Sust ʻāina ble Molokai

Agriculture Needs Assessment

May 2012

Prepared by Malia Akutagawa, Lahela Han, Emillia Noordhoek, and Harmonee Williams

Acknowledgement

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It is our hope that this assessment will serve as a tool for Molokai's farming community to network and replicate their successes. With this work we would also like to stimulate more dialogue as well as afford our residents, consumers, retailers, educators, nonprofits, decision and policy makers, and investors an accurate overview, of the assets, needs, challenges, and potential opportunities for Molokai's agricultural future.

Molokai Agriculture Needs Assessment

a project of

Molokai-pedia

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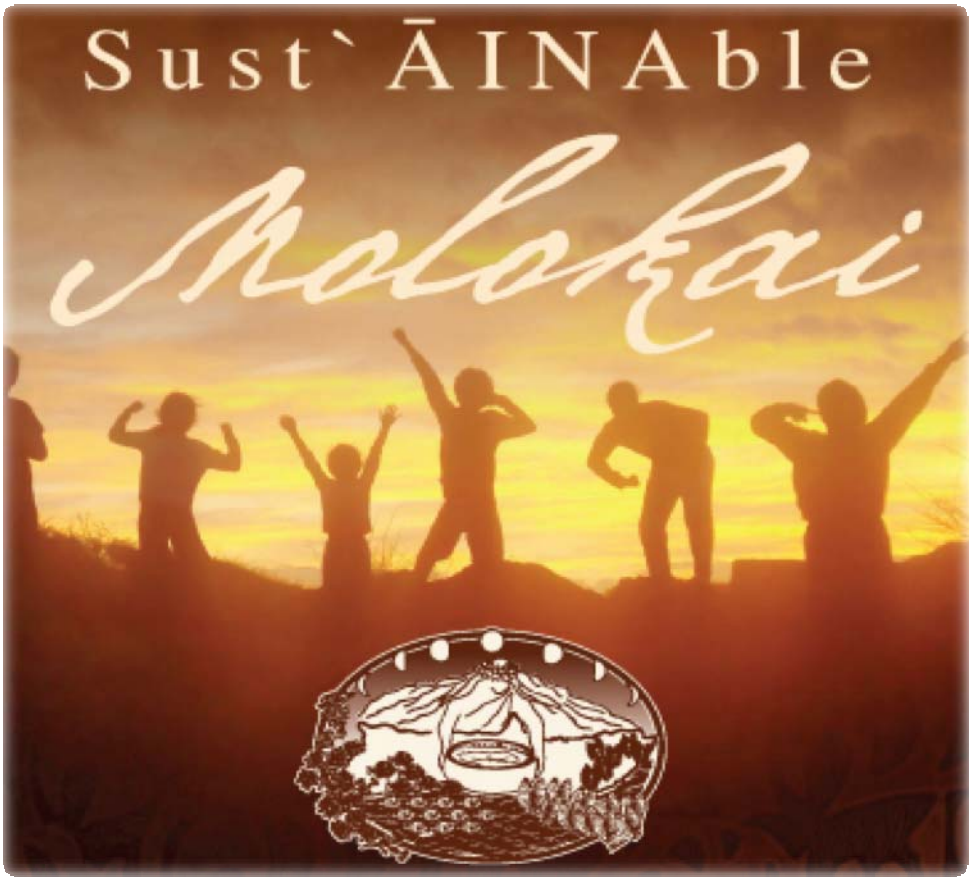


Moloka`i ❋ pedia

Molokai Agriculture Needs Assessment

I. INTRODUCTION

Molokai's Cultural and Historic Legacy as an Agricultural Breadbasket. Flying over the small island of Molokai (38 miles long, 10 wide), one is able to see much of the culture's rich heritage: the remnants of over 60 ancient Hawaiian fishponds stringing the coastline like lei (flower garlands) that once held hundreds of tons of fish. Inland one sees also overgrown, terraced taro fields stretching into every ahupua`a (valley characterized as highly productive, self-sustaining land divisions spanning from the mountain down to the sea). These lo`i (wet taro patches) were crafted by brilliant engineers who channeled cool waters through an intricate system of `auwai (irrigation ditches) that meandered between stream and successive patches, entered the stream once more, and fed the loko i`a (fishponds). From historic times, this island was called `āina momona (the fat or abundant land). It produced so much surplus that it easily fed armies of people from neighboring islands. The people were inherently generous, as scarcity did not exist.

The Land and People: Past and Present. This island also produced the most famed and powerful kahuna (priests) known for their Pule O`o (potent and ripened prayers). Kahuna finishing schools for higher learning were found here. Molokai is also Ka Hula Piko, birthplace of the dance (the giving and expression of life) and also the origin of its counterpart, lua (martial arts as bringer of death). Together they form the necessary duality of the healer and warrior to become one complete art. One comes to know the descendants of this land to express that same duality: a kindness and friendly openness mingled with an intense ferocity as protectors and defenders of Molokai Nui A Hina, Great Child of Hina.

Seventy-two percent (72%) of Molokai's population is of Native Hawaiian ancestry. The island has no stoplights and no buildings taller than a coconut tree. Car doors are rarely locked. A "traffic-jam" on Molokai is described as two vehicles stopped in the middle of the road while their occupants "talk story" and drivers behind them wait patiently for the conversation to end. At least one-third of the average Molokai family's diet comes from traditional, subsistence activities (hunting, fishing, gathering, and farming). It is common practice to exchange fish for venison, breadfruit for taro, and to give food to kupuna (elders) who no longer can fish or hunt for themselves. While no stranger to western influences and the tragedy of the commons; of the islands, Molokai has best managed its natural resources and maintained a greater sense of its heritage as `āina momona.

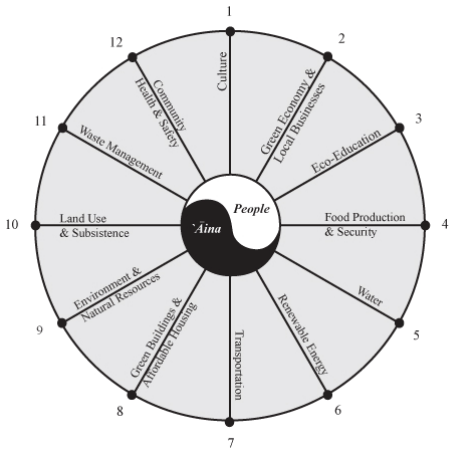
Subsistence and Molokai's Economy. As the plane makes its descent, the island moves into greater focus. One sees a deep scarring of the land, denuded landscapes from the introduction of hooved animals (goat, deer, and cattle); decades of heavy ranching; huge water diversions that were used for destructive plantation agriculture and now in support of the GMO companies. Eroded gullies transport silt into the sea, choking once abundant fishponds with toxic, chemical-laden soils and inundating the largest contiguous fringing reef in the U.S. Despite declining resources, Molokai residents persist by supplementing their diet with subsistence foods grown, gathered, caught, fished, and hunted. One can say the people not only subsist on traditional foods as a cultural practice, but out of necessity. Burdened with a 12% unemployment rate coupled by a high cost of living (gas costs currently at $5.49/gallon, high shipping costs of goods brought by barge that are passed down to the family's grocery bill, and 100% diesel powered electricity costing 45 cents/kwh), the people turn to traditional life skills to stretch their dollars. They also rely on extended `ohana (families) and friends for mutual bartering and goodwill.

A Place of Contrasts. Upon landing on Molokai's short airstrip, one cannot help but take a cooling and restorative breath and absorb the surroundings of a truly beautiful and most special island. Over time, one realizes that Molokai is a place of contrasts; where past and present, abundance and scarcity, ease and hardship occupy the same space. One wonders how to change the paradigm so the best of the past becomes the future, and the future becomes the present -- where the land flourishes and the people thrive. Our goal is to become the abundance our ancestors saw everyday of their lives, that we may restore the pono (balance and right relationship) and embrace the true meaning of sustainability.

Molokai Future of a Hawaiian Island and the Work of Sust`āinable Molokai. Residents took it upon themselves to compile decades of community planning and identified cultural and foundational values into a culminating and living document titled "Molokai: Future of A Hawaiian Island". It set the stage for the work our island will undertake for the next 40 years and beyond. It served as a call to action that resulted in the formation of this grassroots-led nonprofit organization, Sust`āinable Molokai. The document has attracted the interests of decision-makers in state and local government; conservationists and environmentalists; Hawaiian and other indigenous groups; and green innovators. It examines community and cultural values for which future decision-making shall be guided. It identifies opportunities in education (both modern and traditional); business and vocational training; diversified agriculture and aquaculture; responsible land use, management, restoration, and stewardship to maintain open space and protect traditional subsistence; host-based, culturally appropriate models for tourism; green jobs; promoting energy self-sufficiency; water conservation; converting reliance on fossil-fuel-powered automobiles to those run on renewable energy; and a traditional `aha ki`ole, local governance structure that raises community parity .

As co-authors of this document, our core leadership subsequently founded a grassroots initiative in 2008 to ensure that the plan would not sit on a shelf to hold unfulfilled community hopes and dreams. In 2010, we officially incorporated as a 501(c)(3) nonprofit to implement the plan, preserve our island's rich culture and historic legacy of `āina momona while embracing modern pathways to a sustainable future.

The Sust `āina bility Wheel



We define sust`āinability in terms of restoring abundance, or `āina momona to the land and people. `Āina reflects a covenant between the people and the land, where Earth's bounty goes hand in hand with good stewardship. We asked ourselves what makes a happy, healthy, and sust `āina ble community? We came up with the 12 priority areas. We saw these 12 components as spokes on a wheel connected to a central hub that held them all together. That core is the lokahi (unity) and the pono (harmony) between the land and people when we honor the covenant that comes with the word `ĀINA.

12 – POINT SUST `ĀINA BILITY WHEEL		
Cultural Identity	Local, Green Economy	Cultural and Environmental Education
Food Sovereignty and Security	Water Quality and Conservation	Renewable Energy
Energy Efficient Transportation	Green Building and Affordable Housing	Healthy Environment and Abundant Resources
Responsible Land Use and Protecting Subsistence	Zero Waste, Recycling, and Re-Use	Community Health, Safety, and Well-Being

**Moloka`i-pedia and the Agriculture Needs Assessment.** Moloka`i-pedia is a project undertaken by Sust`āinable Molokai for the purpose of creating stronger community networks; informing key stakeholders; increasing equity and access to public and private partnerships and resources; and mobilizing our people to build as well as measure our progress towards a sustainable future. The concept for Moloka`i-pedia stems from our 2009 Sust `aina ble Molokai Resource Guide that is based on our 12-spoke Sustainability Wheel. Positive community involvement has prompted the expansion of this work. The project addresses the current lack of data specifically for our geographic area. The majority of information on Molokai is subsumed within a tri-isle county system that does not account for the vast differences between our rural island of 7,345, to tourism-focused Lanai, and urban Maui with a much higher population density. Further, there is no data collection on the 12 areas of sustainability identified by our project. Moloka`i-pedia also seeks to address the isolation that many individuals and organizations operate in. This silo-effect makes us all ineffective. Sust`āinable Molokai aims to utilize Moloka`i-ipedia as a tool to show how various entities can benefit from collaborating. Public, private, and nonprofit entities will be able to access specific data sets; see a clear picture of needs-to-assets ratios; mobilize collectively to fill existing gaps; and capitalize on available assets and resources to achieve shared goals.

Our online open source database is being organized along the 12 spokes of the Sust`āinability Wheel. Within each section, we are collecting baseline and new data to provide a comprehensive overview in the form of a "needs and assets assessment" of Molokai resources. Once complete, we will be able to see what we have and what is missing. This will inform our next stage of work, and help us to effectively pursue solutions on our path to sustainability. Moloka`i-pedia will assist us in our education, training, and advocacy work; help us to identify existing community assets and inherent challenges; and fill complementary roles that advance local efforts. This vehicle will facilitate the kuleana (responsibility) we place on ourselves to be architects of our own destiny and in developing homegrown solutions that work best. In our success, others also succeed. Our strategy aims to identify partnerships between individuals, community groups, businesses, governmental agencies, and other service providers who could benefit from working together.

We envision Moloka`i-pedia to serve as a tool for citizen empowerment: returning data ownership to community to effect meaningful change and solutions. Moloka`i-pedia ensures community self-determination in how data is collected and utilized; not just scientifically, but responsibly, ethically, and with good intent. It necessitates ongoing community engagement with not only the data and the technology, but also in sharing ideas. Moloka`i-pedia will give everyday people access to real information that is important to them and that improves their lives, especially in a time of government inefficiency and waste, where decision makers often disconnect and abdicate their fiduciary responsibility for the people and places they represent.
When citizens determine for themselves what data sources are information-rich and of great value (including stories shared by kupuna, farmers, fishermen, teachers, coaches, and

grassroots leaders), then life is breathed into the data and it has the power to transform lives for the better.

The first sustainability topic we have begun to survey our population on is in Food Production. To aid us in this endeavor, we searched existing literature on agriculture generally as well as combed through references to Molokai-specific agriculture. This baseline work helped us to determine gaps in the data, and refine our interview and survey questions. The following background information is provided to help lay a foundation and contextual backdrop for our study.

II. BACKGROUND

A Statewide Outlook

Agriculture is a major contributor to Hawai`i's economy and is essential for providing food to residents as well as generating revenue through a robust export market.[1] Agriculture generates $2.9 billion to Hawai`i's annual economy and produces 42,000 jobs.[2] However, there is much room for improvement in terms of providing enough food for the islands as well as increasing revenues for the State.

From Plantation Agriculture to Biotech Seed Crops. Towards the end of the 20th century monocrop plantation agriculture (sugar, pineapple) lost its economic edge due to lower wage, foreign competition.[3] Industrialized, corporate agriculture in Hawai`i has shifted to biotech crops; namely genetically modified seed corn research.[4]

While biotech seed crops have proven most economically lucrative for Hawai`i agriculture, with a profit value of $177 million in the 2008-2009 growing season,[5] allocating precious acreage and limited water resources to GMO seed crop research would in the long-term compromise the State's overall food security and limit the State's ability to provide locally healthy and nutritious foods. Industrial, non-sustainable farming practices that include heavy application of synthetic fertilizers and pesticides further degrade the ecological health and viability of Hawai`i's prime agricultural lands for present and future generations.

