as they brace for the potential impact of a market and regulatory change.

Regardless of speculations on legalization, the future of the *Cannabis* industry at large is still uncertain. *Cannabis* remains the primary agricultural commodity produced in Hayfork and is actively and widely exported via illegal supply chains. The social, economic and ecological effects of the industry in Hayfork are evident to the naked eye and the value of the commodity remains high enough to incentivize the continuation and proliferation of cultivation activities. The green rush is alive and well in Hayfork today.

The drastic changes that have taken place in Hayfork at the hand of the *Cannabis* industry are undeniable. Over the course of the eighteen years since the first medical *Cannabis* legislation, the industry has boomed in Hayfork. Through this transition, many social-ecological changes have taken place. The rural landscape is changing once again, as *Cannabis* farms sprout up throughout the forest environment. There has been a new

influx of urbanites, the contemporary counterpart the 1970's "back-to-the-landers", who have moved into the area in pursuit of a profitable rural lifestyle. Now the community is faced with the challenge of preparing for the future, while relying on what could be another boom-bust economy.

The rapid growth of the *Cannabis* industry in Hayfork and the economic stimulus it has provided have created an opportunity to learn from the past and to create local systems to prepare for the impacts of large scale social, political and economic shifts. The community's ability and willingness to organize around sustainability planning that incorporates *Cannabis* production, without promoting an imbalanced reliance on it, is threatened by conflicts, secrecy and lawlessness associated with *Cannabis* culture. In essence, it's hard to plan for something that, by letter of the law, cannot exist. However, without preparation, Hayfork and the lands that support it could be left in the wake of another social-ecological collapse at the hands of eradication, legalization, industrialization or severe drought.

Since the settlement of Hayfork Valley, we have seen the effects of resource industry booms, and through it all, agriculture has been a mainstay for the community. Even when the food economy could not support the community, subsistence living offered stability through times of major social change. A vulnerability to large-scale social and political changes has left Hayfork threatened in the wake of industry. Now, a potential over-reliance on the unstable and federally unrecognized *Cannabis* industry leaves the community vulnerable once again. However, in the same time that *Cannabis* has boomed in Hayfork, subsequent efforts towards a local food movement and

collaborative and adaptive natural resource management have paved the way for a diversified approach to agriculture in Hayfork, which could play a major part in increasing resilience and enhancing the ability to transform should a major social or ecological shock occur.

### Agricultural Renaissance

In the past decade, the agricultural climate in Hayfork has continued to change and evolve into what some call a “revolution.” As peasant movements take place in rural areas throughout the world, there is also an agricultural renaissance taking place in Hayfork today. The convergence of a local food movement, focused on revitalizing local agriculture, combined with the economic and cultural influences of the *Cannabis* industry and the promising economic and ecological opportunities that collaborative forest management offers, appears to be the community’s response to the drastic changes of the past and preparation for inevitable changes to come.

In 2005, a survey by the University of California Cooperative Extension was conducted to gauge “landowner interest in retaining or expanding agricultural production” in the Hayfork and neighboring Hyampom valleys (Fall and Folero 2006). The study focused on these areas as they have the highest concentration of farms in the entire county, yet 74% or 133 respondents stated that their land was not currently used for agricultural production. Forty percent of respondents were interested in producing agricultural commodities including forest products, specialty crops (such as medicinal herbs) and fruits. Respondents cited lack of funding, marketing opportunities and a

distribution network as the primary obstacles to agricultural production and half of all respondents preferred alternative or organic methods.

In 2005, the Hayfork and Hyampom areas had seen a decline in agricultural production. Thirty-one percent (31%) of the respondents stated that their property had been used for agricultural production but was not any longer. Another 4% of survey participants were absentee landowners and did not live in Trinity County. The study was directed to landowners of agricultural land only. As such, the sample population was older, more educated with higher incomes than the county average (Fall and Folero 2006). A similar study that included a broader sample of the Hayfork population and included all land zoning types would be useful in determining a more accurate assessment of agricultural production taking place in Hayfork today, which I estimate to be much higher.

In 2005, 58% of survey respondents had a creek or surface water supply, 40% with a spring or seep well, 33% with a well, and less than 5% with access to city water. At the time, the respondents did not feel water supply or quantity was an obstacle to agricultural production, however, the authors of the report noted the reliance on creek and spring water should raise “a cautionary note” (Fall and Folero 2006). Since then, perceptions have changed. After a series of very dry years and the most serious drought on record in 2014, the farmers interviewed for this study, cited water availability as a major concern to be addressed by increasing infrastructural investment and/or decreasing production. Despite a changing trajectory toward increased agriculture in Hayfork,

concerns over water security and extreme scarcity present formidable challenges to all land users and agro-ecosystems.

### Water

In January of 2014, California Governor Jerry Brown declared a statewide drought emergency (CA 2014). The year that followed was defined by extreme water scarcity across California. Water allocations excluded many Central Valley farmers, leaving some industrial farms without water. Even in a critically dry year for the Trinity River Basin, water diversions from Trinity River were needed to help meet state demand (Trinity Journal 2014). With little snow pack in the mountains around Hayfork, creeks and streams were at an all time low, many dry at the beginning of the growing season.

Early in 2014, local residents and officials anticipated one of the lowest water years on record and there was general speculation about potential water conflicts as the summer heated up. If water use practices were not adapted to the current water situation on a widespread level, a marked increase in water theft, illegal diversions and the underground sale of the municipal water supply were probable. Many blamed *Cannabis* farmers for the lack of water supply, but others observed that long-standing water rights for large tracts of agriculture lands were also draining the area's water supply. Where most agricultural water use comes from creeks, streams and wells, the legality of water diversions is an important consideration. The limited regulatory capacity of state water agencies combined with limited community buy-in on reporting water use, makes water use hard to track in the Hayfork area.

Local organizations mobilized quickly to promote water conservation early in the year. WRTC conducted proactive outreach even before the drought was officially declared. They hosted events in areas known for intensive *Cannabis* farming, to promote watershed conservation and sustainable alternatives for water use in agriculture. The Trinity Collaborative officially prioritized local water issues on their monthly agenda. The Hayfork Cooperative held a series of workshops on water conservation, emphasizing water conservation strategies such as rain catchment, timely diversion and storage, gray water recycling, crop and herd reduction and more. However, as the growing season progressed, tensions grew and the high value of *Cannabis* created a trade-off between water and capital, each a valuable resource.

On June 14, 2014, in an effort to address ecological concerns associated with *Cannabis* farming, WRTC hosted a timely workshop called “Growing Green in 2014,” featuring speakers from the Humboldt County based, Emerald Grower’s Association. The event was held at the local coffee house, featured live music and local speakers and attempted to include *Cannabis* farmers in a conservation discourse that focused on applying local knowledge, taking action, and gaining legitimacy through compliance with environmental regulations. In another effort to diffuse conflicts over water use in *Cannabis* farming, a regular *Trinity Journal* column by WRTC reminded Trinity residents that *Cannabis* farmers are not solely responsible for the drought and that the “water scarcity problem is cumulative”. The column identified lack of water regulation as a common obstacle and called for citizens to take individual and collective responsibility

for water conservation, and to recognize the “complex system of ecology, economics, culture, agricultural industry and policy” (*Trinity Journal* 2014).

Regardless of local efforts to pre-empt a water crisis, many outside of the local water district were left with scarce supply and the district’s supply was vulnerable to overuse. On August 5, 2014, after a brief suspension of water sales to residents outside the water district, water sales were re-opened but limited and carefully monitored throughout the remainder of the season. The water levels of the reservoir continued to be closely monitored and the parameters of water sale were subject to change throughout the period of drought. On August 12, 2014, the Trinity County Board of Supervisors ratified an emergency services proclamation, confirming a county-wide drought emergency, with extreme public safety ramifications (Morris 2014).

Water use and conservation issues created an opportunity for further bridge building between community members. However, the extreme water shortage in Hayfork also created tension amongst community members as the year progressed, ever drier and drier. Community awareness around water and drought seemed to be high, however conflicts surrounding water use, especially where *Cannabis* was concerned, were climaxing. This perception that *Cannabis* farming was to blame for water scarcity was hardened as increased evidence of illegal diversions and water theft for illegal *Cannabis* operations came to light.

As the drought continues throughout California and agriculture is impacted making food imports a necessity, food prices (already high in rural remote areas like Hayfork) continue to rise. Now, more than ever, a local food system may prove valuable

and necessary, offering food security for the residents of Hayfork. The higher conventional food prices may attract a new clientele to the local farmer's markets as economics shift, making local food the more affordable option. However, water availability to local farms has caused a reduction in local supply and decreased crop diversity at the market, and the ability of local farmers to sustain the local food system through the drought has been threatened. The *Cannabis* industry is also vulnerable to local collapse at the hand of water scarcity. As water availability decreases and the cost of water increases, the costs to farmers also increase. The value of *Cannabis*, still high compared to most agricultural commodities, is vulnerable to an ever-changing market, leaving farmers making dangerous trade-offs, just to survive.

## THE CASE STUDY EXPLORED: DATA AND ANALYSIS

A wide breadth of topics emerged through the in-depth and semi-structured interview process. Interview questions focused on personal information and history, on-property practices and perception of local issues and agricultural capacity. In an effort to focus the analysis of what developed into a large body of data and to tie these results back to the significance of local agriculture, agroecology and resilience, I developed the following eight broad categories to facilitate an interpretation of the content of the interviews: 1) Values, Incentives and Motivations in Agriculture 2) Agroecology: Ecological and Social Domains, 3) Barriers and Opportunities to Agriculture 4) Local Knowledge, Local Capacity and Social Capital, 5) A Trilogy: Local Food, *Cannabis* and Forestry, 6) Water, 7) Resilience, Adaptation and Transformation, and 8) Future Desired Conditions.

### Values, Incentives and Motivations in Agriculture

In a social-ecological system, human interaction with the natural environment is paramount in the creation of resilient, adaptive systems. The quality of this dynamic is determined by the personal ethics associated with local land use practices. This section addresses why participants have relocated or remained in the Hayfork area and chosen to pursue an agricultural lifestyle. The values, motivation and incentives expressed by interview participants help frame the discussion, giving deeper social context and demographic detail to the content.