Agroecology. Hawai`i's geographic isolation as an island archipelago leaves it most vulnerable to food and fuel shortages, natural disasters, drought and rising sea levels associated with global climate change. Measures to increase resilience and adaptability include adopting agroecological approaches, "apply[ing] ecological science to the design of agricultural

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[1] State of Hawai`i Department of Business Economic Development & Tourism, Office of Planning, *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Executive Summary: ii, 2010.

[2] *How Important is Hawai`i's Agriculture Today?* http://hawaii.gov/hdoa/ag-resources/agtoday

[3] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 1 – 2010 Statewide Economic Overview, p. 4-5: *"[I]n 1970, Hawaii produced about 10.5 million tons of raw sugar valued at about $451 million adjusted to 2006-valued dollars. By 2006, sugar production had fallen to 1.6 million tons with a value of about $50 million. Likewise the pineapple industry produced 954,000 tons of fruit in 1970 worth about $161 million when converted to 2006 dollars. By 2006 production had fallen to 185,000 tons with a value of $74 million."*

[4] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 1 – 2010 Statewide Economic Overview, p. 5: *"[I]n 1970, Hawaii produced about 10.5 million tons of raw sugar valued at about $451 million adjusted to 2006-valued dollars. By 2006, sugar production had fallen to 1.6 million tons with a value of about $50 million. Likewise the pineapple industry produced 954,000 tons of fruit in 1970 worth about $161 million when converted to 2006 dollars. By 2006 production had fallen to 185,000 tons with a value of $74 million."*5. *"The Hawaii Department of Agriculture estimates the value of seed corn growing at $169 million in the 2008/09 growing season, more than double the value from the 2005/06. It represented about one-third the value of all crops grown in the state in 2008/09."*

[5] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 1 – 2010 Statewide Economic Overview, p. 30-31.

systems."[6] This methodology includes practices that enhance the life in the soil that provides nutritious, organic food; integrated pest management through guilding with beneficial plants and trees and attracting natural predator insects and animals to protect crops; and selecting for biodiversity to minimize crop losses.

Organic Farming. Renewed interest in sustainable agricultural practices have arisen from a burgeoning organic industry and standards for organic certification that stress ecologically based farming and exclusion of synthetic fertilizers and pesticides and genetically modified organisms.[7] The U.S. organic industry netted $17.8 billion in retail sales in 2007, approximately 2.5% in total national food sales.[8] Worldwide value of organic produce stood at $30 billion as of 2005, with a 14% annual increase since 2000.[9] Acreage dedicated to organic agriculture has increased 20% annually since 2001 with 78 million acres in production worldwide as of 2006.[10] Hawai`i's growth has mirrored global and national trends with State sales of organic crops increasing 60% between 2005 and 2007, from $5 million to $8 million.[11]

Organic foods have become more mainstream with outlets including regular supermarkets rather than just the typical small natural food outposts.[12] Whole Foods Market, Inc. has in recent years established a presence in Hawai`i. With its reputation for buying from small, local farmers, the presence of Whole Foods serves as an incentive for Hawai`i farmers to grow organic food.[13] There are an estimated 200 certified organic producers in the State, operating on a median of 5-13 acres of land.[14] The Big Island holds the most acreage for organic production at 58%, followed by Maui (22%), Kaua`i (11%), Molokai (7%), and Oahu (2%).[15] The industry will continue to expand with increasing consumer preference for organic foods.

Buy Local, Eat Local. Common themes around agriculture emerged from focus group meetings conducted as part of Hawai`i's 2010 Statewide Comprehensive Economic Development Strategy (CEDS). These included support for diversified agriculture and increasing food security by supporting Farmers Markets and "Buy Local/Eat Local" initiatives.[16] The Hawai`i Farm Bureau Federation, State of Hawai`i Department of Agriculture, and University of Hawai`i College of Tropical Agriculture and Human Resources (UH-CTAHR) have sponsored these type of campaigns ad emphasize the following:

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[6] United Nations Human Rights, Office of the High Commissioner for Human Rights, *Eco-Farming can double food production in 10 years, says new UN report,* March 8, 2011. http://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=10819&LangID=E

[7] Radovich, Theodore J., Linda J. Cox, and James.R Hollyer. "Overview of Organic Food Crop Systems in Hawai`i." College of Tropical Agriculture and Human Resources, Sustainable Agriculture Nov. 2009, SA-3.

[8] Radovich, Cox, and Hollyer 2009.

[9] Radovich, Cox, and Hollyer 2009.

[10] Radovich, Cox, and Hollyer 2009.

[11] Radovich, Cox, and Hollyer 2009.

[12] Radovich, Cox, and Hollyer 2009.

[13] Radovich, Cox, and Hollyer 2009.

[14] Radovich, Cox, and Hollyer 2009.

[15] Radovich, Cox, and Hollyer 2009.

[16] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, 2010, Executive Summary: ii.

1. *Enjoy exceptional taste and freshness: premium taste, maximum freshness, produce picked and eaten closer to its height of ripeness, packed with nutrients*
2. *Strengthen your local economy and community: buying local food keeps your dollars circulating in your community. Building relationships with the farmers who grow your food strengthens your ties to the community and the land*
3. *Help preserve open space: by supporting local farmers, buying local food helps preserve green, open space in your community*

Part of this campaign also acknowledges lessening the State's ecological footprint and dependence on fossil fuels from heavy imports from the mainland that have more "food miles" associated with them as compared to locally purchased food.

Diversified Agriculture. Hawai`i's agriculture industry capitalizes on the islands' tropical year-round growing climate, and unique features that allow for niche industries.[17] More small farms have gained a foothold in the diversified agriculture sector through cultivation of specialty crops such as tropical fruits, macadamia nuts, coffee, flowers, and fresh produce sold around the globe.[18] The "Grown in Hawai`i" branding is recognized around the world as a guarantee of high quality delicacies.[19] Hawai`i Regional Cuisine has also become known for its utilization of the freshest seafood, veggies, and tropical fruits in a unique fusion of East, West, and island flavors.[20]

In 2008, farm production in diversified agriculture produced 12,200 jobs throughout the State.[21] Proactive measures to revitalize Hawaii's agriculture industry through diversification has brought revenues that are comparable to the State's early heydays when sugar and pineapple were king. In 2002, Hawaii's Agricultural Farm Revenue crossed $535.9 million.[22] Diversified agriculture accounts for 69% of annual revenues, with pineapple (19%) and unprocessed cane sugar (12%) trailing behind.[23]

Agri-Tourism. Agriculture is also proving important to tourism, Hawai`i's top economic engine.[24] Visitor interest in eco-tours, agri-tours, and culturally authentic experiences is on the rise.[25] In 2006, agritourism brought in $38.8 million in revenue as reported by 112 Hawai`i-

[17] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 1 – 2010 Statewide Economic Overview, p. 12.
[18] *How Important is Hawai`i's Agriculture Today?* http://hawaii.gov/hdoa/ag-resources/agtoday
[19] *How Important is Hawai`i's Agriculture Today?* http://hawaii.gov/hdoa/ag-resources/agtoday
[20] *How Important is Hawai`i's Agriculture Today?* http://hawaii.gov/hdoa/ag-resources/agtoday
[21] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 1 – 2010 Statewide Economic Overview, p. 29.
[22] "Diversified Agriculture: Hawaii produces some of the world's most valued agricultural products." *Enterprise Honolulu. 2008*
[23] "Diversified Agriculture: Hawaii produces some of the world's most valued agricultural products." *Enterprise Honolulu. 2008*
[24] *How Important is Hawai`i's Agriculture Today?* http://hawaii.gov/hdoa/ag-resources/agtoday
[25] *How Important is Hawai`i's Agriculture Today?* http://hawaii.gov/hdoa/ag-resources/agtoday

based farms, an increase of 14% from 2003 figures ($33.9 million).[26] The leading category of revenue received from agri-tours was $12.1 million in on-farm direct sales to visitors.[27] Other activities yielding profit included bed and breakfast amenities, providing meeting spaces and venues for education and entertainment, and outdoor recreation.[28]

Agriculture on Molokai – Past to Present

From ancient times, Molokai was well known as `āina momona (the "fat" or abundant land) for its wealth as an island that produced food in surplus from its verdant ahupua`a and numerous fishponds. As on all Hawaiian islands, Molokai's people and the natural resources were managed under the ahupua`a system. The ahupua`a was a unit of land, typically wedge-shaped running from mauka to makai (mountain to sea) and following the natural boundaries of the watershed. The system was comprised of wao akua (sacred place of the gods), upland forests that gathered the rains. The area was subject to limited uses (e.g., for kia manu/bird catchers to gather feathers for cloaks, helmets and kahili; for the kahuna kālai wa`a to harvest koa for canoe building) and for ceremonial purposes. The mountain forests were preserved intact to form and protect the watershed and carry nutrients lower down the ahupua`a into wao kanaka (the people's domain). Here, the people were free to gather a variety of plants for daily needs, hardwood of the kauila to carve ihe (spears) and make tools and implements; olonā to create strong cordage for fishnets and fish lines; medicinal herbs; `ie`ie for lashing house posts and canoes; and maile for lei. The fertile plains and fields were known as the kula lands; a place rich in agriculture. These lands contained ancient feats of water engineering, contoured terracing of fields planted in taro that slowed the path of the water and allowed for maximum soakage. The water collected and fed

[26] Geisler, Malinda. "agritourism profile." *Ag MRC agricultural marketing resource center.* Updated January 2012. http://www.agmrc.org/commodities__products/agritourism/agritourism-profile/
[27] Geisler, 2012.
[28] Geisler, 2012.

numerous springs below. `Auwai (irrigation ditches) transported water from kahawai (streams), to multiple lo`i (taro patches), and returned the water once more to its source. Taro, banana, `ulu (breadfruit), ti leaf, kō (sugar cane) were all cultivated in the kula region. Fauna harvested from streams included `o`opu (goby), `opae (shrimp), and hihiwai (snail). Grasslands were converted to agricultural fields of `uala (sweet potato). Other kinds of plants and trees cultivated here included kukui (candlenut), `ohe (bamboo), and lauhala (pandanus). At the bottom of the valley, springs carrying nutrients from above flowed along the shoreline and sea. Here loko i`a (fishponds) were constructed to farm fish. These walled fishponds form semi-circles along the shoreline and are designed as micro-environments for certain brackish water and herbivorous fish like mullet and awa (milkfish) that feed on abundant mats of algae; thereby producing food for the people without having to apply excessive fishing pressure along the reef and open ocean.

Existing within the ahupua`a was a strict code of conduct (kapu system) amongst the people of the land (hoa`āina) as delegated and enforced by the ali`i (chiefs) and their konohiki (land agents) for the careful management of the natural resources. The hoa`āina possessed rights of gathering and usage of the natural resources within their ahupua`a of residence, with the understanding that they also had kuleana (responsibility) to mālama (care for) the land and sea, and harvest appropriately for no more than their needs. They engaged in po`alima, collective work days where the people pooled their labor to engage in public works improvements such as constructing additional lo`i and `auwai, and building fishponds. From the conscientious management of the land, waters, and sea and the maintenance of genealogical and spiritual relationships to the natural world, the resources were brought to a state of abundance. The ahupua`a system sustained the people for centuries.

Upon Captain Cook's arrival to the Hawaiian islands in 1778, he estimated the population to be between 20,000 to 36,000.[29] Introduced diseases for which the people had no immunity decimated the population throughout the islands. By 1836, Molokai's population had dwindled to an estimated 8,700 and was further reduced to 2,307 people by the time a census was taken near the turn of the century in 1896.[30]

Kamehameha brought about the unification of all the islands under one Kingdom of Hawai`i. Western influences and the teachings of Christian missionaries brought about decisions among the ali`i to abolish the kapu system (1819), privatize and deconstruct the ahupua`a (Mahele of 1848). While the chiefs received their apportionment of lands, many hoa`āina out of ignorance, trust in their chiefs to care for their well-being and govern them justly, or for fear of reprisal failed to register land claims to small kuleana parcels that would have kept them with a comfortable piece of land to maintain their `ohana (family) with hale (home) and garden plots.

Hawai`i's entry into the international market shifted the labor of the maka`āinana (common people) away from agriculture and towards deforestation of the upland forests to fulfill the

[29] Molokai Community Services Council. http://molokai.org/about-molokai/index.html.
[30] Molokai Community Services Council. http://molokai.org/about-molokai/index.html.

kingdom's sandalwood trade with China. Other enterprises included whaling and plantation agriculture that brought immigrants from around the world to Hawai`i's shores and altered watersheds through the diversion of waters from lush windward valleys to dry leeward plains for the mass production of sugarcane and pineapple. Without water to irrigate their taro fields, many were forced to abandon the lo`i and make for the city. Many Molokai families left the island in search of work in the more commercial centers located on Maui and Oahu.[31] Those who stayed behind maintained their connection to traditional pathways and subsistence living. Early, unsuccessful agriculture trials on Molokai included sugar, coffee, sisal, white potatoes, cotton, corn, grapes, beans, barley, oats, wheat, and alfalfa.[32] These crops failed due to heavy winds and insects.[33]

The area with the greatest population concentration was east Molokai. The easternmost valley of Halawa Valley was rich in lo`i, produced taro commercially, and supported a thriving community until two tsunami in 1946 and 1967 devastated the valley. The commercial centers moved to Puko`o and then Kamalo which held a natural harbor for import and export of goods. The Cooke family acquired the arid central and west Molokai plains, about one-third of the island. These lands are now owned by Molokai Properties, Ltd., commonly known as Molokai Ranch. To attract commerce to its landholdings, the Ranch dredged a harbor in Kaunakakai and constructed a wharf. Today, Kaunakakai serves as the main center of business, with Kamalo Wharf having fallen into disrepair and much of the area emptied of families. The Ranch also strategically purchased lands that would give them riparian and correlative rights to major streams and aquifer water in central Molokai. They diverted water to their westernmost properties used for cattle ranching.

Much of their lands in Kualapu`u and Maunaloa were utilized by Dole and Del Monte companies for pineapple cultivation.[34] The pineapple industry served as the economic engine for the island until it phased out in 1987 due to cheaper labor abroad. Today, many of Molokai Ranch's landholdings that grew pineapple are now leased for biotech corn research and coffee production.

The Hawaiian Homes Commission Act, a measure to rehabilitate Native Hawaiians of 50% blood quantum or more by returning them to the land to build homes and farm, was passed by the U.S. federal government in 1920. Molokai served as the staging ground for the program's success or failure. Hawaiian Home lands were designated in the areas of Kapa`akea, Kalama`ula, Pala`au, and Ho`olehua, and more recently Ualapu`e. Native Hawaiian families from neighboring islands came to Molokai to build their homes and make the land productive. Their early successes aided in the establishment of more homesteads on the other islands. With the influx of additional Hawaiian families and Japanese and Filipino immigrants to work in the pineapple fields, Molokai's population had increased to 4,427.[35] In recent years, Molokai's

[31] Molokai Community Services Council. http://molokai.org/about-molokai/index.html.
[32] Molokai Community Services Council. http://molokai.org/about-molokai/index.html.
[33] Molokai Community Services Council. http://molokai.org/about-molokai/index.html.
[34] Molokai Community Services Council. http://molokai.org/about-molokai/index.html.
[35] Molokai Community Services Council. http://molokai.org/about-molokai/index.html.

population has grown to include snowbirds and retirees from the U.S. mainland, as well as those seeking a more quiet and rural lifestyle. Today, the population of Molokai stands at 7,345.

In 1987, Molokai's livestock industry was crippled by the State Department of Agriculture's mandate to eradicate all cattle on the island due to the threat of bovine tuberculosis. Another heavy blow was dealt at the closure of the old slaughterhouse in Kaunakakai. Much planning from the grassroots level up was undertaken to resolve this problem. Commitments from multiple county, state, and federal partners; in-kind contributions by volunteer members of the Molokai Livestock Cooperative; and countless volunteer hours and services offered by various local businesses and individual residents led to the establishment of a new slaughterhouse facility located in Ho`olehua.

Erecting this state-of-the-art facility represented a vehicle to facilitate the restoration of Molokai's ranching industry and the ability for the island to produce and sell its own meat. Ranchers and homestead farmers now had a venue to process their animals. In addition to the more established ranches, an estimated 150 Molokai families raise livestock largely for home consumption. With the advent of the new slaughterhouse, there are now opportunities for these small scale farmers to expand into commercial livestock production. Stores and restaurants need not import all their meat from off-island as they now have access to local meat. Monies generated could benefit the community directly.

The introduction of hooved animals to Molokai has devastated the natural ecology of the island. Cattle ranching, feral deer and goat have eroded the land. Heavy rains transport tons of silt each year onto Molokai's reefs and fishponds. Introduced mangrove have also destroyed a significant percentage of Molokai's fishponds. Mangroves encroach and break through fishpond walls, trap sediments, and choke off underwater springs such that the water circulation and ecology are no longer viable for fish production.

Despite these hardships and setbacks over the years, agriculture remains the cornerstone of the island's economy. Molokai's rural character lends to a close-knit community with people who perpetuate strong cultural values, traditional subsistence and self-reliance. The people embrace local autonomy and are very involved in local governing processes. Agriculture, nonprofits, small business enterprises and local mom and pop stores are the foundation of the long-term economy on island. Much of the social, cultural, and service oriented programs are also generated from the grassroots, local level through the work of church groups, nonprofits, and unincorporated hui.

During the Focus Maui Nui proceedings in 2003, Maui, Molokai, and Lana`i residents gathered to strategically plan a future for Maui County. The 120 Molokai participants outlined challenges they faced as a community, and provided strategies and action plans to address them. Molokai residents identified top five community priorities which included inter alia, creating jobs (40.9%); strengthening the economy (29.6%); growing more food locally (21.7%); protecting and promoting rural identity (19.1%); and supporting small business development (13.0%).

The Maui County Workforce Investment Board (WIB) Local Plan provides an Assessment of Labor Market Trends to develop a Comprehensive Economic Development Strategy over a 10 year span.

One of WIB's goals is to focus on diversifying the economy, including the agricultural sector and "niche areas." The plan recognizes the need for expansion in value-added opportunities which emphasize the uniqueness of Maui Nui. The increased production and marketing of new agriculture products have heightened demand by world markets.

The plan also identifies entrepreneurship as an important growth area, "The development of entrepreneurship skills is important to the success of Maui [County's] small businesses. Data collected by the Department of Business, Economic Development & Tourism and other organizations suggest more and more residents are taking to self-employment." For Molokai, a significant number of new business start-ups within the past decade have been agricultural enterprises (36 total), particularly from the Hawaiian Homestead area in Ho`olehua.[36]

The Molokai Education Center's Business Plan (2007) acknowledges the island's diversified agriculture industry as a major contributor to Molokai's economy with room for future growth. Areas for future growth include value-added food product development as a niche market. MEC's Business Plan adds that agricultural course offerings at the college and relevant training will play a significant role in preparing the workforce for a diversified economy.

While community and county planning objectives clearly identify agriculture as an economic mainstay for Molokai, a comprehensive profile of Molokai's agriculture industry has not been fully analyzed.

One of the objectives of this Needs Assessment is to determine where Molokai fits in the overall Statewide picture for agriculture. Has Molokai experienced similar successes and challenges that farmers on the other islands face? What are the strengths and assets of Molokai's agricultural community, as well as needs, challenges, and opportunities? What is working and what isn't? What are the perceptions of local consumers? What is the demand for local, Molokai grown produce, meat, and seafood? How many are farming? What is being farmed and where? What are the limiting factors to farming on Molokai? Is there community support for local farmers? Do stores and restaurants on Molokai have strong relationships with local farmers and make priority for their produce and value-added items? How can we strengthen agriculture on Molokai? How food secure is Molokai? These are the questions that we set out to answer through the needs assessment.

[36] Akutagawa, Malia. "Kūha`o Business Center – Entrepreneurial Training & Support Final Report." March 31, 2009.

III. METHODS

We adopted the following methods and strategies:

- An island wide survey on food production and security started from February 27 to March 27, 2012. (See Appendix for Survey Form and Results Analysis Summary)

- Two hundred eight (208) surveys were completed by the adult members (over the age of 18) of the general Molokai population, bringing our sample population at 3.9%. Molokai's adult population is at 5,401 out of a total island population of 7,345.

Target	Sample Size
ADULT POPULATION (Individuals over 18 years of age)	208

- Surveys were made available at various community resource centers as well as online via our website. Email alerts and Facebook invitations were made for the tech savvy. Given Molokai's rural character and varying levels of knowledge and exposure of the general population to technology, the most effective method for data collection proved to be through direct, physical inquiries. Respondents were most receptive to our surveys when offered at our multiple survey tables placed in public areas; particularly strategic locations of commerce such as sidewalks fronting grocery stores and during various community events.

- A total of 36 interviews were conducted with agriculture experts and educators (3); small and medium-scale farmers and Community Supported Agriculture (CSA) operators growing diversified and organic crops (14); deer and cattle ranchers (3); fishermen and aquaculture producers (3); local grocery and health food stores (5); meat processors and value-added food producers (4); hotel and restaurants (3); and other informants (1). (See Appendix for Interview Questions and Results Analysis).

- Key interview informants included:

Agriculture Experts & Educators
Glenn Teves, Molokai Cooperative Extension Agent, University of Hawai`i College of Tropical Agriculture & Human Resources (UH-CTAHR), ph (808) 567-6929, molokai@ctahr.hawaii.edu
Jennifer Hawkins, Molokai Cooperative Extension Agent, UH-CTAHR, ph (808) 567-6929, molokai@ctahr.hawaii.edu
James Boswell, Certifed Organic Inspector and Agriculture Instructor, University of Hawai`i Maui College – Molokai Farm, ph (808) 567-6577, boswellj@hawaii.edu
Farmers – Diversified & Organic Crops
Castle Adolpho, Hawaiian Homestead Farmer and Owner of `Āina Kulani Farms, Ho`olehua
Kimo Kaiama, Hawaiian Homestead Farmer and Owner of Kaiama Farms, Ho`olehua
Rick Tamanaha of Kaleikoa Farms, Hawaiian Homestead Family Farm, Ho`olehua
Kalani Han, Hawaiian Homestead Farmer and Owner of Kuikamoku Farms, Ho`olehua
Tuddi Purdy, Hawaiian Homestead Farmer and Owner of Purdy's Mac Nut Farm, (808) 567-6601, www.molokai-aloha.com/macnuts
Jane Teves, Hawaiian Homestead Farmer and Owner of Hua Kala Farm, Ho`olehua
Lynn DeCoite, Hawaiian Homestead Farmer and Owner of L&R Farm, Ho`olehua – Mahana, (808) 567-9234, www.landrfarms.com
Ku`ulei Arce of Arce's Farm
Kim Markham
Shari Lyn of Mali`o Farm and Executive Director of Ka Hale Pomaika`i, Kamalo and Ualapu`e, East Molokai (808) 558-8107, http://www.localharvest.org/malio-farm-organically-growing-on-molokai-M11205
Ellen Spruance, Owner of Papa o Haku Farm, Mapulehu and Kumimi, East Molokai
Jamie Ronzello, CSA Operator, Mahana Gardens
Joe Kennedy, Permaculturist, Molokai Agriculture Park – Mahana
Emanuela Vinciguerra, Marketing Director of Kumu Farms, Molokai Agriculture Park – Mahana, www.kumufarms.com
Ranchers
Edmund Pedro, Owner of Pedro Ranch, East Molokai
Jan Roney, Manager of Pu`u O Hoku Ranch, East Molokai, (808) 558-8109, www.puuohoku.com/farm
Desmund Manaba, Owner of DJC Ranch, Inc., Ho`olehua – Mahana
Fisherman, Aquaculture Producer
Dedrick Manaba, Fisherman, Kaunakakai
Steve Chaikin, Owner of Molokai Sea Farm, Pala`au, (808) 553-3547, www.broodstock.com
Myron Akutagawa and Sherman Napoleon, Jr., Ke Kua`āina Hanauna Hou, Puko`o, East Molokai
Meat Processor, Value-Added Producers
Jack Spruance, Director of Molokai Livestock Cooperative (Molokai Slaughterhouse), Ho`olehua
Brenda Kaneshiro, Beekeeper and Owner of Molokai Meli, Kamalo, East Molokai, (800) 434-2550
Nancy Gove, Salt Master and Owner of Pacifica Hawai`i Sea Salts, Kaunakakai, (808) 553-8484, www.pacificahawaii.com
Chris Mebile, Chong's Poi Shop, Kaunakakai, (808) 553-4313
Grocery Stores
Crystal Igusa and Staff, Friendly Market Center, Kaunakakai, (808) 553-5595
Kevin Misaki of Misaki's Grocery, Kaunakakai, (808) 553-5505
Dennis Turner, Owner of Outpost Natural Foods, Kaunakakai, (808) 553-3377
Sonya Yuen, Owner of Kualapu`u Market, Kualapu`u, (808) 567-6243
Nani Pele, Manager of Maunaloa General Store, Maunaloa, (808) 552-2346

Hotel & Restaurants
Tina Price, Manager of Kualapu`u Cookhouse, Kualapu`u (808) 567-9655
Gene Pike, Executive Chef at Hula Shores Restaurant, Hotel Molokai, Kamiloloa, (808) 553-5347, http://www.hotelmolokai.com/
Kerrie Felt, Co-Owner of Molokai Burger, (808) 553-3533, www.molokaiburger.com
Other Informants
Byron Espaniola, Aha Moku Representative for Kaluakoi/Maunaloa

- We were unsuccessful in securing an interview with Monsanto as the largest employer and agriculture operation on Molokai. Our repeated inquiries remained unanswered. There were additional Molokai growers, ranchers, aquaculture operators, fishermen, stores, and restaurants that we wanted to interview; but in the interest of generating this report in a timely manner we were unable to fully meet this objective.

- Findings were also supplemented through research of existing literature of global, statewide, and Molokai-specific agriculture facts and trends. A review of current and prior community-based planning, economic, education and training initiatives in support of agriculture were also examined. These are referenced throughout the document.

IV. KEY FINDINGS

This section has been organized into the following categories:

- Local Molokai Consumer Perspectives and Practices on Food
- Available Molokai Produce, Meat, Seafood, and Value-Added Products
- Molokai Processors, Stores, and Restaurant Needs and Relationships with Local Agriculture Producers
- Molokai Farmer Perspectives on their Personal and Collective Assets/Strengths, Needs/Weaknesses, Threats/Challenges, and Opportunities
- Addressing Molokai's Food Supply in terms of Food Security and Disaster Preparedness

Local Molokai Consumer Perspectives and Practices on Food

Access to Locally Grown Food. *W*e asked Molokai residents if they felt access was available to locally grown food in the local grocery stores and open markets. 78% of those surveyed felt they have access, while 13% felt they did not.

Awareness, Preference, and Demand for Locally Grown Food.

Do you care or think about where your food comes from?

- 94% of the sample population care/think about where their food comes from, while 5% do not.

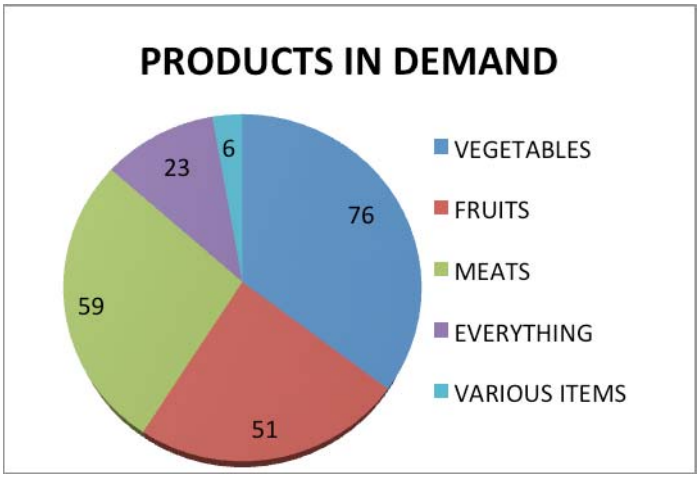
Do you prefer to buy more local Molokai food products?

- 90% of those surveyed prefer to buy local Molokai food products, while 2% do not.

Would you eat more local food if it were available?

- 98% of those surveyed would eat more local food if it was available, while 1% would not.

Question: What would you like to eat or buy, if it was made or grown on Molokai?