Interviewees named a variety of factors that influence their decisions to live in Hayfork and work in agriculture. These values ranged from lifestyle choices such as a desire to live sustainably, economically and remotely, to political and spiritual beliefs such as a desire for independence from government control, rejection of urban life or pursuit of a deeper connection with nature and spirit. Of those interviewed, five were born and/or raised in Hayfork, five had relocated and homesteaded in the 1970's and the remaining eight had relocated to Hayfork within the last 20 years. All 18 local participants have made a conscious decision to cultivate an agricultural lifestyle in Hayfork and to do so employing a sustainability ethic in practice.

Participants repeatedly expressed personal values associated with self-reliance, independence, family, sustainability and conservation. A desire to homestead, to enjoy a rural lifestyle, move "back-to-the-land" and away from urban centers, reflected a common vision for the quality of life associated with rural living. Many cited a spiritual and physical connection to nature as a motivator. One homesteader referenced her "connection to Mother Earth," and explained the importance of "being grounded" through conservation ideals and a passion for cultivating nutritional and medicinal foods. For some, the ability to grow their own food and provide a service for others to eat healthy foods was a deciding factor. Family values associated with raising children and teaching the value of conservation and active land management were also cited. Independence from the pressures and politics associated with society at large was a common motivation. A desire to reduce reliance on global society and to minimize government intervention, were mentioned as additional factors.

Some household-level incentives and motivations were discussed as reasons for choosing agriculture or homesteading. All participants cited some form of supplemental income derived from agriculture, whether in the market or through offsets on a household level. A desire for independence and reduced reliance on global systems, as well as a concern for climate change and an opportunity to reduce fossil fuel dependence, were mentioned. For those who had relocated from elsewhere, the remote location with affordable, large tracts of usable property, offered attractive incentives to settle in Hayfork. For those born and/or raised in the area, having family close by and a family legacy to conserve were important values. While many interviewees shared reasons for living and working the way they do, their practices and knowledge varied greatly and showed a breadth of local knowledge.

Throughout my fieldwork process, I was amazed and inspired by the level to which these hardworking people put their personal values into practice. A desire to grow healthy food for themselves and for the community, combined with a general reverence for the land, directly corresponded to the way in which they managed their farm, ranch and garden systems. Principles associated with sustainable agriculture and agroecology were presented, in most cases unknowingly or without pretense. These participants don't apply these principles in order to brand or market their wares as sustainable, but because a healthy lifestyle and healthy environment is important to them.

#### Agroecology: Ecological and Social Domains

At the heart of agro-ecology, lies the interconnectedness of ecological

conservation, agricultural methods and social domains, all tied together through the farmer's engagement with the land and community (Figure 1). Agroecological systems promote and encourage social-ecological resilience by engaging land managers with ecological function through active engagement with biodiversity conservation, within a socio-political economic context and with the objective of sustaining agricultural demand. The social needs of farmers and community are linked directly to ecological conservation, agricultural capacity is optimized, and social networks form to strengthen community capacity for resilience.

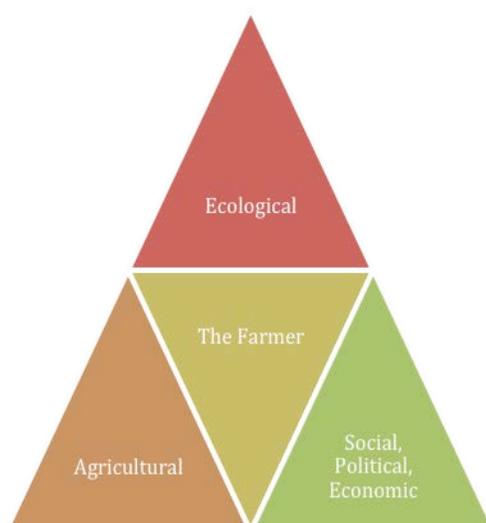


Figure 1. The integral and central role of the farmer in an agroecological system

An agricultural system is a social-ecological system that, while land-based in nature, involves and relies on human interaction with that land. While most participants described their connection to the land, the drive to produce healthy foods and to live a rural lifestyle as the main drivers in their choice to live as agriculturalists, many also named social factors that influenced their land and farm management decisions.

Participants varied greatly in the level to which they had studied different methods or mimicked other systems, but one thing held constant throughout, all were deeply embedded in an adaptive management process, constantly learning by doing and adapting to the inevitable social and ecological changes presented to them over time. In an effort to apply agroecology and sustainability thinking to this study, I investigated the applications of ecological practices such as landscape design, planting strategies, soil building, nutrient cycling, pest management and biodiversity, as well as social factors such as economics and gender that influence the farmer or land managers engagement with agriculture.

#### Landscape design and planting

The design of a property and the integration of management principles in design, physically signify a farmer's intentions for, and knowledge of, the land. The importance placed on context-specific design relates directly to agroecological thinking as individual systems are managed by experiential understanding of the specific processes at play on that land, and adapted accordingly. This study deals with the Hayfork Valley area only, and the community in question is defined by geographical boundaries; however, the land area is quite vast, with many micro-climates. On one property, located approximately ten miles from the town center, the temperatures can sometimes range twenty degrees Fahrenheit cooler than in town. In over forty years on this particular site, the owners have designed their home and garden accordingly, and adapted and developed consistently throughout the years to adopt refined, cold-resistant systems. They have experimented with enhanced frost protection on seasonal irrigation systems, the use of

frost cloth over crops and the planting and experimentation with cold hardy plants. This example highlights the need for context specificity on a landscape or property level, even for lands located within the same community area.

In all but three cases, interviewees managed mixed farm systems that included livestock, vegetables and livestock feed crops (hay). In two of these cases, the homesteads were intentionally “vegan,” and no animal products were used or consumed on property. In the third, the lack of infrastructure for livestock was a factor, but they planned to invest in chickens and goats in the future. With the exception of two local beef ranches, properties were home to multiple species of food and medicine crops. On these two ranches, some vegetable production and grain production had been present in the past, but was cut back in recent years due mainly to decreased water availability. In most cases, garden sites and livestock pens were located around the home or very close to the home, all with water availability and sun exposure in mind.

Companion planting, intercropping and crop rotation were noted by participants as design functions that also served as methods for enhancing soil fertility. Companion planting is the intentional planting of complementary species of plants in the same plot. A popular example of this is the “trilogy” or “three sisters” method where corn, beans and squash are planted together; the corn growing high and creating a stalk for the beans, the beans acting as a nitrogen-fixing legume for the lower-lying bushy, nitrogen-hungry squash. Intercropping is similar and refers to the planting of various crops side by side. Crop rotation is a strategy employed in alternating years to take advantage of nutrients left in the soil by different crops while simultaneously remediating the soil throughout the

rotation. Crop rotation based on season was cited by at least two participants, who planted in three cycles, rotating seasonally in early spring, summer and fall/winter, for year round harvest.

### Soil building and nutrient cycling

None of the land managers I interviewed used synthetic fertilizers or pest control substances and, while the purchase of some organic amendments was needed to supplement on-farm nutrient sources, many used animal manure, compost and cover-cropping as methods for increasing soil fertility with on-farm sources. Soil building and soil fertility management were essential components to the systems studied and many participants emphasized the importance of healthy soil for productive farming.

Intercropping, companion cropping, cover-cropping and crop rotation all lend to soil building. Mulching was also employed for soil building, and doubled as a water conservation technique. Interviewees cited compost, purchased supplements, compost tea, horse manure, worm castings and kelp as popular sources of on-farm and purchased soil-building supplements. To combat the compacted soils typical of the Hayfork Valley, more recent transplants to the Hayfork area relied on the purchase of established soil to get started while others promoted the use of weed crops to de-compact hard soils.

Nutrient cycling on mixed farm systems was presented as a way to reduce purchase of supplements. One rancher described rotating beef crops with cover crops in a complementary fashion. By allowing the cover crop to grow in, then putting the cattle to graze and re-fertilize the soil, then removing the livestock to graze elsewhere as the cover crop grows back in, soil fertility is enhanced and reliance on external inputs is

reduced. Off-farm, one local agriculture activist created a system with the local stores and restaurants for composting food waste and handled all the pick-up in exchange for using the waste on her farm as livestock feed and compost builder.

The local organizations observed in this study have created multiple forums for information sharing related to soil building strategies through composting workshops, presentations by local experts and manure hauling programs. The fact that information is readily available and that many ethically-produced and organic supplements are available through local nurseries and grow shops makes farming without harmful chemicals feasible for people in Hayfork.

### Pest management

Pest management is a seemingly persistent course of trial and error for farmers around the world. In fact, the science of agroecology was based in large part on biological management practices for pest control and the investigation of farm-specific techniques for managing pests (Altieri 1995). The land managers interviewed overwhelmingly resorted to natural or non-chemical techniques for handling pests. The most commonly occurring pests mentioned were deer and rodents such as gophers and moles. Most participants who cited deer as a threat used fencing as a solution. One respondent who did not yet have a fence in place experimented with feeding deer in another location on the property, reducing the demand on her garden. For rodents, wild radish seed was cited as a deterrent, and others mentioned growing in raised beds with wire mesh at the bottom or the use of mesh baskets around root systems to protect the roots from the pests. Some used traps and others might be tempted to resort to the use of

a rifle if pushed to their limits. None mentioned the use of poison to handle the rodent population.

Slugs were a problem for two participants and those cultivating *Cannabis* mentioned mold and mites. On one established farm “trap crops” were used to manage various pests including slugs and aphids. A trap crop is planted with the intent of attracting certain pests. On this farm, Brussel spouts are not grown for market, but they are grown as a trap crop for bugs that customarily attack the lettuce needed for market. Beneficial organisms are also widely used by a number of farmers, ladybugs being the most popular. In a healthy eco-system, pests exist, but they also self-manage. One market farmer mentioned, “You just have to live with some pest issues.” When organic production and a healthy farm eco-system is your priority, one has to account for some loss associated with pests, rather than try to control them with harmful chemicals.

#### Biodiversity and on-property diversification

All interview participants demonstrated a consciousness for biodiversity and eco-system function on their lands. Of the eighteen participants, fourteen were actively producing in a mixed farm environment, where various food, medicine, cash and meat crops were produced on the same land, serving various household and ecological functions. For example, one household consisted of a *Cannabis* garden, a medicinal herb garden and a vegetable garden with free-range chickens. In this case, the *Cannabis* served as the cash crop, the vegetables and chickens to offset family food costs and the herbals for tinctures and teas for family use and to offer to other community members. On another property, over seventy types of fruit and vegetables are grown for market,

while goats and chickens provide a protein staple and manure crop for household use only. A third farm, focused mainly on livestock, is home to meat and milk goats, pigs, chickens and turkeys. In this case, the farmer's extensive knowledge of breeding and husbandry has led to genetically- diverse and established breeds, making the livestock more desirable for sale.

The four participants engaging mainly in beef production, of all the participants, also own and manage the largest tracts of land. Of these, an ecological conservation ethic was mentioned by three, all practicing eco-friendly grazing strategies focused on the timely rotation of herds with the re-growth of ground cover for grazing. In one case, a hay crop was rotated with grazing and grass crops, and this hay used to supplement feed needs during winter when ground cover was not available. This rancher identified the ability to grow hay as the only way to make the beef enterprise profitable. Without that offset, the cost of feed throughout the year could greatly reduce profits. Due in part to the size of these ranches and the associated operating costs, other economic endeavors helped maintain the function of the ranch, such as timber harvest, conservation grants, *Cannabis* farming, the addition of other types of livestock and outside business ventures.

Biological diversity conservation was practiced on the farm and ranch systems of the participants and an awareness of the importance of eco-system balance in the overall ability of the system to thrive was prominent. A diversity of function on a household level was also emphasized (Figure 2). Participants who produce food crops for market recognized that other modes of employment or business ventures allowed them to invest in their farms and support their households, but a full reliance on the agricultural market

income was not enough to sustain them. One successful family farm was supplemented by a retirement income as well as offsets to the food budget, achieved by the production of most of their own food, including meat crops not produced for market. Another family employed a division of labor, where wife was responsible for farming, providing food for the family and generating some supplemental income, while husband worked a career job. For one couple, a fixed-income did not provide the desired simple yet comfortable lifestyle, therefore a small *Cannabis* crop supplemented their income while a vegetable garden, small livestock and hunting offset their food needs.

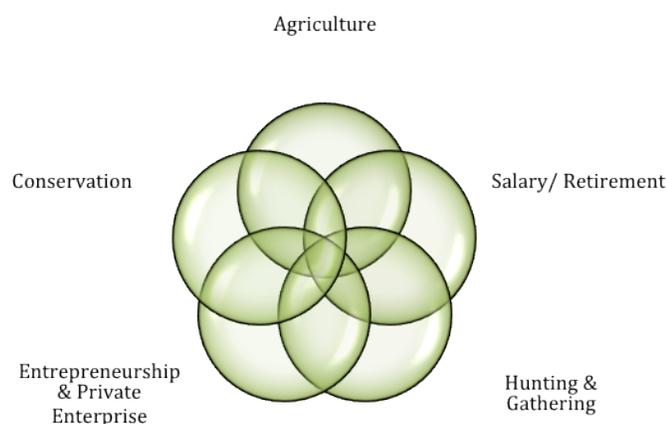


Figure 2. Overlapping functions in diverse agro-ecosystems

These are just a few examples of how individuals and households demonstrated a diversity of social and ecological function on property and used agricultural crops as supplemental income and financial offsets. None of the participants exhibited the ability or preference to rely on one particular crop or venture. All systems studied were both biologically and functionally diverse and the reasons varied, complex and site-specific.

## Community

Hayfork can be described as isolated and somewhat insular, as is characteristic of many rural communities. One might assume that settling as a newcomer in such a place would be difficult. However, each person I interviewed that had settled in Hayfork, transplanted from elsewhere, whether in the 1970's back-to-the-land movement, the 1990's post-timber influx or more recently during the *Cannabis* boom, expressed pleasant surprise at the treatment they received from community members. This is not to say that cultural conflicts do not exist. In fact, ideological polarization is historically prevalent in Hayfork and largely centered around historical transitions and subsequent dualities the valley has seen: native/settler, timber/environment, old-timer/newcomer and most recently *Cannabis* industry/anti-*Cannabis*.

One homesteader and self-reliant food producer, originally from an urban center, recounted his experience discussing his environmental views with a business owner early in his tenure in Hayfork. While the viewpoints were extremely polarized, their interaction was not. They quickly found mutual respect for each other's ability to speak openly about such views and find common ground in other subjects. A young woman, relatively new to the Hayfork Valley, explained her anticipation of prejudice based on her earthy appearance characterized by her dreadlocks and affinity for wearing hemp fabrics. She was surprised at the kindness and lack of prejudice she felt from the people of Hayfork, and expressed gratitude and surprise to find that many of the friends she made shared her philosophies on conservation and healthy living.

### Family

Family values and dynamics played a major part in the way participant's lives were structured. For example, all four cattle ranches were multi-generational ventures, with either multiple generations operating the ranch, or multiple generations of land tenure. As such, family dynamics and values influence the way these ranches are managed. One rancher cited the family dynamic as the primary factor inhibiting further ranch development. Even so, a desire to preserve a family legacy was a driving force behind continuing land management and conservation practices. Another expressed how the drive to teach ranching and conservation to future generations provided motivation to "do the work". For another, the quality of ranch life influenced his willingness to take over ranch management from aging predecessors.

Overwhelmingly, a drive to produce food and sustain resource-based livelihoods for the household and extended family, were mentioned. Despite social and financial obstacles, a desire to create a healthy living and working environment for family, led these land managers to do so sustainably, in a manner that included thoughtfulness for future generations.

### Education

Fifteen of the eighteen interview participants either had college degrees or had pursued some college education or special training. Four participants had degrees in agriculture or permaculture. Others specialized in education, forestry, social welfare and business. Perhaps due to their personal backgrounds, education was an important factor to many of the interviewees. On a household level, self-education, experimentation and

knowledge transfer to children were mentioned. On a community level, sharing knowledge with others through community meetings and outreach was important.

One mother of school aged children believed that the school could provide an opportunity to “raise consciousness” about healthy living and local foods, but rather found that the local schools were “the most dangerous location” for kids’ nutrition. She described “a disconnect” between a community where an abundance of quality, healthy local foods are grown and a school system whose main priority is to provide the cheapest food possible, not the healthiest. She referred to the agricultural program in the local school as “chemmy”, referring to the teaching of chemical applications. For her, the schools present an opportunity to spread knowledge about sustainable agriculture, local foods and healthy living; an opportunity that she feels the community is not seizing.

The Agriculture Science program at Hayfork High School is quite extensive and boasts extremely high enrollment relative to overall school population, with approximately 2/3 of the total school population taking classes in the agriculture department. The program includes classes in plant and animal science, agriculture business, agriculture mechanics and horticulture. There are two livestock barns and a system of greenhouses on the school property, where students are taught with a hands-on approach. The program supplies some supplemental food to the cafeteria when possible, a part of the program that has been poorly publicized to the community. Unfortunately, the farm-to-cafeteria program cannot supply consistent demand of ingredients to seriously offset school food expenses. The program is also understaffed during times when school students are not available to work, making it hard to maximize this potential.

The interest of students to enroll in the “Ag” program is indicative of the general agricultural interest and skill set available in the Hayfork Valley. Youth are interested in agricultural work and may be putting their skills to work after high school, but just how many and in what way, is hard to track. Some students may be putting their knowledge of growing and scientific breeding to use in the *Cannabis* industry. Even though the program teaches a range of techniques, mostly industrial agriculture oriented, there aren’t any large-scale industrial agriculture businesses located in Hayfork, so these skills are either applied on a smaller scale, in the *Cannabis* industry or elsewhere. According to one participant, the population and demographic is changing and so the number of kids and their interests are changing too, resulting in declining school population, lack of funding for special programs, making such programs harder to sustain.

In addition to educational opportunities in the schools, a couple of participants mentioned the importance of hands-on learning on a community level. Beyond the work that local groups do to educate community members about sustainability in agriculture, the opportunity to learn-by-doing is important to many. One farmer, after working as an activist in local groups, decided her energy would be better applied teaching classes on her farm. She offers workshops on animal handling, milking, husbandry, slaughter and food preparation. Another participant noticed a need for more working/teaching farms in town. She expressed support for the idea of a learning center type format and thinks it could be quite successful.

## Gender

Of the eighteen farmers interviewed, ten were female and eight male.

Surprisingly, the issue of gender only came up in the context of *Cannabis*. In households where *Cannabis* was farmed alongside other crops, the men in the household were more consumed with the *Cannabis* or “cash-crop” operation, where the woman would tend more to the vegetable and herb gardens and livestock. Two participants mentioned that their partner’s agricultural ventures took priority over theirs, and that they often got the “leftovers” where inputs, soil, infrastructure and water were concerned. This issue displays a prioritization of a cash-earning crop over a subsistence or supplemental market crop, and also calls into question the various gender dimensions present in the *Cannabis* industry and within the household, where in a traditional sense, the male was responsible for earning, while the female responsible for providing food and medicine for the family.

## Economics – Subsistence, direct sale and underground markets

In an effort to address the microeconomic impact of agriculture on a household level, I asked the question, in reference to activities that they described, “How does this contribute to your household?” Responses varied but were mainly limited to subsistence, trade and supplemental income through direct sale both in the public market and in underground spheres (Figure 3). Most interviewees expressed a combination of subsistence living for household use and direct sale. None of the participants relied completely on their agricultural endeavors for survival, but rather on a combination of agriculture with other endeavors. One rancher explained that cattle and hay systems were

intended to profit enough to pay the property taxes every year. As long as that goal is met, her cattle enterprise is a success. One couple generates a large portion of their summer foods at home, while relying on a cash infusion from their *Cannabis* sale every year in order to travel to see family. Another couple attempts to grow and preserve enough food every year to provide for their household as well as share and trade with their immediate neighbors, purposefully growing enough for six people, even though they are a family of two. This allows them to interact with their neighbors and foster harmonious relationships, and to acquire resources such as manure for free in exchange.