The Molokai population wants to eat as much Molokai made products as possible. Fresh vegetables and fruits ranked the highest. Specifically mentioned items were kalo (taro), sweet potato, brussel sprouts, bitter melon, cabbage, olives, pumpkin, asparagus, corn, lettuce, tomatoes, broccoli, cucumber, eggplant, squash, zucchini, beans, carrots, onion, garlic, ginger, spinach, melons, watermelons, pears, strawberries, and persimmons. Meat products included requests for fish, chicken, pork and beef. Value added product requests included hamburger, sausage, tofu, poi, butter and jam. Requests were also made for dairy products like milk, eggs, cheese and goat cheese.

While 90% of those surveyed stated they would buy more local food if it was available, it appears that some respondents (25 people) felt that there wasn't enough demand on island for local produce and that likely posed a challenge to Molokai farmers.

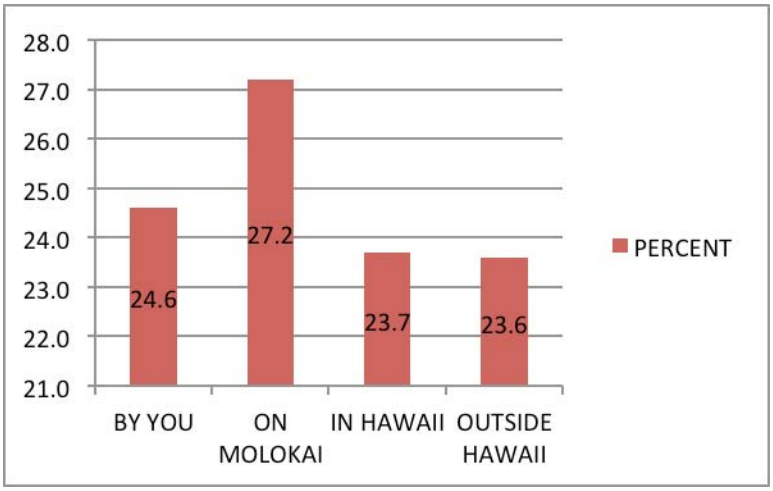
We queried Molokai residents on what they would like to see in terms of improving agriculture on Molokai and increasing their access as customers to local foods. These were some of their responses:

"more support for local farmers"
"(create a) better farmers market"
"by buying local"
"that stores buy and sell more local produce"
"co-op - one distributor"
"label gmo and organic products so we know"

Subsistence. We also surveyed the Molokai population to determine some of their practices around food preparation and what percentage of their food came from different sources. As we had surveyed Molokai's farming community and analyzed the behavior of the island's main grocery stores on what items they selected to sell, we wanted to know if there might be a direct correlation between consumer demand for local products and level of self-sufficiency among the general population to engage in subsistence activities.

We found that an average 82.5% of those surveyed prepare their food at home, while 17.4% mainly eat restaurant-prepared foods.

Question: Of the food you prepare at home, approximately what percentage is grown, caught, and/or produced:



From our survey responses to what percentage of food prepared at home came from what was grown, caught, and/or produced by individuals themselves, on Molokai in general, within the State of Hawai`i overall, and from outside of Hawai`i, we found that residents accessed food from these multiple sources at a near equal rate, with a range of 23.6 % to 27.2% from each source. It is interesting to note that 24.6% of the food prepared in the average person's home came from personal subsistence activities. The figure of 27.2% of locally grown, caught, or produced foods may include both of what is available in Molokai stores as well as what might have been bartered or shared by other Molokai residents as a result of their subsistence activities. When asked directly what percentage of food consumed comes from subsistence activities, an average of 40.1% came from items that were fished, hunted, gathered, raised, or grown (to include one's personal harvests and foods acquired and shared/bartered by others also engaged in subsistence). Thus, it would make sense that combining the two figures in the graph above of prepared foods grown, caught, and/or produced by the individuals themselves (24.6%) and what was acquired generally from Molokai resources (27.2%) either shared by others or bought directly from the store, the cumulative total being 51.8%; one may extrapolate from this data that the difference between 51.8% and 40.1% being 11.7% may be the amount of locally produced foods sold in Molokai's stores. When polled as to the importance of subsistence activities in their lives, 72% of the respondents said it was very important to them. Of the 13% who responded that they do not engage in any subsistence activity, lack of time was cited as the greatest reason why they did not take part in subsistence.

In comparing our general data on subsistence with the results presented in the Governor's Molokai Subsistence Task Force Report[37] in 1993, we found that subsistence may be playing an

[37] Matsuoka, Jon, Davianna McGregor, Luciano Minerbi, Malia Akutagawa, *Governor's Molokai Subsistence Task Force Report*, Molokai Department of Business, Economic Development, and Tourism, 1993.

even bigger role today than it did two decades ago. Loss of jobs and the global economic downturn may be contributing factors.

Subsistence Factors	1993	2012
Estimated total percentage of food that comes from various subsistence activities	28% - for Molokai families overall, race not factored 38% - for Native Hawaiian Molokai families 50% - 54 respondents out of 241 surveyed	40% - for Molokai families overall, race not factored
Overall importance of subsistence to Molokai families.	51% - very important 25% - somewhat important 11% - somewhat unimportant 32% - not at all important	72% - very important 21% - somewhat important 1% - somewhat unimportant 2% - not at all important

From this information, though not as comprehensive and rigorous in its exploration of subsistence on Molokai as the 1993 Task Force Report, we are assured that subsistence continues to be an important part of Molokai's families and overall economy.

Fifty-three percent (53%) of our respondents stated that they grow their own food through farming or gardening. When polled as to the kinds of subsistence activities they typically engage in, respondents identified the following:

HUNTING

- 39% of those surveyed hunt (axis deer, wild pig, goat).

FISHING & DIVING

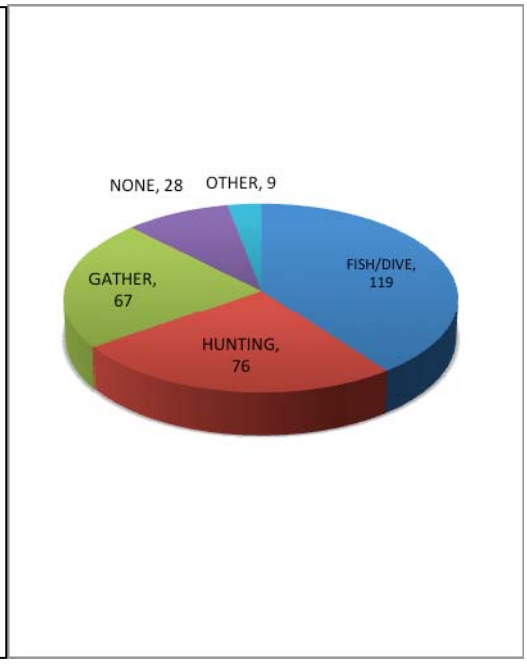
- 57% of those surveyed fish or dive.

GATHERING

- 32% gather (limu, opihi, crab, pipipi, lā'au, ha'uke'uke) as a subsistence activity.

OTHER

- 4% cited a mixture of raising livestock, sharing and trading food as a subsistence activity.



The fact that subsistence remains a significant contributor to how Molokai families acquire their food, this in turn may also affect local market behavior in terms of what locally produced items are placed on store shelves and whether Molokai farmers and producers find it necessary to provide a significant volume of food for the local Molokai market.

Available Molokai Produce, Meat, Seafood, and Value-Added Products

We were pleased to find that Molokai's agriculture industry is quite diverse and hosts a number of small family farms both on the Hawaiian Homestead in Ho`olehua and also dotting the landscape in Mana`e, East Molokai. During our interviews, we asked farmers, ranchers, and aquaculturists what crops and value-added products they cultivated, processed, value-added, and sold, and what were their primary markets. We also combed the internet and learned by word of mouth of other agribusinesses. The following table provides for the reader an at-a-glance list of growers on Molokai and what types of food and products are available on island. It also lists primary local as well as off-island markets.

Produce, Meat, Seafood, Value-Added Products	Farmer, Rancher, Producer	Store Outlets, Other Places Sold
Meats & Eggs		
Molokai Grass Fed Beef	Pedro Ranch, Pu`u O Hoku Ranch, Kualapu`u Ranch, Pohakuloa Ranch	Processed and sold by Slaughterhouse (Molokai Livestock Cooperative) to Molokai Burger, Friendly Market Center, Kualapu`u Market, Kualapu`u Cookhouse, Pu`u O Hoku Ranch.
Venison	DJC Ranch, LLC	Not sold. Shared only with customers on formal hunts and Molokai families for subsistence.
Lamb (free range)	Kalapana and Deeanna Keli`iho`omalu	Pilot phase. Processed at Molokai Slaughterhouse. Sold to Kumu Farms, Friendly Market Center, and Misaki's
Free Range Eggs	Davis `ohana	Molokai Minimart, Mana`e Goods & Grindz, other Molokai grocery stores. (note, became more popular and visible in stores after mainland eggs were recalled nationwide for bacterial contamination)
Duck Eggs	Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries
Seafood		
Fish – aku/tuna, akule, opakapaka, ahi, ono, mahimahi, onaga	Various commercial fishermen. 5 on island.	Direct Customer Sales, Off-Island Wholesaler/Distributor (for hotels and restaurants)
Shrimp	Keawa Nui Farms, (808) 558-8931 http://www.keawanuifarms.com/ Molokai Sea Farms	Friendly Market Center, Misaki's, Off-Island, Online Sales for Shrimp Broodstock
Seaweed/Limu Ogo (Gracilaria)	Keawa Nui Farm, Molokai Sea Farms	Misaki's, Off-Island

Produce, Meat, Seafood, Value-Added Products	Farmer, Rancher, Producer	Store Outlets, Other Places Sold
Greens & Other Vegetables		
Lettuces	Kim Markham, Waialua Permafarm, (808) 558-8306	Community-Supported Agriculture (CSA) – subscription box pick-up and deliveries
Kale	Waialua Permafarm (CSA), Kumu Farms	CSA – subscription box pick-up and deliveries
Mustard Cabbage	Mali`o Farm, Waialua Permafarm (CSA)	Therapeutic Farm – produce shared with clients in treatment with remainder sold by clients for fundraising. CSA – subscription box pick-up and deliveries
Bok Choy	Arce's Farm, Kim Markham, Mali`o Farm	Direct sales to customers via email list. Therapeutic Farm – produce shared with clients in treatment with remainder sold by clients for fundraising.
Chinese cabbage	Arce's Farm	Direct sales to customers via email list
Arugula	Waialua Permafarm (CSA), Kumu Farms	CSA – subscription box pick-up and deliveries Direct sales
Swiss Chard	Jamie Ronzello (CSA), Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries
Tomatillo	Jamie Ronzello (CSA)	CSA – subscription box pick-up and deliveries
Tomato	Arce's Farm, Kim Markham, Waialua Permafarm (CSA)	Direct sales to customers via email list. CSA – subscription box pick-up and deliveries
Sweet corn	Arce's Farm	Direct sales to customers via email list
Chinese Peas	Arce's Farm, Waialua Permafarm (CSA)	Direct sales to customers via email list. CSA – subscription box pick-up and deliveries
Soy Beans	Jamie Ronzello (CSA)	CSA – subscription box pick-up and deliveries
Black Beans	Mali`o Farm	Therapeutic Farm – produce shared with clients in treatment with remainder sold by clients for fundraising
Green Beans	Arce's Farm, Waialua Permafarm (CSA), Jamie Ronzello (CSA)	Direct sales to customers via email list. CSA – subscription box pick-up and deliveries
Green Onion	Kuikamoku Farm, Waialua Permafarm (CSA)	All Molokai grocery stores; CSA – subscription box pick-up and deliveries
Radish	Kim Markham, Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries
Beets	Kim Markham, Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries

Produce, Meat, Seafood, Value-Added Products	Farmer, Rancher, Producer	Store Outlets, Other Places Sold
Greens & Other Vegetables		
Brocolli	Arce's Farm	Direct sales to customers via email list.
Eggplant	Arce's Farm, Mali`o Farm, Waialua Permafarm (CSA)	Direct sales to customers via email list. Therapeutic Farm – produce shared with clients in treatment with remainder sold by clients for fundraising CSA – subscription box pick-up and deliveries
Carrots	Jamie Ronzello (CSA), Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries
Sweet Potato, Sweet Potato Chips	L & R Farm	Various local Molokai stores, 8 tons shipped weekly off-island
Yams, Yam Chips (in development phase)	Tuipulotu Farm	
Taro – regular and certified biodynamic, different varieties, dry and wet, lu`au leaf	`Āina Kulani Farms, Kaiama Farms, Kim Markham, Papa o Haku Farm	Friendly Market Center, direct sales to customers. Certified biodynamic taro sold off-island at health store outlets
Avocado	Pualani O Molokai Mana`e Grown Farm, 558-8383, http://www.localharvest.org/pualani-o-molokai-manae-grown-farm-M21752	
Organic ginger	Papa O Haku Farm	Off-Island health food stores, Whole Foods
Organic turmeric	Papa O Haku Farm	Not sold. Medicinal use.
Awa	Pu`u O Hoku Ranch, Kaiama Farms,	Direct sales to customers
Chili Pepper	Mali`o Farm	Therapeutic Farm – produce shared with clients in treatment and for client fundraising.
Herbs & Spices		
Basils (Italian, Thai)	Kumu Farms, Waialua Permafarm (CSA), Jamie Ronzello (CSA)	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada. Community-Supported Agriculture (CSA) – subscription box pick-up and deliveries
Thyme	Jamie Ronzello (CSA), Kumu Farms	Community-Supported Agriculture (CSA) – subscription box pick-up and deliveries
Dill	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Oregano	Kim Markham, Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Italian Parsley	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada

Produce, Meat, Seafood, Value-Added Products	Farmer, Rancher, Producer	Store Outlets, Other Places Sold
Herbs & Spices		
Chinese Parsley	Kim Markham, Mali`o Farm, Waialua Permafarm (CSA)	Community-Supported Agriculture (CSA) – subscription box pick-up and deliveries
Cilantro	Kim Markham, Waialua Permafarm (CSA), Kumu Farms	Community-Supported Agriculture (CSA) – subscription box pick-up and deliveries. Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Rosemary	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Spearmint	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Lavender	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Savory	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Sage	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Cinnamon	Pualani O Molokai Mana`e Grown Farm, (808) 553-8383 www.localharvest.org/pualani-o-molokai-manae-grown-farm-M21752	
Vanilla	Pualani O Molokai Mana'e Grown Farm	
Cacao	Pualani O Molokai Mana'e Grown Farm	
Fruits & Nuts		
Orange	Mali`o Farm, Waialua Permafarm (CSA)	Therapeutic Farm – produce shared with clients in treatment with remainder sold by clients for fundraising. CSA – subscription box pick-up and deliveries
Tangerine	Mali`o Farm, Waialua Permafarm (CSA)	Therapeutic Farm – produce shared with clients in treatment with remainder sold by clients for fundraising. CSA– subscription box pick-up and deliveries

Produce, Meat, Seafood, Value-Added Products	Farmer, Rancher, Producer	Store Outlets, Other Places Sold
Fruits & Nuts		
Limes	Mali`o Farm, Waialua Permafarm (CSA)	Therapeutic Farm – produce shared with clients in treatment with remainder sold by clients for fundraising CSA – subscription box pick-up and deliveries
Papaya – conventional and organic	Kaiama Farms, Kaleikoa Farms, Hua Kala Farm, Noah Kuoha, Kumu Farms, Mali`o Farm, Waialua Permafarm (CSA)	Various local Molokai stores, exported throughout Hawaiian islands, Whole Foods outlets, Mainland U.S., and Canada, CSA – subscription box pick-up and deliveries
Watermelon	`Aina Kulani Farm	Direct sales to customers
Banana, Apple Banana	Hua Kala Farm, `Aina Kulani Farms, Kumu Farms, Waialua Permafarm (CSA)	Kualapu`u Market, Outpost, Friendly Market Center, Misaki's. CSA – subscription box pick-up and deliveries
Rambutan	Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries
Jack Fruit	Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries
Mango	Mali`o Farm Waialua Permafarm (CSA) Pualani O Molokai Mana'e Grown Farm	Therapeutic Farm – produce shared with clients in treatment and sold by them CSA – subscription box pick-up and deliveries
Soursop	Waialua Permafarm (CSA) Pualani O Molokai Mana'e Grown Farm	CSA – subscription box pick-up and deliveries
Dragonfruit	Waialua Permafarm (CSA)	CSA – subscription box pick-up and deliveries
Strawberry	Pualani O Molokai Mana'e Grown Farm	
Lychee	Pualani O Molokai Mana'e Grown Farm	
Macadamia Nuts	Purdy's Mac Nut Farm	Direct sales to visitors participating in farm tour. Mail orders.
Coffee	Coffees of Hawai`i, (808) 567-9490, www.coffeesofhawaii.com	All Molokai stores, online orders.

Produce, Meat, Seafood, Value-Added Products	Farmer, Rancher, Producer	Store Outlets, Other Places Sold
Value-Added Products		
Cilantro Lime Pesto	Kumu Farms	Direct sales on Molokai, online sales, outlets throughout Hawai`i, mainland U.S. and Canada,
Basil Macadamia Nut Pesto	Kumu Farms	Direct sales on Molokai, outlets throughout Hawai`i, mainland U.S. and Canada
Pickled Organic Ginger	Papa O Haku Farm	Off-island health food stores, Whole Foods
Honey (premium silky honey, kiawe dark honey, honey combs)	Molokai Meli, Kim Markham	Kumu Farms, Outpost Natural Food Store
Poi	Chong's Poi Shop	All Molokai stores
Kulolo	`Āina Kulani Farms	Direct Sales
Taro Chips	Hua Kala Farm	Not enough volume to sell regularly.
Yam Chips	Tuipuloto Farm	Still in development stage
Beeswax Candles, Chapstick	Molokai Meli	Kumu Farms
Gourmet Sea Salt	Pacifica Hawai`i Sea Salts Hawaii Kai Corporation, http://www.hawaiikaico.com/	Pu`u O Hoku Ranch, Kumu Farms, Kamakana Country Store, Molokai Wines & Spirits, Blue Monkey, Friendly Market Center, outlets throughout Hawaii State and U.S. Mainland, online sales
	Other	
Ti leaf	Kim Markham	
Kukui Starters	Purdy's Mac Nut Farm	Given to homesteaders for reforestation in Ho`olehua
Flowers: ginger, akulekule, cigar	Purdy's Mac Nut Farm	Shipped leis to off-island.
Tropical flowers (variety)	Kuleana Work Center, www.molokaiflowers.com/	Online sales and direct sales at Saturday Open Market days.
Seeds/Seedbank	Ka`ano, The Molokai Seed Project, 553-4243	

Molokai Processors, Stores, and Restaurant Needs and Relationships with Local Agriculture Producers

MOLOKAI ESTABLISHMENTS SELLING OR SERVING FOOD & GROCERIES ON MOLOKAI	
RESTAURANTS & FAST FOOD	
Coffees of Hawaii	567-9655
Hula Shores (Hotel Molokai)	553-5347
Kanemitsu Bakery & Restaurant	553-5855
Kualapu'u Cookhouse	567-9655
Little Grass Shack	553-5862
Maka's Corner	553-8058
Mana'e Goodz n Grindz	558-8498
Molokai Burger	553-3533
Molokai Drive Inn	553-5655
Molokai Pizza Café	553-3288
Molokai Roast Pork House	553-9068
Mrs. K's	553-3201
Sundown Deli	553-3713
LOCAL GROCERY STORES	
Friendly Market Center	553-5595
C. Pascua Store	553-5443
Kamoi's Snack N Go	553-5443
Kualapuu Market Ltd	567-6243
Maunaloa General Store	552-2346
Misakis	553-5505
Molokai Mini Mart	553-4447
Outpost Natural Foods	553-3377
Molokai Wines N Spirits	553-5009
The Store House	553-3399
Kamakana Country Store	553-5725
GAS STATIONS	
Hayaku Gas N Go	553-3444
Rawlins Chevron Station	553-3214

Reference: Sustainable Molokai Resource Guide 2009.

Molokai's grocery stores and restaurants sell locally grown, harvested, and processed items. An average of 2% of locally grown or Made on Molokai products are sold in local grocery stores. Some stores, such as Misaki's carry a higher percentage (15%) of Molokai produce. Those establishments we interviewed all stated that they want to sell everything that is Molokai made. Papaya, sweet potato, Chong's Poi, coffee, Kanemitsu bread, and Kumu Farms pesto are the most common Molokai items found in local stores. Misaki's tends to carry a greater assortment of Molokai produce and value-added products in addition to these common items. Misaki's sells L&R sweet potato chips, string beans, bittermelon, utong, eggplant, green onion, lime and lemon. Fish also are purchased from local fishermen.

Some stores and restaurants also purchase Molokai grass fed beef processed through the island's slaughterhouse. These orders are filled on a consistent basis.

Smaller stores like Kualapu`u Market and Maunaloa General Store that do not experience as much traffic as the grocery stores in Kaunakakai have to concern themselves with how quickly an item sells. For some customers Molokai grass fed beef is an acquired taste and it may take a more conscientious eater considering the health benefits of grass fed beef to appreciate its flavor. But if the average customer does not appreciate these qualities and prefers a certain taste of beef that s/he has grown accustomed to, then the store risks spoilage. The same goes for fruits like mango that ripen quickly but may not sell fast enough, especially since many families have mango trees in their own back yards. For these small stores, carrying items that will sell quickly is important; especially meat and produce that have a short shelf life. Kualapu`u Market typically sells Molokai coffee, sweet potato chips, poi,

Molokai bread and eggs. Maunaloa General Store makes it a point to accept produce from the community garden run by the Ka Hale Mua low income housing. They typically grow string beans, tomatoes, eggplant and lettuce. Maunaloa residents are also permitted to utilize the facility to prepare musubi, bento and local plate lunches to sell prepared foods as well as their art and crafts at the front of the store.

Other locally produced items that some of the stores would like to sell in more volume are tomatoes, bananas, fish, and dairy. If Molokai farmers elect not to grow or sell certain produce or products to the local grocery stores, the stores will sell off-island produce (e.g., Manoa lettuce, Kula tomatoes, etc.). Sometimes they will also order items from as far away as California or Mexico to satisfy customer demands and preferences.

The requirements are not overly stringent for the local farmer to sell produce and value-added foods to local grocery stores. For some stores like Friendly Market, individuals must possess a business license. For other stores that receive small quantities of fresh produce at a time, they do not require proof of business license.

Grocery stores showcasing locally grown food feel cheated when farmers simultaneously peddle their produce on the street.

Pricing is also an issue for Molokai stores. They would like to buy more locally grown items; however, they can get produce a lot cheaper from the mainland. For example, the average cost of a tomato that is locally grown is $2/lb., while stores can acquire tomatoes from the mainland for $1/lb. and pass the savings on to the customer. Friendly Market has expressed a preference for buying produce from farmers who have a price cost and plan (e.g., that identifies specific amounts of produce that will be available and their cost) to ensure item consistency in pricing and availability. Ideally, stores want to save on paying shipping costs to import food from the mainland and off-island by providing preference for locally grown foods.

Consistency is important for stores to continue carrying specific items provided by local farmers and producers. Consistency was cited by every store and restaurant we interviewed as the number one challenge that most farmers face in working with them. Misaki's has found a way around this issue. They purchase Molokai fish caught and sold to the Honolulu fish market through a distributor there so that customers can still benefit from eating Molokai caught fish. Misaki's also prefers to buy from an Oahu distributor that buys the bulk of its produce from Molokai farmers. In this way, by buying in bulk through a distributor, Misaki's is assured a consistent product.

There are stores who specifically select for local and organic foods as part of their marketing strategy. One such store is the Outpost Natural Foods Store which will sell everything that is Molokai made. Consumers expect to pay a heftier grocery bill as they have an expectation of buying local and preferably organically grown and produced foods. Other items that cannot be sourced locally, or are in lesser supply, or for which there is a demand for (e.g., apples, pears, and oranges) are sourced from the mainland and sold at the Outpost.

We interviewed 3 restaurants: Kualapu`u Cookhouse, Hotel Molokai's Hula Shores restaurant, and Molokai Burger. Use of and emphasis on use of local meat, seafood, and produce varied. The Kualapu`u Cookhouse estimates that it utilizes 1% of Molokai grown produce and value-added products in its dishes as it does not have strict requirements to do so. It primarily purchases Molokai lettuce through Kualapu`u Market.

Hotel Molokai uses less than 20% local produce and seafood in its dishes, but would ideally prefer to utilize at least 60% of locally grown and harvested foods on their menu. The hotel currently buys locally grown lettuce, eggplant, and papaya from Kumu Farms and incorporates these foods into their menu. Fresh fish is the fastest and most popular selling item and does not require a price cost list when buying from fishermen. Patrons buy fish dishes at market price. It was communicated that as chefs, it is important to establish relationships with local farmers and acquire high end items on a consistent basis. What has been a challenge for the chefs at the hotel is figuring out who is growing what and searching these farmers out to provide the produce, meat and seafood they need. What would easily serve them would be a broker or local distributor to take on that type of work. Currently, the Hotel is considering setting aside some space on the hotel grounds for an herb garden to readily supply some of the kitchen's needs while providing some kind of youth internship program to install and maintain the garden.

Molokai Burger exclusively serves 100% Molokai grass fed beef for its burgers and Tuesday Mexican menu. The restaurant purchases 240 pounds of Molokai beef from the slaughterhouse. It receives positive customer feedback; its loyal customers being especially health conscious individuals and local and native Hawaiian activists who make it a point to support establishments that utilize local Molokai foods. Molokai Burger also purchases from Kumu Farms on a weekly basis 8 pounds of their vegetable greens to serve in their special salad and chicken salad plates. Molokai sweet potatoes are also utilized for sweet potato nacho chips on the Mexican menu. While not locally produced, Molokai Burger also purchases buns from a local Molokai distributor as a way to support as many local businesses as possible.

Question: What local food items would you like to sell or incorporate in your menu that are not currently available or are in short supply?

Friendly Market: *oranges, all citruses, mango, avocado, bok choy, won bok, tropical fruits in season, fish, pork processed through slaughterhouse, all dairy (milk, cheese) or soy based milk as an alternative, and free range eggs. Will sell all local items.*
Misaki's: *bananas and tomatoes. Will sell anything grown and made on Molokai*
Outpost Natural Foods Store: *strawberries, cantaloupes, cucumbers, tomatoes, potatoes and Yukon from local growers.*
Kualapu`u Cookhouse: *local free range chicken eggs*
Kualapu`u Market: *a greater diversity and selection of local produce grown by Molokai's farmers.*
Maunaloa General Store: *more bananas and papayas as they sell out fastest*
Hula Shores Restaurant of Hotel Molokai: *venison*
Molokai Burger: *a consistent supply of Molokai tomatoes, free range eggs, and fish that are reasonably priced.*

Molokai Farmer Perspectives on their Personal and Collective Assets/Strengths, Needs/Weaknesses, Threats/Challenges, and Opportunities

Question: Are you a farmer? If so, how old are you?	***Question to farmers interviewed: How long have you been farming?***
46% from our survey population consider themselves farmers (both subsistence and commercial) ▪ Of the sample population surveyed, the average age of a Molokai farmer is 44 years old. ▪ Of our key informants interviewed who farm commercially, their average age is 54 years.	▪ Molokai farmers have been farming for an average of 22 years with 40 years as the longest.

Question: How much land are you farming?

- Of the sample population surveyed, 44 farmers utilize less than one acre; 32 farmers utilize 1 to 5 acres of land; 5 persons farm 15-40 acres of land and 3 farmers utilize 40 or more acres of land.
    - Larger, more established farm businesses utilize 60 or more acres of land, with Kumu Farms farming 60 acres of leased property at the Ag Park and L&R Farm utilizing 200 acres of Hawaiian Homestead in the Ho`olehua-Mahana area.

Question to farmers: what do you feel are the challenges farmers face on Molokai?

<u>Nature and the Elements</u>

Wind

Homestead farmers must contend with high winds on a regular basis. Thus, initial farm planning must include installing windbreaks to avoid crop damage from weathering. The community has identified in several former planning documents such as the Molokai Empowerment Zone Application (1998) mass planting of windbreaks throughout the Ho`olehua area to protect homestead farm lands as one of the 40 priority projects. In the end, Molokai was successful in achieving the Molokai Enterprise Community federal designation, a step

second to Empowerment Zone status. Windbreaks remained part of the 40 priority projects. Installation of windbreaks have also been reiterated as a Short Range Priority Project in the Maui County Comprehensive Economic Development Strategy (CEDS) 2010.[38] However, not much has been done to move this from a conceptual stage to implementation.