Thirteen of the eighteen participants engaged in some level of direct sale activity for cash return, whether at the farmer's market, in private circles or at an auction yard. Of the remaining five, four were in the process of developing value-added products for sale at the farmer's market such as baked goods, skincare products and herbal products. The other was content simply raising food for her household, for friends and community members in need. Six of the eighteen participants referred directly to the underground sale of illegal products. Though *Cannabis* sale is assumed to be the main illegal product produced and sold in Hayfork, this category is not limited to *Cannabis*. In fact, due to strict USDA and FDA guidelines on food production, especially where meat and dairy products are concerned, the sale of locally slaughtered meats and raw milk products is forbidden. This creates a conflict for those who believe in the health benefits of local, sustainably produced foods, but are limited by the barriers and constraints of legal production. Some choose to prioritize access to healthy foods (such as raw milk), over the legality of such foods.

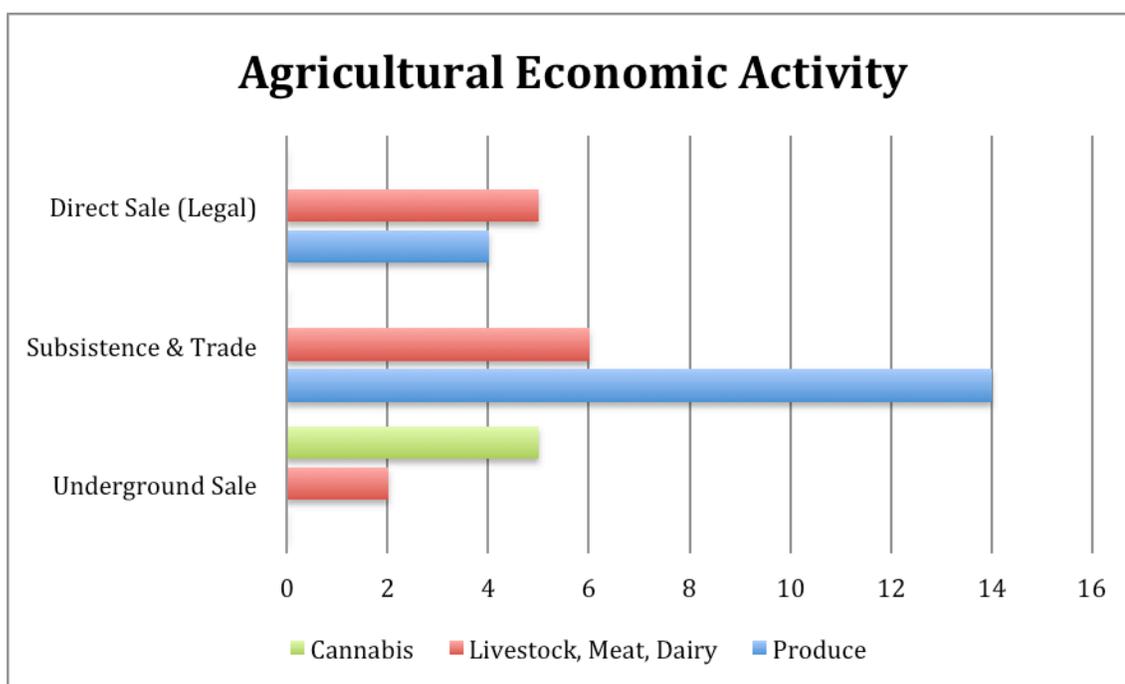


Figure 3. Distribution of agricultural activity among participants

Whether *Cannabis* or restricted food, the sale of illegal products carries some risks. The costs and benefits of the choice to sell agricultural product in an underground market are calculated risks that seven of respondents admitted to taking for the overall benefit to their household livelihoods. Generally, the opportunities associated with agriculture in Hayfork, are accompanied with challenges and barriers. Based on the content of the interviews, the barriers seem to outweigh the opportunities where the sale of legal produce is considered, however the opposite is true for the illegal market, where profits and benefits seem to take precedence over challenges and risk.

#### Barriers and Opportunities to Agriculture

In a social-ecological system, resilience is exhibited by the ability of the system to respond to shocks and changes, and the adaptive capacity of that system is measured by

the system's persistence, despite disruption, to regenerate itself and transform when necessary. In a rural community and in agricultural systems, shocks are presented as barriers, and the way that the system responds by creating and seizing opportunities indicates levels of resilience and adaptive capacity.

A quaint, rustic rural lifestyle may be romantic to some, but agricultural life is not simple or easy. The robust character, grit and energetic spirit displayed by the research participants were remarkable. All interviewees displayed a drive to do the work for personal and spiritual reasons stretching beyond economics, and the values they placed on their lifestyle choices were based in family, health, conservation ethic and localism. This is important to note here, because the barriers and challenges these people face on a regular basis might dissuade the weak at heart. Beyond the difficulty presented by everyday tasks, broader social, ecological and political barriers also impact these individuals. While generally optimistic about their lifestyles, participants named quite a few more barriers than they did opportunities. Even so, sixteen out of eighteen interviewees planned to continue to learn and adapt and develop their properties in the Hayfork area. The remaining two, found themselves in flux, discouraged by the limitations and ready to pursue new opportunities elsewhere. Many of the barriers presented here are accompanied with perceived opportunities that may balance the barriers. But for some, there is no immediate solution on the horizon, leaving farmers to find ways to cope with challenges and integrate them into a risk management strategy.

First on many people's minds in 2014 was the California drought emergency. Water is an essential resource for agriculture, and in 2014 it was incredibly scarce. Water

scarcity was named the biggest and most immediate threat to agriculture by most respondents. One gardener made the choice to reduce her family's vegetable garden substantially noting, "It is cheaper to buy food than to pay for the water". Other water-related constraints such as lack of, or inadequate, irrigation and storage infrastructure were also cited. In addition to water scarcity, participants faced general climate and ecological concerns such as a short growing season, extreme cold and hot temperatures, soil composition and extreme fire danger, all presenting environmental challenges.

The geographic location was identified as a direct barrier to business development and agriculture for export. "It's an island here," says a rancher, referring to transportation in and out of the remote, isolated mountain valley, which requires reliable and appropriate vehicles, fuel and time, all extremely valuable and costly resources. This is especially an issue for cattle producers as the closest auction yard is seventy miles away. In order to sell beef locally or otherwise, cattle must be slaughtered at a USDA certified facility, of which there are none closer than 100 miles from Hayfork.

Economic barriers to agriculture in Hayfork may far outweigh the economic opportunities, especially in a year where essential resources are scarce and prices high. The costs associated with transportation and fuel, land prices, inheritance and property taxes, are of particular concern for cattle ranchers who typically have the longest haul distances and the largest tracts of land, requiring the most feed, water and fuel resources. In addition, government regulations and complicated certification processes for livestock production present challenges for beef production specifically. However, real estate,

taxes, fuel and energy, water and feed costs in general are high for all farmers in Hayfork and affect even small-scale subsistence gardeners.

Government intervention and regulation was a concern across ideological and demographic lines. Stringent regulation and oversight of agricultural activities, from organic vegetable farming to livestock rearing and processing, was a “thorn in the side” to almost all participants. Of all the participants only one was organic-certified and one producing a USDA-certified meat product. Others producing high value, organic and sustainable products were not certified due to the extensive application process and costs. One un-certified organic farmer stated, “It doesn’t change how we do things.” Another complained about the “headache” all the paperwork caused. One rancher, experienced in co-managing conservation grants with government organizations, vowed “never” to invite another governmental organization onto her land. In general, government interventions on private lands seemed to present more challenges than opportunities.

In addition to the ecological, economic and political limitations presented, some social and cultural themes arose as well. A perceived lack of commitment from local people and a transient culture within the community were cited as barriers to developing local agriculture. Also, a lack of business savvy and “vision” were mentioned. An aging population and gender dynamics were also mentioned as barriers to agricultural development at large.

Participants named a number of local opportunities available for people wanting to start or continue agricultural production, including social, ecological, political, economic and practical opportunities. Desire and momentum amongst local people to

practice self-reliance, as well as the isolation of the community, were given as examples of social opportunities, while funding opportunities such as micro-enterprise grants were cited as economic opportunities.

When I inquired about agricultural commodities that could be produced for export, folks mentioned hay, grapes and hemp, along with certain hardy vegetables that could travel well, such as garlic. A new CSA program and the farmer's markets were mentioned as opportunities for producers to sell their wares, where the California Cottage Food Operations Act of 2013<sup>4</sup> offers new opportunity for homemade value-added products such as preserves, cheese and herbal tinctures. According to interviewees, agriculture itself creates opportunities for education and employment as well as for trade, barter and self-reliance. In response to infrastructural and geographical concerns such as the remote location of the community and short growing season, mobile livestock processing units and greenhouses were seen as opportunities to surmount such barriers.

*Cannabis* production was mentioned as both a barrier and an opportunity. On one hand, the production of a cash crop with a high value has enhanced the local economy. Increased local knowledge in areas such as soil chemistry and plant genetics, while commonly applied to *Cannabis*, can be applied across agricultural spheres. Increased crime and transient population were cited as challenges to the community, but a younger and more diverse demographic was mentioned as a positive impact. An increase in local agriculture businesses and local knowledge was also recognized. Some "legitimate"

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<sup>4</sup> Effective January 1, 2013, The Cottage Food Operations bill allows individuals to prepare and/or package certain non-potentially hazardous foods in private-homes (CA Dept. of Public Health 2013)

agriculture enterprises may feel the strain of competition with *Cannabis*, especially where land prices and water allocation are concerned, while others see an opportunity to capitalize on the resources the industry provides and to be proactive in creating a niche market for medicinal and recreational *Cannabis*. Some cited hemp farming as a potential opportunity for Hayfork. Overall, many of the barriers presented were matched with opportunities that could present solutions for such challenges (Figure 4).

<b>Barriers</b>	<b>Opportunities</b>
Location and climate	Mobile slaughter units, greenhouses
Costs	Value-added products, grant funding
Government regulation	Local organizations
Lack of local knowledge and workforce	Education, Workshops
Competition with <i>Cannabis</i>	Embrace industry, create a niche
Competition with subsidized food	Direct sale
Culture of complacency	Self-reliance, entrepreneurship
Water scarcity	Water conservation and storage
Soil type	Compost, soil building, forest biomass

Figure 4. Barriers and opportunities to agricultural production

The existence of barriers and constraints is a reality for land managers everywhere, but the ability to adapt to these challenges and identify transformative solutions is important in a resilient social-ecological system. Learning from the experience of working within these barriers has enabled land managers to use local

knowledge to vision creative alternatives, exhibiting a propensity for adaptive capacity and management.

### Local Knowledge, Local Capacity and Social Capital

Diverse knowledge and expertise tied by a common thread of sustainability values, enhances local capacity to manage systems for adaptation and resilience. The utilization of local knowledge to build social capital is imperative in generating local capacity for social-ecological resilience and transformation. Overall, participants demonstrated high levels of local knowledge pertaining to land management and agriculture. The breadth of this knowledge was ascertained by direct questions regarding practices and techniques such as soil building, pest management and livestock rearing. I was curious how these farmers learned to do the things they do. The participants demonstrated a mix of book-learned knowledge through the study of various practices, experiential knowledge by trial and error over time, horizontal knowledge learned from other local farmers and community members, transferrable knowledge from past ventures in other areas, inter-generational and family-generated knowledge.

When I asked one ranch owner how she learned to do what she did, she simply replied, “I married a rancher.” She married a rancher and then became a rancher, only to continue the family enterprise with great precision and knowledge after her husband’s passing. Another woman, attributed her knowledge of the local growing seasons and techniques to her interactions with “old timers” when she first moved to town as a young woman. Now at the age of seventy and after forty years of learning by reading and experimentation, she is considered a knowledgeable “old-timer” herself. Others

mentioned learning from their parents and grandparents, and from other locals, sharing and trading knowledge. All participants exhibited a mixed methods approach for gathering and using the knowledge employed on their lands.

During the course of my fieldwork, I observed two potentially oppositional social phenomena that directly affect the capacity of local people to organize around agricultural issues - a libertarian, rugged individualism and a culture of collaborative community activism. On the one hand, the land managers that I interviewed opposed government intervention on their land and practices and expressed a desire for less regulation and more freedom to produce according to their knowledge and needs. On the other hand, these same participants expressed support for local groups organizing to collaborate around sustainability and agriculture, some directly participating and others choosing to serve the community in other ways.

Interviewees mentioned local organizations that they recognized doing work on sustainable agriculture in Hayfork: The Hayfork Cooperative, Trinity Homegrown Foods, The University of California Cooperative Extension, The Watershed Research and Training Center (WRTC) and The Trinity Collaborative. Over the course of the year, Trinity Homegrown Foods was consolidated to a county-wide organization, and the Southern/Hayfork chapter dissolved. The UC Extension office in Hayfork, previously with limited office hours at the Trinity County Fairgrounds, was de-funded and office hours in Hayfork were eliminated. The Trinity County UC Extension agent still serves Hayfork through consultations, workshops and presentations.

Regarding the status of agriculture development in Hayfork, participants referenced a lack of resources available and a lack of business savvy and skill sets needed to implement programs and business strategies. One said, “You can’t pull yourself up by your bootstraps, if you don’t have the boots or the straps.” The existence of the local groups mentioned is a positive thing, but when it comes to getting things done, they are not all organized in a way to make this feasible. A lack of formal non-profit status and organizational structure makes it impossible for some of these local groups to apply for funding or implement programs to support community and agriculture development. In addition, an over-reliance on volunteerism puts a strain on willing individual community members and leaves groups vulnerable to leadership changes, aging membership, and general shifts in participation by core volunteers.

I observed the aforementioned local groups and the committed membership and participation from community members organizing around the transfer of knowledge. However, participation in these groups by many of the interviewees was limited. One market farmer said, “If you are actually doing the work, you don’t have time to stand around talking about it”. This same farmer expressed a willingness to engage in a teaching capacity, but was not interested in regular meeting participation or membership. Another participant expressed that she felt better serving in a teaching capacity on her property, as opposed to organizing and attending meetings. Of those interviewed, six had been directly involved in organizing local organizations. At the time of the interview, two were still involved and the others four had shifted their focus elsewhere.

Over the course of my fieldwork, I participated and observed approximately fifteen local meetings and special presentations organized by these groups. Attendance generally ranged between 20-40 people for any given meeting, and though membership and attendance differed from group to group and between meetings, there was significant overlap and repeat attendance by the same community members. Based on my observations, the local capacity to organize around timely local issues pertaining to sustainable agriculture is strong, however the capacity to integrate various facets of the community seems to be lacking. Others share this concern. In response, the WRTC initiated outreach directed towards integrating *Cannabis* farmers into a public discussion about sustainable practices, which culminated in the “Growing Green in 2014: Best Management Practices Workshop”. The event was successful in drawing from established local groups as well as appealing to a younger, *Cannabis* oriented demographic.

In general, local capacity to organize around agriculture has been exhibited. However, the dissolution of the Southern Chapter of Trinity Homegrown Foods is an example of difficulties that some local groups face. Changes in leadership, internal conflicts and a lack of commitment by a transient membership all played a part in the demise of a group that had seen notable momentum and movement previously. Also, the insular nature of the groups in general, shows a strong capacity for bonding social capital through the ability to organize, among like-minded individuals with shared priorities, but less of a capacity to bridge and integrate across interest groups and with practicing ranchers and farmers. These groups offered resources for individuals on a household

level as well as a forum to share information and organize support for local issues.

However, as one presenter said in a meeting, “I feel like I’m preaching to the choir”.

The WRTC and the Trinity Collaborative have attempted to increase social capital by creating forums for a more integrated and vertical approach to community outreach that actively focuses on the participation of various stakeholders with diverse interests. The local focus of the WRTC in reaching across social conflict barriers to integrate *Cannabis* farmers, and the Trinity Collaborative’s vertically integrated social-ecological-economic approach to sustainable forestry, agriculture and economic development, both show high levels of social capital and organizational capacity to adapt according to the needs of the community.

#### A Trilogy: Local Food, *Cannabis* and Forestry

Natural resource-based rural communities are commonly susceptible to boom-bust cycles of industrialization and deindustrialization. An over-reliance on one sector and a focus on replacement strategies to remedy periods of collapse have proven problematic over time in Hayfork. A diversified social-ecological strategy that promotes the multifunctional capacity of the community, while utilizing local resources and social capital, will likely prove more resilient to inevitable change. The trilogy of local food, *Cannabis* and forestry, make up the working lands fabric of Hayfork (Figure 5). Local foods provide security and sovereignty in a context of isolation from conventional food centers. *Cannabis* provides an economic stimulus that aids the social function of the community. Forestry activates the human-nature connection and provides employment in the context of ecological conservation. The three are not only combined in practice on

many properties, but community-wide create the diversification of industry and land use needed as part of a multi-pronged resilience strategy that maintains social-ecological function and strengthens the ability of the community to withstand shocks and adapt as needed.

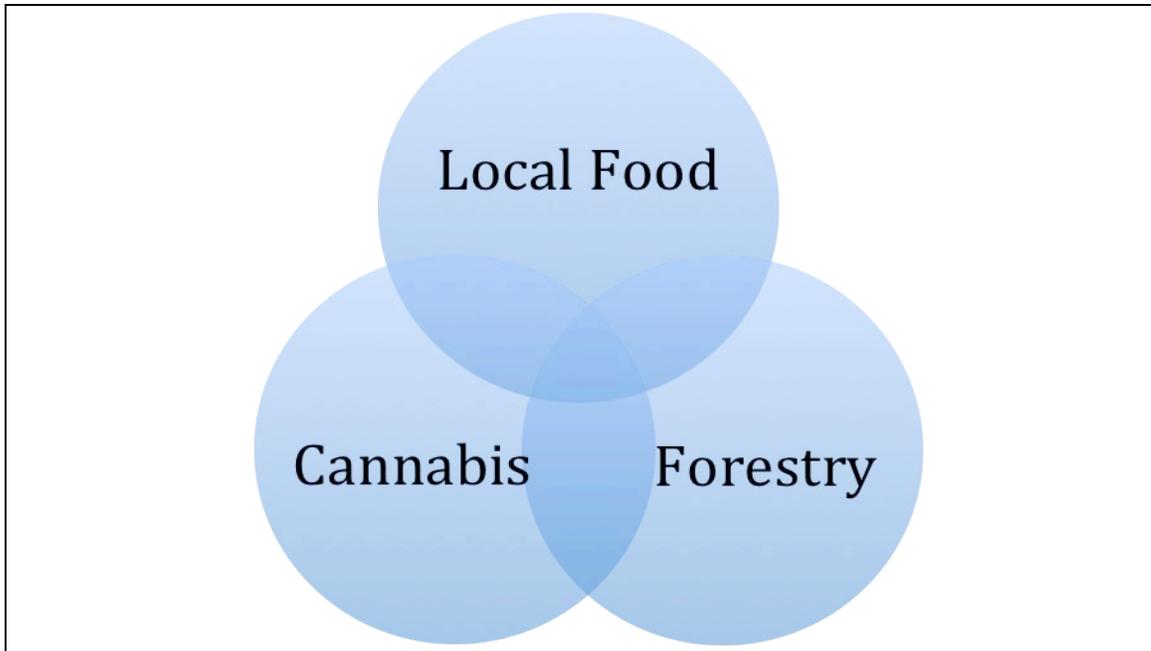


Figure 5. An agricultural trilogy - local food, *Cannabis* and forestry

When asked about the role of agriculture in Hayfork, all interview participants made some mention of both local food and *Cannabis*, where twelve of the eighteen directly referenced forestry (conservation, timber and non-timber forest products). The fact that participants linked forestry and agriculture prompted the inclusion of forestry in this study.

### Local food

The ability to grow one's own food, provide local food to others, and the availability of local food for purchase, were generally important to the research participants. Those that grow their own food find personal satisfaction and sense of purpose. Others value the farmer's market and direct sale channels as alternatives to local grocery market options. Interviewees differ in their perception of supply and demand for local foods. One market farmer commented that with newcomers, comes an increased interest in growing food, but the fact that "everyone has a veggie garden," reduces the demand for his wares at the local market. One farmer said, "The community can support more than one farm", while another believes the community can only really support one. Some would like to see more diversity at the market and more vendors, where vendors themselves understand the challenges of providing for this diversity and keeping customers happy with quality, sustainably-grown produce.