The situation was exacerbated in 2005 upon the introduction of the virulent erythrina gall wasp that destroyed the vast majority of wiliwili trees Statewide. Larvae implanted into the tissue of wiliwili leaves form tumorous like growths and effectively starve the trees from receiving nutrition.[39] Much of the wiliwili trees that had served primarily as windbreaks died within a year or two. Thus, farms that had established wiliwili windbreaks became newly exposed to winds. With the introduction of *Eurytoma* by scientists, a predator species that exclusively feeds on erythrina gall wasps and avoids native wasps, the surviving wiliwili have been able to make a comeback.[40]

Drought

A number of farmers have cited current drought conditions as a serious threat to farming. One farmer reported that her entire organic ginger crop failed due to drought and she was unable to yield a harvest this year. At the time we started our interviews in February (2012) Molokai was experiencing the lowest rainfall in a decade, comparable to 2001 drought figures.

A dry winter and spring season have been causing water shortages. A recent heavy storm in March (2012) brought some relief, but with primarily eroded soils exposed to the elements, much of that muddied water washed into the sea to choke corals, affect nursery grounds for fish, and cover limu (seaweed) beds.[41] Steady percolation into the aquifer is necessary to make a difference to the watershed and levels in the reservoir.[42] According to Glenn Teves, Extension Agent for UH-CTAHR, drought conditions affect insect behavior. For example, ants seeking water will find a substitute by acquiring honeydew from certain insects that produce it such as "aphids, mealy bugs, whiteflies, and scales … known to suck plant juices and weaken them … [and] spread plant viruses on an array of crops such as melons, peppers, and tomatoes."[43] Animals will also chew through drip irrigation systems to access water in a drought, and will subsequently cause leaks and water loss for the farmer.[44] Cows are also affected with a higher incidence of miscarriage or smaller calf size due to lack of high quality

[38] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 4: Maui County Comprehensive Economic Development Strategy 2010, Short Range Priority Projects, 1102. Agriculture: Reforestation: Windbreak Planting, p.50.
[39] Richards, Sabrina. "Wasp wars: New predator checks Hawai`i's gall wasp epidemic." *Scienceline*, January 6, 2011. http://scienceline.org/2011/01/wasp-wars/
[40] Richards 2011.
[41] Teves, G. "Effects of Rain and Drought." *Molokai Dispatch*, March 15, 2012. http://themolokaidispatch.com/effects-of-rain-and-drought/
[42] Teves 2012.
[43] Teves 2012.
[44] Teves 2012.

food consumed during pregnancy.[45] Deer will also compete and feed on grass reserves for cattle. Teves roughly estimates that farmers and ranchers have experienced a cumulative crop loss valued at $1 million due to the drought.[46]

Molokai Irrigation System (MIS)

Built in the 1950s and '60s, the MIS was constructed to transport water from Waikolu Valley on the north shore to the farming areas of Central Molokai to provide water for the sole purpose of agriculture.[47] Waikolu Valley provides water to the system via a 5.1 mile long tunnel. Pipes and flumes convey the water to the Kualapu`u Reservoir which is designed for a maximum depth of 54 feet or 1.4 billion gallon capacity.[48]

The Hawaiian Homes Commission Act ("HHCA") of 1920 § 221(d) granted homesteaders "the right to use, free of all charge, any of the water upon the island of Molokai."[49] This provision was amended in 1955 to give Hawaiian Homes a two-thirds water allocation preference from the MIS.[50] The Department of Agriculture which manages the MIS has not enforced this provision. Presently, 80% of the MIS is consumed by non-homesteaders despite 2/3rds water reservation requirement for homesteaders.[51] It has been recently noted that homesteader water usage has increased by nearly 20% compared to last year.[52] The MIS Water Use Advisory Board speculated that homestead families are expanding their family gardens.[53]

The entire island of Molokai has been designated by the State Commission on Water Resources Management (CWRM or "Water Commission") a sole source aquifer and critical water management area. These designations underscore the fact that the entire island depends on one water source for its drinking water, subsistence, and agricultural needs and careful management is necessary to maintain the aquifer.

Records for the Molokai Irrigation System (MIS) revealed that as of December 2011, the Kualapu`u reservoir had lowered to 11 feet (as compared to 17 feet a year prior) and continued to decline.[54] Today, the reservoir has lowered another foot, with storage levels 50% less than a

[45] Teves 2012.
[46] Teves 2012.
[47] Baldauf, Natasha, Ha'aheo Kaho'ohalahala and David Sakoda, "The Moloka`i Irrigation System: A Vision for a Sustainable Future." December 1, 2009.
[48] Baldauf, Kaho`ohalahala and Sakoda 2009.
[49] Baldauf, Kaho`ohalahala and Sakoda 2009.
[50] Baldauf, Kaho`ohalahala and Sakoda 2009.
[51] Baldauf, Kaho`ohalahala and Sakoda 2009.
[52] "Molokai Irrigation System Gets $1.25 Million." *Molokai Dispatch*, February 6, 2012. http://themolokaidispatch.com/molokai-irrigation-system-gets-125-million/
[53] "Molokai Irrigation System Gets $1.25 Million." *Molokai Dispatch*, February 6, 2012. http://themolokaidispatch.com/molokai-irrigation-system-gets-125-million/
[54] "Molokai Irrigation System Gets $1.25 Million." *Molokai Dispatch*, February 6, 2012. http://themolokaidispatch.com/molokai-irrigation-system-gets-125-million/

year ago.[55] Current rainfall is 10% of normal levels and those utilizing the MIS have been subject to a 30% restriction in water usage over the past 3 years.[56]

The State legislature recently set aside $1.25 million for improvements to the MIS.[57] Funds will cover:

- A new hydropower plant; water flow will produce energy and offset electrical costs.
- Replacement of above-ground concrete flume with an underground pipeline to avoid animals and debris from falling into and contaminating the water supply.
- Structural repair to MIS access bridge.
- Installation of SCADA (supervisory control and data acquisition) system to allow for monitoring of water flow remotely

This is a step in the right direction and hopefully will assist in decreasing water loss in the system and improve management of the MIS.

Weeds, Pests, Wild Animals

Numerous farmers interviewed, particularly in the Ho`olehua Homestead area, have cited deer as a major problem in crop failure. The organic papaya farmers have been hit hard, with one farmer having lost his entire crop of papaya trees. Seedlings were eaten and adult trees were also affected by deer rubbings. Another farmer has had to adopt protective measures for his young kukui starter trees as deer seeking moisture from young plants will eat them. He has indicated that young kukui trees have to reach a certain height where deer can no longer bite the leaves from the top. Farmers are also experiencing broken water and irrigation pipes destroyed by deer. One farmer was issued a $700 water bill before discovering his broken water pipe. Much of this activity has been attributed to the ongoing drought conditions; deer are seeking farms for water and food. It is estimated that $1 million in agriculture profit was lost to deer within the last year.

Another problem that farmers encountered a few years ago was an infestation of rat and mice. They were so numerous that drivers often saw them crossing the road. One farmer resolved this problem on his farm by adopting 20 cats.

[55] "State task force to address MIS problems related to drought conditions.". *Molokai News,* April 26, 2012. http://themolokainews.com/2012/04/26/state-task-force-to-address-mis-problems-related-to-drought-conditions/

[56] "State task force to address MIS problems related to drought conditions.". *Molokai News,* April 26, 2012. http://themolokainews.com/2012/04/26/state-task-force-to-address-mis-problems-related-to-drought-conditions/

[57] "Molokai Irrigation System Gets $1.25 Million." *Molokai Dispatch*, February 6, 2012. http://themolokaidispatch.com/molokai-irrigation-system-gets-125-million/

Other farmers have cited pests and weeds as a problem on their farms. One organic farmer stated that she finds it a challenge because use of pesticides and herbicides are prohibited in organic farming.

There is an urgent need to keep Molokai's bee population healthy, as they are pollinators important to the agriculture industry. Threats to the local bee population include pesticides, beetles, and mites.

High Operational Costs

Of the 208 surveyed, 61 people considered high operational costs as a big challenge to farming on Molokai. These costs include:

- Labor
- Infrastructure
- Tools, implements
- Fuel for equipment and vehicles
- Supplies such as fertilizer, compost, pesticides, herbicides, seeds, irrigation supplies, etc. Supply costs are especially higher due to additional cost mark-up for shipping items in to Molokai.
- Electricity costs for running refrigeration/chiller
- All fees and taxes incurred from running a business.
- Special costs for organic certification (est. $1,300 per year)

High Cost of Water

Seventy (70) survey respondents felt farming is made difficult by the high cost of water. This was especially true for farmers who are on county water instead of cheaper agriculture water from the Molokai Irrigation System. These farmers are on the East End of the island. Also it is very difficult for people in Maunaloa and Kaluakoi to farm and even garden due to the water system run by Molokai Ranch. Rates for water are astronomical, having increased by 178%.[58] The State Public Utilities Commission allowed for a rate increase for the Ranch's Molokai Public Utilities from $3.18 per 1,000 gallons to $6.04.[59] The Waiola O Molokai Inc. water also owned by Molokai Ranch was approved for a rate increase from $1.85 to $5.15.[60] These increases impact approximately 1,200 residents on the west side of the island.[61]

[58] Bernardo, R. "Molokai water users protest rate hike." *Honolulu Star Bulletin*, September 5, 2008. http://archives.starbulletin.com/2008/09/05/news/story08.html
[59] Bernardo 2008.
[60] Bernardo 2008.
[61] Bernardo 2008.

High Equipment Costs

Sixty(60) survey respondents considered high equipment costs as a challenge to farming. Tractor costs can range from $21,000 to $80,000 depending on the size needed, which is relative to the amount of acreage to be farmed. Many small and beginning farmers lack access to capital to purchase big ticket items such as equipment.

High Shipping Costs

Young Brothers is the primary shipping provider for Molokai. Some farmers utilize cargo planes such as Kamaka Air for shipment of more perishable items. Shipping from Molokai involves added cost and disadvantages for Molokai as a rural island trying to transport goods across the ocean to the larger urban centers such as Oahu and Maui. For those utilizing distributors, that is another added cost.

In the past, farmers received a partial break on shipping costs through Young Brothers. The Farm Bureau assisted in defraying charges associated with the Molokai to Honoluu leg, while the farmer was required to cover only the cost of shipping from Honolulu to the mainland. This helped to level the playing field for Molokai farmers with the rest of farmers on Oahu and Statewide. Within the last five years however, this policy has been discontinued; causing a disadvantage to the Molokai farmer.

Young Brothers will be phasing out its "G" Vans, 218 cubic ft. containers for shipping, priced at $180/container and will be palletizing everything. It will no longer be easy to drop items off at the pier and ship out. Farmers will need to make the transition and will likely have to solicit the services of Makoa Trucking to palletize their goods and transport them to the pier.

Theft

One farmer interviewed cited crop theft as a challenge. There are also risks of theft of equipment, tools, and supplies without adequate storage and security measures.

Fire

A local beekeeping family that produces premium, organic, raw kiawe honey, experienced a devastating fire in 2009 that wiped out the majority of their hives. They have a high amount of orders to fill, and are currently recovering from the damage to their hives.

<u>Not Enough Land to Farm & Competing Uses for Agriculture Land</u>

The Molokai Agricultural Park owned by the State of Hawai`i is located in the Ho`olehua/Mahana region, adjacent to Molokai Ranch and Hawaiian Home Lands. It consists of

22 subdivided lots spanning a total of 753 acres.[62] The purpose of agricultural parks statewide is to provide affordable, long-term leases to small farmers.[63] Currently all Molokai Ag Park lands are being utilized.[64] This makes it difficult for new farmers who are non-homesteaders to secure cheap land.

Seed biotech companies such as Monsanto and Mycogen have gained a solid foothold on the island. Their use of prime agriculture lands and limited water resources impact the local farming community. It is problematic especially for organic farmers who risk losing their certification if their farms are in proximity to GMO crops. It is known that a local family of beekeepers were forced to move their hives, or else risk losing their organic honey certification.

Low Prices Offered for Local Produce, Not Enough Demand for Goods, and Product Inconsistency

Of those surveyed, 25 people felt that not enough consumer demand for produce was a major challenge for farmers. While our survey also found that 90% of our respondents would buy more local food if it was available, Molokai's small population limits how much produce farmers can place in the local market.

Many of the farmers that we interviewed were frustrated at the low prices they get for the produce they grow. They find it difficult to negotiate with stores on pricing. For them, it is challenging to make a living or be economically sustainable by selling produce only on Molokai.

One certified, organic and biodynamic farmer informed us that she is offered $1.10/lb. by Molokai stores for her organic ginger; but she can sell it at a much higher price on Oahu at $5/lb. in stores that showcase organic foods. With that amount she is able to make a profit as well as recoup her production and shipping costs.

UH CTAHR Agriculture Extension Agent Glenn Teves states that a lot of farmers do not pay close enough attention to their pricing. Oftentimes they will price their produce on the low end. This sets a negative standard that makes it more difficult for other farmers to get a reasonable price for their crops. He recommends that farmers check regularly on produce prices and make comparisons also on how much they sell for on the other islands so that they can provide more competitive pricing that is advantageous to them.

Lack of Support for Agriculture

Lawmakers have also become unsupportive to preserving agriculture lands. Abuses abound on agricultural lands with multi-million dollar gentleman estates developed and defined as "farm

[62] State of Hawai`i Department of Agriculture. http://hawaii.gov/hdoa/arm/arm_agparks
[63] State of Hawai`i Department of Agriculture. http://hawaii.gov/hdoa/arm/arm_agparks
[64] State of Hawai`i Department of Agriculture. http://hawaii.gov/hdoa/arm/arm_agparks

dwellings" and attractive landscaping required under CCRs and Association Rules dubbed as legitimate "agriculture." These "farm dwellings" increase the price of agriculture land for real farmers.