The Hayfork Farmer's Market is the main venue for the community members to acquire local food, unless growing their own, trading or buying underground. Local, grass-fed beef is available at one supermarket in a direct sale format. A countywide CSA program mostly supports the Weaverville area, and Hayfork farmers have been dissuaded by CSA's additional regulations. The farmer's market is open May – October. For the rest of the year, locals rely on their own gardens, livestock and a combination of local and non-local grocery outlets. One farmer is motivated to produce as much variety for her customer-base as possible, regardless of the challenges presented by growing seventy varieties of foods in a year. She said, "It's sad what comes in on the trucks, we are the

last stop”, highlighting the importance to provide healthy alternatives for the community. According to interviewees, local foods are not available in local grocery stores for a two main reasons: a low priority for organic or local foods and food safety concerns on the part of the grocer. There is also a lack of incentive for local producers to sell in the stores, as they would receive a wholesale price, much lower than the direct sale price.

Interviewees name the many benefits of a local food system. For the producer, it is economical in that “organic certification doesn’t matter” to local buyers. Local buyers are content with knowing who has grown the food and how. A connection with the farmer at the market, replaces the needs for a formal certification or labeling process, which minimizes cost and hassle to the farmer. A local market also reduces transportation, fuel and shipping costs and valuable farmer time. Where homegrown foods and trade are concerned, a “reduced reliance on currency” and “local control of food supply” are cited as benefits of a local food system. Others appreciate the culture around local food and the balance and harmony it creates in the community.

The local foods most readily available in Hayfork include but are not limited to: chicken, eggs, goat, pig, beef, apples, pears, plums, berries, leafy greens, micro-greens, root vegetables (beets, potatoes, carrots), vine fruits (tomatoes and cucumber), squash, beans, corn, garlic, onions and more. Some value-added food products are also available such as preserves, baked goods, granola and cheese. The availability of meat products for sale is limited by the restrictions on meat slaughter and processing. Most meat producers focus on smaller animals such as goats and chickens, where small-scale slaughter is allowed, without “cut and wrap” or butchering. In essence, a producer can

raise, sell and slaughter smaller livestock, but cannot process for sale without meeting USDA food safety guidelines, a factor that deters many producers. However, according to meat producers interviewed, there is a local market for “good, clean, local meat”, and an internet market for direct sale is also expanding, providing avenues for small scale meat producers beyond the local markets.

All interviewees voiced support for the Hayfork Farmer’s Market. Of the eighteen participants, eight had either vended in the past and or planned to in the future. One market participant stated, “You can make a legitimate living if you already own property”. Another farmer claimed to have made only \$25,000 in his best year selling at the market, which for a family income, is arguably legitimate. The UC Extension agent noted that, while countywide more producers are needed to round out the markets, in Hayfork, more customers are needed to support the market. In 2014, the change of location of the market appeased some of the interviewees concerns that the market lacked “diversity” and “community involvement”. One interviewee still expressed a desire for more integrated participation that would include the high school and other local groups. The market now boasts more homemade and local wares beyond produce, and the increase in vendors has led to increased community attendance. One seller noted conflict between participants that complied with requirements and those that did not, another issue that has been remedied by a new, hands-on and Hayfork-based market manager. The market accepts CalFresh EBT cards and Senior Farmer’s Market Nutrition Program coupons, which has helped address concerns about accessibility to disadvantaged groups.

Momentum surrounding the local food movement in Hayfork is strong, and while

opportunities seem to abound, the challenges are many. The choice to grow sustainable local foods is based mainly on personal and ethical principles, where the economics are purely supplemental. *Cannabis* as an agricultural commodity plays a direct and indirect role in the local food movement. Directly, the *Cannabis* industry provides an economic stimulus to producers and consumers alike, allowing for a thriving local food market. Because of the *Cannabis* industry, agricultural resources such as inputs and infrastructural supplies are readily available. Socially speaking, a changing demographic that prioritizes local, sustainable foods creates a culture around local food. However, the fact still remains that incentives to develop local farms for food productions are lessened, when countered with the incentive to grow *Cannabis*.

The lack of regulation around *Cannabis* farming practices, and the underground nature of the market, leaves *Cannabis* production mainly exempt from any of the certification or permits required for food producers. According to one farmer, “There are more requirements to grow hay than to grow *Cannabis*.” And, even though *Cannabis* is consumed by humans for nutritional, medicinal and recreation purposes, it is exempt from any FDA, USDA or local agricultural commission oversight. The economics of *Cannabis* compared to food crops also demand pause for farmers when considering what to grow and how to allocate resources, when “you can make the same amount (of money) with one pot plant as you can with five acres of veggies.” Research participants with diversified production systems in place that included vegetable and *Cannabis* gardening as well as livestock or timber and in some cases other business ventures, exhibited the

highest levels of resilience to political or economic shifts that could impact their ability to continue production of any one product.

### *Cannabis*

Of the 18 land managers interviewed, five referred directly to *Cannabis* crops being grown on their properties. Of the five, two relied almost entirely on *Cannabis* for income while vegetable gardens supplemented the household food budgets and nutritional needs. The others had diversified income sources, including *Cannabis*, retirement, heavy equipment, livestock and vegetable gardens. This information was volunteered, as I did not ask this directly. Therefore, this number may or may not represent the actual number of interviewees farming *Cannabis* or involved in the *Cannabis* industry. Regardless, the topic of *Cannabis* production came up frequently over the course of the interviews, referenced in some context by every single participant. As one participant eloquently put it, “It’s ag.”

Based on the content of my interviews and observations, it seems it is common knowledge in Hayfork that the *Cannabis* industry provides economic stimulus to the community. In reference to getting established in the community of Hayfork, one interviewee observed, “If you don’t have a job tied to the government, you probably can’t make it without *Cannabis*”. Another commented, “Without a trust fund or a cash crop, it’s nearly impossible to get started”. One business owner joked, “If you aren’t digging in the dirt, you might as well be selling shovels”. In reference to the *Cannabis* boom and the potential bust that may ensue, one landowner predicted, “When it ends, property will be dirt cheap, ready to go”, and “The next phase is homesteading”. Another predicted,

“It’s the beginning of the end,” referring to what he called a flooded market, where there is too much supply and prices are dropping.

Interviewees who have lived in Hayfork since before the boom remember a time when *Cannabis* farming was present, but more clandestine. One *Cannabis* farmer recalls, “It used to be hidden, but now it’s out in the open”, and gives examples of evidence such as dirt trucks coming into the valley and everyone with water tanks on the back of their trucks. A food farmer recalls the 1970’s where people grew it for personal use and you didn’t talk about or hear about it in town. *Cannabis* growers and other interviewees alike, lamented the sheer number and size of grows, as well as large, illegal grows in surrounding public lands. As one *Cannabis* farmer put it, “Nobody likes cartels.”

General concern with the environmental impacts of *Cannabis* production was present throughout the interviews as well as in public forums when the topic would arise. Just a couple years ago, when I began this field-work, the local conflicts around *Cannabis* seemed to stem around cultural and identity stigma issues between growers and non-growers, old timers and newcomers. More recently, the tides of public conflict seem to have shifted to a matter of farming practices. All interviewees, regardless of personal involvement with *Cannabis*, expressed concern with the ecological impacts they associated with *Cannabis* production in Hayfork. Similarly, when the topic did arise in the public forum, groups tended to focus on environmental issues as a common concern with hopes of bridging various interests. Community members openly expressed their concern with these impacts, but citizens often prefaced comments with a disclaimer along the lines of, “I don’t have a problem with a little pot here and there but...” The

ecological impacts of *Cannabis* farming most commonly mentioned were deforestation, the overconsumption and unsustainable use of scarce resources (especially water), water quality (chemical pollution and sedimentation as a result of land conversion), and toxic waste dumping on and off private property. Concerns for the effects of these impacts on wildlife and on quality of life for Hayfork residents were referenced indirectly, and it seemed generally understood that an imbalanced eco-system is bad for everyone.

In addition to the perceived direct ecological impacts, observations about social and cultural effects were made. An increase in a seasonal, transient migrant worker population during “trim” season is a visual bi-product of a thriving industry. Increased homelessness, crime and public health issues were mentioned. On the other hand, some interviewees valued the diversity that came along with the influx of workers every year. Inflated property values were also identified as a direct impact of the *Cannabis* industry.

While concerns over negative impacts of the industry were prevalent, some positive outcomes were also expressed. The blooming local economy, increased employment in other sectors and an increase in local resources and supplies (especially for agriculture, but also food options and more) were all mentioned. An increase in local knowledge around alternative and sustainable farming practices was also noted. The influx of a younger demographic of farmers with substantial knowledge, education and interest in sustainable farming, permaculture and homesteading has led to what some perceive as a new wave of back-to-the-landers. One participant recognized the potentially positive impacts of the changing demographic on his sustainable agriculture enterprise as a “good thing.”

Overall, a desire for a more sustainable *Cannabis* industry and an increase in environmental regulation and oversight were common sentiments. The community's current dependence on *Cannabis* also raised questions for many interviewees who expressed a concern for effects on the local economy should the *Cannabis* bubble burst.

### Forestry

When asked about the role of agriculture in Hayfork, five participants identified timber as an agricultural resource and/or part of their land management strategy. One former mill employee reminded, "We can't forget about the biggest, most imposing plants around here (the trees) and how we treat them." While many may not commonly think of trees as an agricultural commodity, but more of a natural resource, the way that our public forests have traditionally been managed has treated them as such. A revised approach to forestry has led to the conservation of forests but with the side effect of dangerous overgrowth and fire danger in many local forests, leaving local people yearning for a sustainable harvest approach in the future.

In addition to timber and forestry opportunities on public lands, land managers in the Hayfork area are also timber managers by default. The land is heavily forested and actively managed for fuel wood, income and fire resilience. Of the interviewees, seven were either actively managing for timber harvest or had engaged in conservation plans through the Natural Resources Conservation Services (NRCS). Three were participating in prescribed fire programs through local organizations and another one was actively reforesting after direct fire damage from a 2012 fire that threatened the Hayfork Valley.