Nationwide, family farmers are being edged out by large, corporate producers at the rate of 330 farmers per week.[65] The United States has an estimated 5 million fewer farms than it had in the 1930s.[66] Today 2 million farms exist in the U.S., with 565,000 identified as family farms.[67] The reason for this is that federal government policies favor large-scale, corporate agriculture. Policies such as subsidizing big agriculture creates a false set-point on true production costs.[68] The American taxpayer absorbs these hefty costs. The federal government spent over $177 billion in agricultural subsidies from the years of 1995 to 2006.[69] These large agriculture operations are able to provide huge volumes of food for a cheap price because of the subsidies allocated. They easily outcompete and squeeze out the small farmer that receives no help from subsidies and must pass to the customer the true costs of production in order to remain a viable business. Strong corporate lobbying maintains this status quo.

Need for Additional Education & Training to Build Capacity of Molokai's Farming Community

Of those surveyed, 33 farmers considered a lack of capacity/education to be a challenge. Some farmers are daunted by the costs of higher education and the time they would need to invest in education alongside balancing family responsibilities and full-time farming.

Proficiency in knowledge and experience of farming principles and techniques is necessary for all farmers. They must understand farm planning; how to plant, maintain, and harvest crops; how to set up irrigation; meet the biological and mineral needs of their crops; how to maintain soil health; how to minimize off-farm releases of pollutants and toxins such as chemical fertilizers and pesticides; operate and repair tools and machinery; basic carpentry skills; and possess a true passion for farming. A lot is learned through trial and error, but education combined with practical experience gives farmers a better chance at making it. These skills alone are not the only requirements, however.

A farmer (or participating family members) must also be financially literate and possess strong business, bookkeeping/accounting, and marketing skills. To lease lands, access business start up funds, successfully apply for loans and receive financing for big equipment purchases, the

[65] "the issues – family farms." *SustainableTable.org*, http://www.sustainabletable.org/issues/familyfarms/index_pf.html
[66] "the issues – family farms." *SustainableTable.org*, http://www.sustainabletable.org/issues/familyfarms/index_pf.html
[67] "the issues – family farms." *SustainableTable.org*, http://www.sustainabletable.org/issues/familyfarms/index_pf.html
[68] "*the issues – economics*." *SustainableTable.org*. http://www.sustainabletable.org/issues/economics/index_pf.html
[69] "*the issues – economics*." *SustainableTable.org*. http://www.sustainabletable.org/issues/economics/index_pf.html

farmer has to have good credit and be financially literate. If he is saddled with debt and bad credit, then he will need to create and stick to a plan for repairing his credit.

Other skills a farmer must cultivate to successfully start an agriculture enterprise is learning how to do market research and business planning. It's better to make mistakes on paper first, rather than in real life after much time and investment has been made. Once the farm enterprise is up and running, then the farmer has to contend with keeping financial records current, either personally or true securing a bookkeeper or accountant. Business and payroll taxes will need to be paid, fees for special certifications such as organic farming may also have to be factored in. A farmer must be aware of what to grow and produce and how to market her products in order to be profitable. She must be disciplined in implementing her farm plan, account for year round, staggered plantings and harvests, and crop rotations; and reinvest profits back into the business.

Rarely do these skills exist in one person. Most farmers just want to farm and not deal with the other details of running a business. As they age too, farmers will need to think about a succession plan. Ideally it should be a family enterprise with family members possessing different skill sets and playing different roles that collectively make a successful agriculture enterprise.

Ranching & The Molokai Livestock Cooperative

Molokai's history includes large scale ranching of cattle, which was once an enterprise endeavor by Molokai Ranch, the island's largest private land owner, now known as Molokai Properties Limited. Since MPL's closure of major operations, ranching is currently done by members of the community in which they cultivate the remaining cattle on property. Cattle Ranchers include: Pohakuloa Ranch, Kualapu`u Ranch, Pedro Ranch, and Pu`u O Hoku Ranch.

Challenges with Molokai Beef

- Much of the ranching community do not finish their animals through the slaughterhouse, preferring to sell cattle off island
- Less meat is produced on the island which in turn means less Molokai beef available for consumption in restaurants and stores
- More than one individual/entity does not like the taste/consistency of the beef – some suggested that the meat be cured longer
- Some members of the cooperative feel the cost for animal processing ($65/animal) is unfair since it is not based on actual product yield (e.g., deer or goat meat yields less pounds of meat than cattle)

Slaughterhouse

The Molokai Livestock Cooperative which operates the only slaughterhouse facility on the island processes cattle and pork. Pork is not usually sold to stores due to the preference of

Molokai families to utilize reared hogs for home consumption. Thus pork is subject usually to custom kills only. As for cattle, a maximum of 18 head per week and a minimum of 5 head per week goes through the slaughterhouse, with a cumulative total of 730 animals processed to date since the facility opened its doors several years ago.

The slaughterhouse is currently not operating at full capacity. There is a historical context for some of the challenges that the Molokai Livestock Cooperative faces today. After the wholesale TB eradication of Molokai cattle in the 1980s and the closure of the old slaughterhouse in Kaunakakai, local ranchers initially worked to get a new slaughterhouse built with their sweat equity and through securing funding from County, State, and Federal sources. Unfortunately, the process of moving this project from a conceptual phase to brick and mortar took over a decade to complete. By the time the slaughterhouse facility was completed, ranchers had moved away from grass-finished cattle on Molokai to finishing their animals on the mainland. Over time, the ranchers' commitment to strengthening their own local slaughterhouse as a viable economic engine had wavered. Some ranches do not see an economic incentive to return to the former model of grass finishing their cattle and prefer a quicker turn-around time and the convenience of selling their animals pre-finished.

While the Molokai Livestock Cooperative's new slaughterhouse has made positive inroads to getting Molokai grass-fed beef in local grocery stores and restaurants through its work with committed ranchers utilizing the facility, lack of volume from hold-out ranchers also limits the slaughterhouse's ability to expand the market and fully develop an organic niche product. To make up for this shortfall, the slaughterhouse now ships in 30 head of non-Molokai cattle (50% of total stock) on a regular basis.

Lamb/Sheep

For the past 5 years, a husband and wife team has been experimenting with ranching free range lambs/sheep on 55 acres of land in west Molokai. The couple has 80 animals (60 ewes, 20 lambs). They harvest the lambs at 6 months of age and have been testing the quality of the animals.

Most recently, they market tested their lambs. The lambs were processed at the slaughterhouse. The meat was sold to Kumu Farms, Friendly Market, and Misaki's. Customer feedback has been very positive. The lamb meat sold out quickly in the stores. Right now the lamb/sheep ranchers are trying to figure out pricing, whether to sell directly to the slaughterhouse for processing, marketing, and distribution or to handle some of those aspects on their own.

Deer Ranching

Deer ranching is not a widespread activity, in fact there are only two people on the island that raise venison. Deer pens exist in Maunaloa and Pala'au with as much as 260 animals corralled

within high game fencing. The deer ranching is part of a safari tour business which allows visitors to experience hunting game.

Deer can be processed through the Molokai Slaughterhouse if the animal is presented at the facility at least one hour after the kill and a USDA Certified Inspector participates in the hunt. This is currently not being done by deer ranchers on Molokai.

The owners of DJC Ranch, Inc. which currently operates a deer ranch has done some initial market testing and research on the demand and potential for venison meat production. They have found a huge demand from restaurants and the general public for venison due to the health benefits and superior taste of Molokai axis deer. There is currently no steady source for venison meat and value-added products in Hawai`i. DJC Ranch has stated in its marketing plan that in the first year they could provide venison on a seasonal basis and initially produce ground venison and sausages. As herd numbers increase, additional markets could potentially be opened up to Whole Foods and Costco. Currently, DJC Ranch has a USDA license to slaughter venison and could utilize the Molokai Slaughterhouse. The company is FDA approved through the USDA with its own stamp and seal for marketing. The products that DJC Ranch had considered marketing were:

1. Ground venison for human consumption and also dog food
2. 9 different sausages which it has developed and successfully market tested
3. Venison corned beef
4. Fresh cuts
5. Innards

There is much potential in this area and hopefully investments can be successfully acquired to implement DJC Ranch's plan.

Additionally, there may be opportunity to create a collaboration between deer ranchers and farmers suffering from crop losses due to deer grazing if a plan could be undertaken to divert deer from cultivated lands and absorb them into ranching operations.

<u>Aquaculture</u>

Efforts have been made to restore fishponds and have met with some success for subsistence uses. State regulations affecting the restoration and utilization of these ponds limit uses to subsistence and educational purposes, making it difficult to utilize the ponds for commercial aquaculture. This is unfortunate given the hard work on the part of the community and federal funds invested in Project Loko I`a, a training program that had served an estimated 20 young Molokai adults in drystack and fishpond wall reconstruction, fishpond husbandry, live rock cultivation for the aquarium industry, shrimp and seaweed aquaculture, water sampling and analysis, leadership and entrepreneurial skills. These young adults were trained with all the tools to be successful in aquaculture, but were not given the chance to commercially lease Molokai ponds and establish a business.

Plans and funding allocated to establish a finfish hatchery on Molokai as early as 1991 and to stock fishponds for commercial production were stalled and are unlikely to come to fruition.

The Molokai Ice House completed construction at the Kaunakakai Wharf in 1993. It was established by a local commercial fishermen's cooperative of 40 individuals who contributed approximately 60-70% of Molokai's commercial fish landings. The Ice House operated successfully for nearly a decade, providing ice, fresh fish, poke, and seaweed for sale.

A Native Hawaiian non-profit, Ke Kua`āina Hanauna Hou, established a successful limu (seaweed) growers network and limu buy-back program with 30 families living along Molokai's south and central shores. These families were trained in cultivation of the edible and highly prized seaweed *Gracilaria parvispora*, commonly known as limu ogo. An estimated 1,000 lbs. weekly were shipped to Oahu fish markets as well as distributed to the Molokai Ice House and various stores on island in the form of fresh and value-added products (limu salsa and namasu). Ke Kua`āina Hanauna Hou served as a marketer and broker for the families. In the end, however, some of the more successful growers opted to sell and distribute their harvests independently, causing the cooperative type of structure to dismantle and driving the prices down for Molokai limu ogo due to competition amongst the growers.

There are two shrimp farms on Molokai: Molokai Sea Farms in Pala`au and Keawa Nui Farms in east Molokai. Keawa Nui Farms supplies SPF certified *Penaeus vannamei* shrimp broodstock, as well as seasonal harvests of tilapia fish and limu ogo.[70] Molokai Sea Farms also specializes in disease free, SPF *P. vannamei* broodstock and serves customers throughout the world.[71]

Pacifica Hawai`i Sea Salts and Hawai`i Kai Corporation both farm sea salt from Molokai's ocean waters. These salts carry essential minerals and trace elements. Molokai salt production has reached a global market as far as China and Europe. Products can also be found in Molokai stores.

Addressing Molokai's Food Supply in terms of Food Security & Disaster Preparation

Molokai's hidden subsistence economy is a strength that assists families today in a chronically depressed economy. There is enough deer, goat, and wild pig on the land and fish on the reef to meet the people's protein requirements and provide food security for tomorrow. The Ho`olehua Homestead community with family farms dotting the landscape has enough produce and starch in the ground to feed their community. As compared to other islands, Molokai is in better shape than most, if not all islands.

However, there is still a strong reliance on Young Brothers to ship in food to the island. At any given time there is an estimated 4 days of food stocked on Molokai's store shelves. No disaster

[70] Keawa Nui Farms, http://www.keawanuifarms.com/
[71] Molokai Sea Farms, http://www.broodstock.com/Hawaiian_SPF_Shrimp_Broodstock/home.html

scenario planning has ever been undertaken for how this community should respond if one day the barge does not arrive and all transportation venues by sea, air, and land were interrupted.

According to one informant, Molokai's food reserves are stored on Maui by the American Red Cross. This is wrong. Molokai is one of the few islands without a main airport on the coastal shores. In times of disaster (e.g., hurricane, tsunami), there would be better access on the island to receive assistance. Realistically however, Molokai would be of a lesser priority to ship in food and medical supplies in a Statewide disaster scenario due to the island's small population. Initial aid would be focused primarily on urban and densely populated areas on the neighboring islands.

In the Mana`e and Kaunakakai areas (east and central Molokai) where a significant portion of Molokai's population is concentrated, the roads and majority of homes are located on the coast within the tsunami and flood zone corridor. Getting assistance to these areas would be problematic. No major farming takes place in Kaunakakai and Mana`e, except for home gardens and some wetland taro cultivation in the lusher valleys on the east side.

Mono-cropping increases risks of wholesale and mass crop failure. While most small-scale farmers are doing diversified agriculture on Molokai; not enough effort has been made to preserve the hundreds of varieties of sweet potato, breadfruit, taro, and other canoe plants. Not enough has been done to cultivate and preserve varieties of regionally-adapted, open-pollinated seeds for home gardens and small scale farmers. UH CTAHR has through its research developed seeds adapted to certain environments. More effort may be needed to get these seeds to farmers.

V. RECOMMENDATIONS

Mitigating Impacts and Working with Nature and the Elements

Wind

As wind will continue to be an issue for farmers, especially homestead farmers in the Ho`olehua area, it is important to establish a comprehensive project to install windbreaks that will help to open up more homestead land for farming. Cost can be a factor for small-scale and beginning farmers. Thus, accessing funding and creating collaborative partnerships with core leadership is necessary to move this project along.

Other things to consider in terms of deciding what types of windbreaks to install would be to optimize the potential of the windbreaks to serve multiple functions. One common complaint amongst homestead farmers has been the destruction of crops from grazing deer. Providing a vegetative windbreak with tight plantings could serve as a living fence that keeps out deer. Selecting also for nitrogen fixing species will also add nutrients to the soil and boost farmer's crops.