Not only is forest management a necessity for many landowners in Hayfork, but the proximity of national forests, makes the management of public and private lands important for local people where public safety, ecological services and economics are concerned. The only remaining mill in the county, located in Weaverville, is still the largest private employer in the county. Local conservation organizations such as WRTC offer viable forestry employment opportunities as well. On a household or property level, timber and non-timber forest products offer supplemental income and fuel. In addition, the forest offers ecological services and benefits such as clean air, water and wildlife habitat, making the conservation of public lands important to the ecological condition of Hayfork and planet Earth.

Engagement with public land management agencies, county entities and local non-profit organizations, as evidenced through the Trinity Collaborative, is important for social, ecological and economic reasons. The local capacity to organize exhibits high levels of both vertical and bridging social capital where timber and forestry are concerned. Moreover, the existence of historically intense social conflicts around timber, and now the more recent capacity exhibited to move beyond conflict to consensus, is evidence of high levels social capital and potentially long-term resilience in this sphere.

### Water

The people and community of Hayfork have exhibited strong adaptive capacity to survive multidimensional social-ecological shifts. Sustainable, adaptive and collaborative practices offer agroecological solutions for conservation and resilience in times of economic hardship and social conflict. However, a lack of water and water

conservation infrastructure could provide a shock to agricultural viability in Hayfork that may be difficult to overcome, and a transformation of water use practices may be required.

Drought has heightened awareness around water use in the Hayfork Valley. Many attribute water quality and quantity issues to the *Cannabis* industry, reinvigorating some conflict around *Cannabis* production. Jurisdiction over these water issues is a complex, interagency dynamic, but enforcement of illegal diversions from riparian zones lies mainly in the hands of the California Water Resources Board. One landowner believes the lack of enforcement efforts are due to fear on the part of the agencies that “they have guns”, they, of course being *Cannabis* growers. However, the issue is not so simple. Limited administrative and regulatory capacity of the agency inhibits adequate enforcement of water policy.

In an area where many live outside the service area of the local water district, water diversion from springs, streams and creeks for household and agricultural use is common practice. With increasing population and agricultural intensity, as well as extended drought conditions, water quantity is declining throughout the Hayfork watershed. Large landholders, mainly ranches, have long-standing rights to large quantities of water for traditional agricultural use. Of the interviewees, four participants fall into this category. Three other participants claimed that the most inefficient use of water in Hayfork was at the hand of those with agricultural water rights. It should be noted however, that these seemingly water-rich ranchers were also bracing themselves for the lowest water levels they had ever seen, and adjusting water use accordingly by

reducing herds and implementing additional storage infrastructure. This unanticipated conflict between small and large landholders only emphasizes an important theme for locals that it's not what you are doing with your land, but how you are doing it.

Of the 18 land managers interviewed, only four lived within the water district. Four were ranchers with pre-established water rights, and ten others relied on combinations of wells and creek/stream diversion. Of those with independent water systems (non-municipal), ten had multiple system types in place such as a creek diversion and storage pond, or creek diversion and well. In addition five interviewees irrigated with gravity fed systems, which combined with the multiple water sources, was a sign of increased resilience to equilibrium shifts such as power outages, fuel shortages and water scarcity.

In response to the drought, land managers studied were employing multiple strategies to adapt to the changing conditions. Livestock herd reductions, crop reductions, and storage tank installation were the most common strategies employed. Three of the four cattle ranchers planned to reduce their herds by at least half. The lack of water posed threats for cattle health, as well as the ability to irrigate fields that would feed the cattle through grazing, and/or to produce hay for feed. Without the grazing and hay production potential, the (rising) costs of purchased feed far outweighed the profit potential for these ranchers. One mixed livestock producer also planned to reduce her herd dramatically in light of a very dry creek and a diminishing storage supply, before losing animals to death or illness by dehydration or lack of quality feed. In addition to herd reduction, she and her family planned to invest approximately \$40,000 in storage

tank infrastructure. When faced with the choice to uproot and move her farm, she made the decision to stay and adapt to the changing climactic demands, an investment she feels will help sustain her operation over time. While most interviewees planned to stay put, adapt and suffer out a lean, dry year, one couple of market farmers suspended their production entirely. Multiple reasons for this were cited, including lack of economic incentive at the market, possible re-location, educational pursuits and personal reasons. But water scarcity presented the proverbial “last straw.” The land they leased for their farm would not have enough water to sustain their operation, the irrigation of which required approximately 27,000 gallons of water every other day.

Evidence of the drought’s effects were made apparent at the farmer’s market in two ways: 1) many community members are not growing as big of vegetable gardens this year and are relying more on the farmers market for homegrown local food options, and 2) the produce at the market is limited due to crop reduction on the part of sellers. One farm is no longer vending and another, usually with ample seasonal goods, lacks the availability of water intensive foods like salad greens and corn. Sadly, at the social apex of the local food dilemma, where supply and demand may finally be starting to match up, an uncontrollable ecological shift is leaving both farmers and consumers at the mercy of extreme drought.

At the time that I write, the drought continues into 2015 and the extended impacts on local agriculture remain to be seen. Many speculate that the drought will come to an end this year, while others fear that climate change could lead to drier conditions in the long-term. Based on the uncertainty of climactic conditions and water supply, the

measures local growers are taking to implement permanent water storage and conservation systems demonstrate a strong adaptive capacity on their part. However, local concern over the adaptive capacity of the *Cannabis* industry, and the social capital needed to promote and regulate water use programs, is bubbling to the surface as conflicts are anticipated to rise as a new season begins, with no rain in sight.

### Resilience, Adaptation and Transformation

When treating the subject of rural resilience and agriculture, the social and ecological domains, the interrelation between them and the role of land management must be considered. In the case of Hayfork, three agricultural system types account for a large swath of the social and ecological fabric of the community: local food, *Cannabis* and forestry. Most Hayfork residents have either peripheral or direct involvement with one or a combination of these three, on a spectrum spanning from home gardening, farming and ranching, to local conservation or federal agency employment. Local agroecological knowledge and social capital inform and support local land management practices. Agriculture is embedded in both social and ecological domains across temporal and spatial scales throughout the contemporary history of Hayfork. Various adaptive cycles are interwoven in a complex social and ecological system, the resilience of each must be considered, but in relation to one another as well. Where there is capacity to adapt and retain function in one, another may experience a shock that demands transformation in the face of collapse.

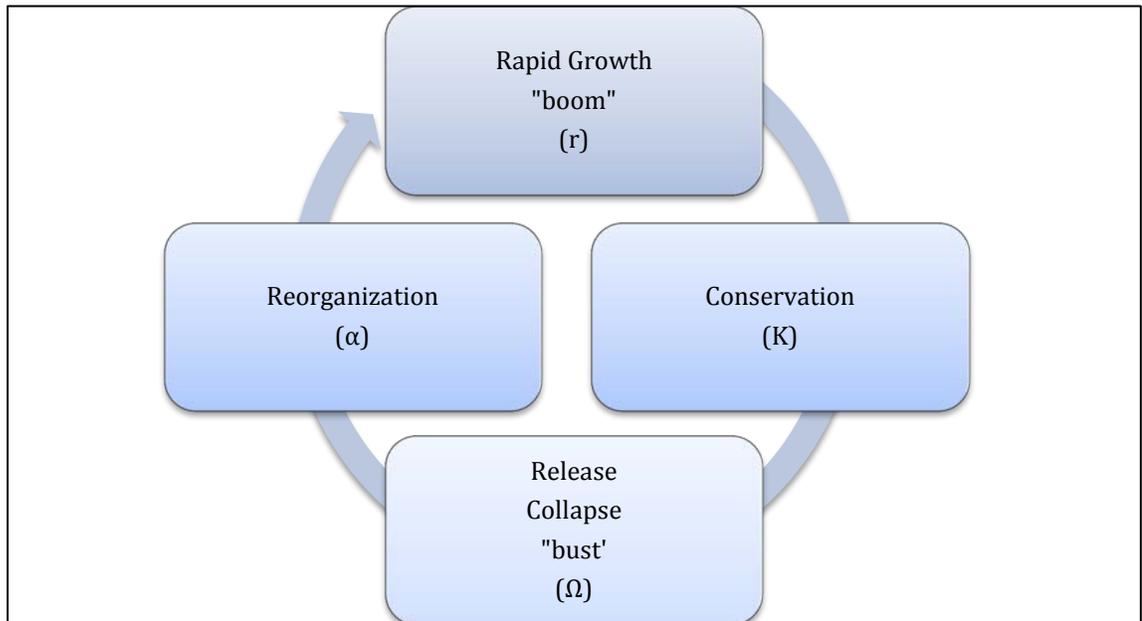


Figure 6. The adaptive cycle (adapted from Holling and Gunderson)

Hayfork provides an example of past and present adaptive cycles in a social-ecological system (Figure 6). The rapid growth phase (r) of settlement in the 1850's and the conservation phase (K) that followed, were signified by an agricultural system that thrived for the better part of a century. The collapse or bust ( $\Omega$ ) of local foods in the post-WWII era preceded a reorganization phase ( $\alpha$ ), that provided opportunity for a timber industry boom (r) that was sustained for approximately half a century, before deindustrialization of timber and the economic bust ( $\Omega$ ), that led to another period of restructuring and organization ( $\alpha$ ), giving way to the rapid growth (r) of a new *Cannabis* industry, now holding tenuously in a conservation phase (K), but vulnerable to shocks in the system that could cause collapse ( $\Omega$ ).

These cycles appear to be consecutive and based in economics, perhaps due to a historically linear approach to rural development that is overly reliant on replacing one

extractive, resource-based industry with another, and does not encourage diverse resilience strategies. In a social-ecological system however, economy is intrinsically tied to the ecology of the working lands that sustain the community. For each of these cycles, adaptive ecological cycles have been concurrent. Furthermore, each of these cycles still co-exist today in revitalized and localized formats, exhibiting adaptive capacity and resilience despite punctuated systemic shifts.

There are also nested adaptive cycles to consider. This is the story of one small town, embedded within local, regional, national and global scales of influence. The case of Hayfork illustrates how macro-level socio-political, ecological and economic shifts such as globalization, war and climate change can cause notable social-ecological impacts on a local micro-level, in community and on public and private lands. Panarchy exists on a local level, across spatial scales and also across temporal boundaries. The aforementioned adaptive cycles of settlement, local food, timber, and now *Cannabis*, are all embedded in a broader cycle of local agriculture over time. Local agriculture exists in relation to the entire global agricultural system. The work of local farmers and land managers, consists of various adaptive social-ecological cycles, from the biotic function of soil to the engagement in local collaborative planning.

Agriculture has evidently persisted, adapted and exhibited resilience over time in Hayfork and may now be poised for a transformation that hinges on the trilogy of local food, forestry and *Cannabis*. The current opportunities to develop deliberately transformative systems, based on the lessons of the past, could support a sustained conservation phase on a local level and increased resilience to broader systemic change.

To put this theory into practice, planning must occur prior to collapse, pre-empt catastrophic change and be based on a sustainable, multi-pronged approach to community planning that encourages resilient agroecological system development.

Research participants exhibited overwhelmingly high levels of resilience, adaptive capacity and transformative vision across the board. A keen sense of the nested relationships between property and farmer, environment and community, local and global, was ever-present in the interviews. Local agroecological knowledge was exhibited in creating context-specific adaptive systems at home and in community that could sustain personal, social and ecological well-being in the long term.

#### Future Desired Conditions

There is not one consistent vision for the direction of Hayfork. There is no local government and the priorities of local individuals and groups vary. However, where agriculture is concerned, identifying challenges and opportunities based on lessons learned from the past encourages the development of forward thinking resilience strategies. For research participants, future desired conditions mainly centered on the continued ability to engage in agriculture, underscoring the value of sustainable practices. In order to adapt to changing social and ecological conditions, collaboration and utilization of local knowledge was considered important moving forward. Fundamentally, the continued creation of local jobs, reduced reliance on illegal *Cannabis*, increased environmental regulation to address ecological concerns about *Cannabis* and more local infrastructure and collaboration for food production and forestry, were expressed.

## DISCUSSION

In the case of Hayfork, the persistent struggle to thrive in the throws of industrial society has created a vicious cycle of poverty and increased susceptibility to boom-bust economic cycles. After having been settled in the expansive gold rush era of mining and agriculture, after displacing the indigenous population and being sustained for years by timber, the deindustrialization of the local timber industry, coupled with the environmental movement, created a huge shift in the local culture and economy. This gap has been filled by small-scale agriculture, community forestry, and the rapid expansion of *Cannabis* cultivation. The timely coincidence of the final mill closure and medical *Cannabis* legislation in 1996 undoubtedly opened a window for this boom. The increased scale of *Cannabis* production signifies a community's adaptability and opportunism in order to survive, and has provided an alternative means of economic survival that many are taking advantage of.

The resilience of a social-ecological system, such as a garden, a farm, forest or a natural resource-dependent community, is indicated by the system's ability to adapt to changes and to transform when adaptation is no longer possible or optimal. Agroecology focuses on the interconnection between the biological, social and political systems. By applying agroecological thinking to a social-ecological system, the system becomes more resilient. The adaptive capacity of a system can be measured by the practice of sustainable resource and farm management, the existence of local knowledge, social

capital and organizational capacity. Over time, the community of Hayfork has exhibited the capacity to adapt to both gradual and punctuated changes on social and ecological levels. The prominence of local agriculture since the time of settlement is only now reinforced by the second wave of a back-to-the-landers and an emerging local food movement worldwide. All these factors converge to show Hayfork as a fine candidate for an increased sustainable agriculture initiative that is inspired by the local culture of self-reliance, cooperative action, food sovereignty, healthy and independent living and focused on the agricultural trilogy of local food, forestry and *Cannabis* sectors.

A strong, self motivated conservation and sustainability ethic among local land managers, combined with a broader and systemic call to enhance local food markets, reduce reliance on industrialized agriculture for environmental and economic reasons and maximize eco-system services, indicates that Hayfork could exhibit high levels of resilience and adaptive capacity, not only in its ability to withstand changes on a local and non-local level, but to adapt accordingly and transform when necessary.

*Cannabis* provides economic stimulus and incentive to the community, yet also poses direct social and environmental risks that are not easily monitored or addressed. It cannot be denied that the economic benefits and cultural influences have assisted in the transition of Hayfork away from a traditional timber economy, but when the future of the community seems bleak, the over-reliance on one crop, or one industry, weakens its overall resilience to broader social, political and environmental changes. The potential legalization of *Cannabis*, the extreme eradication of it, or an extreme ecological shift such as continued drought, could bust the economy and social fabric of Hayfork. An

over-extraction of natural resources such as land and water, for a short-term financial gain, could have long-term social and ecological impacts, crippling the community. It is exactly this type of major shift that local, sustainable agriculture can help mitigate. A community's ability and capacity to produce various agricultural products in a sustainable manner will create resilience for the community in the wake of a potential shift. The culture of stewardship, conservation and collaboration inherent in the community will likely help sustain Hayfork through inevitable social and ecological changes.

Any inquiry into Hayfork agriculture requires a look beyond food production systems to include *Cannabis*, timber and non-timber forest products like wild food and medicines, hard woods products, commercial and residential firewood. When considering the viability and importance of sustainable agro-ecosystem management, all agricultural ventures must be included in the discourse. There is no doubt that the community of Hayfork has returned to an agricultural economy, but how resilient is it? While the existence of local food and collaborative forestry movements indicate levels of diversity, social capital and organizational capacity key to a resilience, the apparent over-dependence on one commodity, with tenuous legal standing, very little regulatory influence, and potentially extreme social and ecological impacts, requires special consideration.

Throughout this study, local agriculturalists have exhibited extensive knowledge of sustainable management practices on farm and in the forest environment. Many individuals utilize this knowledge in diverse ways on their property, managing food

systems with cash crops or commodity systems and forest management. Yet, strategies on how to expand this knowledge across cultural lines and property boundaries for maximum community and environmental benefit, have been slow to emerge.

Collaborative management strategies hold great promise for the management of natural resources on public, federally-managed national forest lands. The application of the same philosophies to private land management presents a unique set of challenges. The existence of groups like the Hayfork Cooperative, exemplify a culture of community cooperation amongst local land-owners; however, some members feel their efforts are insular. Inclusivity of the topic of *Cannabis* and applications of local knowledge to a sustainable *Cannabis* industry has been delayed to enter the public discourse, however the looming ecological shock of drought has helped facilitate more growth in this area.

A true agricultural renaissance that emphasizes local food, sustainable farming and agroecological principles, must be applied to all agricultural endeavors if maximum social-ecological benefit is to be achieved. Therefore the development of social capital and the proactive dissolution of social and cultural conflicts must be included in a strategy for a sustainable and resilient future. Even then, when all the truest of intentions manifest in sustained community cooperation and collaborative planning, will the natural resources on which Hayfork depends be able to continue to sustain the community demands?

## CONCLUSION AND RECOMMENDATIONS

The community of Hayfork, California, has exhibited high levels of social-ecological resilience and a strong capacity to adapt in the face of inevitable change of various scales over time. Small-scale, subsistence-based agriculture has provided for the needs of local people through transitional times. Engagement with the public forest lands has provided economic and stewardship opportunities since settlement, and now focuses on conservation and adaptive management strategies that provide employment for local people, while protecting eco-system services for everyone. A thriving *Cannabis* industry has provided an economic stimulus over the past two decades, which has in part aided in the community's ability to withstand shocks caused by the deindustrialization of timber. However, an over-reliance on one industry and the imminent threat of severe drought may leave the community vulnerable to collapse.

An integrated, multipronged approach to rural resilience must include sustainable agriculture, and any consideration of sustainable agriculture in Hayfork, must address the interconnectedness of land and community through local food, forestry and *Cannabis*. The continuance of existing efforts by local organizations such as the Watershed Research and Training Center, the Trinity Collaborative, UC Extension, the Hayfork Cooperative and the Hayfork Farmer's Market, to build social capital within the community and across sectors, is paramount to such a strategy.

In addition, intense focus must be placed on the integration of *Cannabis* into a local discourse on sustainability and resilience. Additional studies are needed to evaluate

the economic and ecological role that *Cannabis* plays in Hayfork. Pro-active planning for the effects of legalization must be initiated across cultural boundaries to provide some stability in the face of this probable change.

Furthermore, immediate action must be taken to address water issues in Hayfork. Without pre-emptive, collaborative and adaptive strategies for water conservation and preservation, all types of agriculture may be threatened, causing a shock that could be difficult for the community and lands of Hayfork to absorb moving forward.

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## APPENDIX A. INTERVIEW GUIDE

1. Personal Information
  - Age, Occupation, Education, family, interests
  - How long have you lived in Hayfork?
  
2. Life in Hayfork
  - What brought you to Hayfork?
  - What do you value about living here?
  - What would you change?
  
3. Living/ Property Information
  - Own or rent
  - in or out of town
  - how many acres, how is it zoned?
  - ranch, farm, garden
  - on/ off grid?
  
4. Would you call yourself a: (choose any and all that apply)
  - a) grower
  - b) gardener
  - c) farmer
  - d) rancher
  - e) \_\_\_\_\_
  
5. Land Use
  - Livestock? Tell me about your animals?
  - Crops? What do you grow?
  
6. How do these items grown contribute to you and/ or your household?
 

Probes: income, sustenance, trade, hobby
  
7. Why did you choose these animals/ crops? How did you learn to do this?
  
8. Fertilizer/ Pest Management?
  
9. Water
  - Where do you get you water? How do you irrigate?
  - Being a drought year, what if any changes are you making? How are you preparing for this year?

- Have there been times in the past where you did not have enough water? How did you adapt?

10. Infrastructure

- How do you decide what to plant where?
- What kind of infrastructure do you have? Greenhouses, fences, barns etc.

11. How much of an investment did you have to make to get started?

- time, Money, energy

12. What are some of the challenges you face with your land/ crops?

- social and ecological

13. Local Barriers and opportunities to agriculture

- organic certification
- markets
- location
- transportation

14. What role does agriculture play in the community of Hayfork?

Probes: historically, currently, contributions, issues

15. Are there any crops that can be grown here for export?

Probes: Opportunities, limitations

16. How have things changed here over time?

- Socially & Ecologically
- How have your practices changed over time

17. What kinds of organizations or programs exist locally to support local agriculture?

Bonus Questions:

Is it important for communities to grow enough food to sustain themselves?

- What would it take for Hayfork to do that?

Define Sustainability

- Is sustainability important to you?