Identified as a key project in the Environment Section of *Molokai Future of a Hawaiian Island* is providing wind breaks in Ho`olehua. The vision is to plant windbreaks "along the coastal pali, around the central plain and … along individual farmers' lots. Native trees and trees with secondary market value (fruit trees and hardwoods)" should be utilized.[72]

Drought-Proofing, Reforestation

The community initiated document, *Molokai Future of a Hawaiian Island* has identified in its Agriculture & Aquaculture Section the following priorities:[73]

- *Recognize the limited availability of water as a primary factor in prioritizing suitable agricultural food crops*
- *Protect and manage natural resources, land, and water for agriculture/aquaculture food production.*

Water is a limiting factor in farming; especially in light of chronic drought conditions and continuous mandatory cutbacks on water use from the Molokai Irrigation System. There are ways that the farmer can harvest water as well as minimize water loss. Planting windbreaks will aid in creating a microclimate that will reduce evapotranspiration and allow for some shade for crops that require less sunlight. Installing swales and terraces on contour in tandem with plantings will slow the path of water runoff coming onto the property, create good soakage that will build the water table and naturally feed crops. Mulching and planting ground cover species

[72] *Molokai Future of a Hawaiian Island*. May 2008: 15. http://molokai.org/fileadmin/user/pdf/molokai.pdf
[73] *Molokai Future of a Hawaiian Island*. May 2008: 13. http://molokai.org/fileadmin/user/pdf/molokai.pdf

alongside main crops will retain moisture and support soil health. These drought-proofing strategies working in concert will provide a great benefit to the farmer.

A longer term strategy that one homestead farmer suggested and for which he has begun to spread amongst other homesteaders is conducting mass plantings of Kukui trees to create a forest for Ho`olehua and capture rain. He is setting the example by creating a kukui plant nursery on his property and giving keiki plants to other homesteaders.

Adoption of these types of strategies should also be considered by non-homestead users who have utilized the lion's share of MIS water. Reforestation of the slopes of Maunaloa that had been damaged by cattle ranching and pineapple cultivation would also lessen dependence on water diversions. This has been identified as a key project under the community document *Molokai Future of a Hawaiian Island* along with certain erosion control measures for the West End gulches that include installing "rock dikes (gabions), hedgerow plantings, [and] siltation ponds." [74]

Protecting Water Resource Rights

The Water Code directs the Commission to "incorporate and protect adequate reserves of water for current and foreseeable development and use of Hawaiian home lands as set forth in section 221 of the Hawaiian Homes Commission Act."[75] Additionally, by law the Hawaiian Homes Commission Act recognizes a two-thirds water preference for homesteaders on the Molokai Irrigation System.[76] These laws should be enforced and the Department of Hawaiian Home Lands needs to actively advocate on behalf of homesteaders to ensure the protection of their water rights. The Department of Agriculture which manages the MIS must also responsibly meet the State's fiduciary duty by assuring that water allocations are in compliance with the two-thirds provision for homesteaders.

Wild Animal Control

A number of farmers plagued by deer have opted to allow subsistence hunting on their property or hunt the deer themselves. Others are installing fencing to keep the deer out. A local deer rancher surmised that a lot of the deer are originating from dry Molokai Ranch lands and moving towards the homestead region of Ho`olehua in search of water and food. This deer farmer would like to work with Molokai Ranch to lease and expand his operations onto Ranch lands, erect fencing and provide adequate water for the deer to prevent them from invading the Homestead. With collaboration among farmers, Molokai Ranch, and local deer ranchers, this could provide a win-win solution for all.

[74] *Molokai Future of a Hawaiian Island*. May 2008: 15. http://molokai.org/fileadmin/user/pdf/molokai.pdf
[75] Haw. Rev. Stat. Section 174C-101(a).
[76] Hawaiian Homes Commission Act § 221(d), 1920, amended 1955.

Integrated Pest Management, Weed Control, Building Soil Health

Typically weeds are found in disturbed areas. Weeds are bio-indicators of soil health and structure. They serve different functions and are often pioneer species that come into a system early on to create optimal conditions for the next stages of succession into a more mature system. Different weeds perform different functions such as adding nitrogen to the soil; re-mineralizing the soil with deep taproots that bring nutrients below up to the surface; loosening compacted, hard pan soils to allow for aeration and room for new seedlings to grow; and stabilizing fragile and exposed soils with root structures that fan out more widely to hold loose soil together. The key is to select species that are more useful to the farmer than the natural or disturbed vegetation and over time these species will outcompete weedy varieties. Diversifying crops and mimicking natural succession, doing time stacking with denser plantings of perennial legumes, ground covers, windbreaks, fruit trees, and vines of preferred species will allow for maturation of the system, create better soil health, and select out non-favorable weedy species.

One farmer who operates an organic papaya farm does the following to preserve soil fertility and control pests:[77]

- Utilizes a local manufacturer from Oahu who recycles used cooking oil, fats, bones and fish collected from restaurants, food manufacturers, and fish outlets and turns this waste into 100% certified organic soil amendments. Tons of raw material waste now diverted from landfill.
- Uses dolomite and crushed coral to amend soil, or gypsum as substitute.
- Grows sunn hemp on resting fields to help with nematodes and fix nitrogen in soil.
- Provides cover crop of grasses and weeds between rows of mature papaya trees irrigated with micro-sprinklers to keep moisture and life in the soil.
- Maintains a diverse flora, rather than engaging in monocropping
- Responds to cut worms (seasonal) by planting extra seedling trays to replace damaged seedlings
- Sprays kumulus (organic sulfur) and baking soda to combat powdery mildew, mites, and thrips.
- Rips and airs out old fields and rests fields for at least 15 months to address nematode issue
- Focuses on growing the strongest, healthiest plants to provide greater resistance to pests.

[77] University of Hawai`i College of Tropical Agriculture and Human Resources, *Featured Farmer: Rick Tamanaha, Kaleikoa farms, Ho`olehua, Moloka`i.* Hānai `Ai Newsletter, June-July-August 2011. http://www.ctahr.hawaii.edu/sustainag/news/articles/V8-KaleikoaFarms-FF.pdf

Addressing High Operational Costs

Equipment Access

Several community partners came together to address one of the major impediments for small farmers on Molokai: access to equipment. The Molokai Enterprise Community – Ke Aupuni Lōkahi purchased a tractor as part of a planned equipment rental program administered by UH CTAHR and the Hawaiian Homestead Association. The Molokai Rural Development Project purchased tractor implements to further assist the farmers. These implements included a Jacto Arbus Airblast Sprayer with Tractor Mount to assist farmers in spraying their fields without added labor; S & A AG 20 Spreader to allow growers to improve their soil pH and organic matter; Miller Bobcat 250 welder to aid farmers in repairing and fabricating tools and implements as well as serve as a training tool in welding and farm mechanics; and a Great Plains Sub Soiler SS1300 to assist farmers in field preparation with minimal soil disruption.

While farmers will still need access to other forms of equipment to cut down labor and time, the Equipment Rental Model is a good one that should be replicated to benefit the Molokai farming community overall and ameliorate farmers' chances of success by bringing their individual costs down.

Shipping

How to tackle high shipping costs? Consolidation. Compile cargo and negotiate with carriers based on volume.[78] This could be handled formally through a cooperative structure or informally through a hui of farmers. The Molokai community has also recommended commissioning a "study to explore new alternatives for transportation links (air and sea) between Molokai and other areas and markets."[79]

Another alternative that Sust`āinable Molokai is preliminarily exploring is the feasibility of providing a sailing vessel equipped with chill space that would ideally be powered by renewable energy (e.g., wind, solar) to serve as a communal shipping vessel for Molokai exports and imports. One of our concerns is not only the high shipping costs that residents incur, but also dealing with the inevitable consequences of global peak oil and helping to increase our island's fuel and energy security.

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[78] Youn, J.L. "Roots of Change: To Richard Nelson, diversification is much more than just a buzzword." *Hawaii Business Magazine.* February 2004. http://www.hawaiibusiness.com/Hawaii-Business/February-2004/Roots-of-Change/

[79] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 4: Maui County Comprehensive Economic Development Strategy 2010, Short Range Priority Projects, 1105. Infrastructure: Transportation Alternatives, p.51.

Providing Adequate Volume, Product Consistency, and Fair Pricing for Goods

One of the areas where some farmers feel challenged is marketing and distributing their products off-island. While some of them want to take advantage of better pricing on the neighbor islands, the lack of knowledge and experience in penetrating those markets can be daunting for the Molokai farmer. It was also expressed to us from vendors and restaurants that it is difficult to determine which farmer is selling what and to achieve a level of product consistency among individual farmers. For Molokai stores and restaurants, it would be easier to deal with a broker, distributor, or marketing team who is plugged into the Molokai farming community and could consolidate goods amongst all farmers and achieve a fair price for them. Costs to retain this distributor could also be shared amongst the farmers. This distributor could also handle markets on neighboring islands, mainland, and internationally and remove the headache from farmers who just want to farm.

Originally the Hiki`ola Farmers Cooperative was set up to sell and distribute farmers' products and help to remove the impediments and personal challenges farmers face in marketing their produce and products independently. However, this proved unsuccessful because of product inconsistency. This may be an ongoing challenge, but not completely insurmountable. Perhaps more careful farm planning and collaboration with farmers may be needed to collectively grow specific items to maintain a certain volume and consistency. Issues of seasonality, however, will always impact consistency.

Marketing

Farmers could also increase their profits through appropriate branding, a common logo, and shared website featuring "Grown on Molokai" or "Made on Molokai" product line. This would also help prospective value-added food entrepreneurs who are challenged by high start-up and insurance costs that comes with developing a product, designing a logo and label, and coming up with appropriate packaging. Under one brand and a common insurance, these costs can be minimized and the value-added producer could focus chiefly on creating a quality product.

Farmers Market & Community Supported Agriculture

Molokai's current Saturday market located in the heart of Kaunakakai Town is an open market where there are a variety of items sold: arts, crafts, various sundries, baked goods, and a variety of vegetables and fruits. It has been suggested that the Molokai open market be improved upon to reflect a true farmers market. Improvements would include providing chill space to provide other products like Molokai grass fed beef and seafood; showcasing value-added Molokai products; selling more and bona fide Molokai produce; and increasing accessibility for low income families to fresh local produce and other foods through undergoing the formal process and clearance to accept EBT/food stamps.

Farmers Markets serve as an important venue for farmers to sell directly to customers and create positive relationships with them. For those who prefer to farm and leave the selling and marketing to others; a local distributor could fill those shoes.

Some have suggested that several farmers markets be established within the various districts of the island (east, central, and west Molokai) to make local foods readily accessible to all consumers.

Another suggestion was that Molokai create its own local dollar or Local Exchange Trading System (LETS) amongst a community or group of people who mutually agree to extend and earn credit from each other through a series of transactions and exchanges of goods and services. Direct barter between parties is not necessary; rather, one can earn LETS credits from performing a service or giving a good, and be reciprocated at a later time for goods or services of equal value (e.g., providing babysitting services to earn credits and receive plumbing work in return). LETS allows communities greater flexibility and creates equality among its members, offering value beyond the conventional monetary system.

Some farmers create their own market by operating a CSA, or Community Supported Agriculture. The Waialua Permafarm has been operating successfully for about 30 years now as a CSA. The Waialua Permafarm has families that regularly subscribe to their CSA and purchase weekly or bi-monthly boxes of veggies and fruits. The Waialua Permafarm provides an impressive listing of vegetable and fruits that they grow with customers choosing their favorites. Whatever is in season and preferred by the customer is what the CSA provides. Pu`u O Hoku Ranch also provides veggie boxes as well as a more recent operation running out of Mahana Gardens.

One Molokai CSA operator suggested the Siskiyou Sustainable Cooperative in Oregon as a great model that could help farmers here to consolidate their efforts and create direct farmer to consumer relationships. Some of the best practices coming from Siskiyou Sustainable Cooperative include:

- A collective of farmers who wanted to form a marketing and business cooperative.
- Their business plan included visionary goals such as: a credit union for farmers; a cooperatively owned, state of the art commercial kitchen and seed cleaning facility; affordable health insurance for farm families; etc.
- In the first 2 years, the farmers developed 3 marketing venues: a CSA, a farmstand along the roadside; and a cooperatively run market booth. Eventually the Cooperative focused more exclusively on the CSA as it proved most financially successful.
- Farmers' goal is to provide continual access to more locally grown and produced foods and to make the CSA box more of a "one-stop shopping" experience for members. To date, the CSA offers bread, cheese, eggs, flowers, beef and buffalo products, coffee and honey in addition to the regular produce boxes.
- Co-op provides certified organic fruits, vegetables and specialty items produced on 9 small-scale family farms and ranches.

- Feeds 250 families through cooperative Community Supported Agriculture (CSA) marketing and distribution program, while enhancing the economic viability of their sustainable agriculture operations
- Co-op offers a small share that feeds 2 people, and a large share that feeds 3-5 people. Co-op drops off the food boxes to 7 different spots on a weekly basis.
- Providing produce to low-income populations is part of Co-op's mission. Co-op provides food to ACCESS and food banks.
- Co-op also successfully applied to accept food stamps. Co-op understands that eating fresh, healthy food is important for everyone, especially for the more vulnerable populations, like children, pregnant and nursing mothers, the elderly, and disabled. These people are most in need of nutrient-dense high quality foods.
- CSA members also benefit from farm days offered by the co-op, members get to see their food being grown and meet their farmers. Co-op also sends recipes and newsletters with each box to help members learn new and exciting ways to prepare their vegetables.
- Co-op works to expand markets for local seed producers to provide varieties of regionally-adapted, open-pollinated seeds for home gardeners and small-scale farmers. Co-op leases seed cleaning equipment from a local non-profit to improve seed quality and encourage growers to produce more seed, as the equipment saves time. One of the co-op founding members started his own local seed company, see website: www.biodynamicseeds.blogspot.com.
- Co-op farms utilize interns as an inexpensive labor pool, while providing them with opportunities to learn how to grow food and run a farm operation. In an effort to provide quality internships, some of the co-op members formed a non-profit to provide education and social opportunities for farm interns. See website: http://roguefarmcorps.org/

Achieving Financial Sustainability Through MIFF Strategy

Today's farmer must possess a diverse skills-set to be truly competitive in a global market. According to Richard Nelson, president of Hawaii Bizlink LLC, an agriculture-consulting firm on the Big Island, niche market development is the key to successful agribusiness in Hawaii rather than the "agriculture as a commodity mindset."[80] He adds, "[A]g is economic development, and it is also tourism. Visitors want to eat the Nalo greens and the fresh fish, see the pineapple plantation and visit the aquaculture operations... a hard look [needs to be taken in] assisting farmers with a variety of things, including development of market plans, business plans, package design, introduction to buyers, development of trade shows and marketing venues for local producers... [E]very farmer has got to get smarter... It's no longer just harvesting product and throwing it in a bin... Farmers have to wear multiple hats now."[81] As we look to building greater capacity in our farming community, more education and training must be available for farmers to meet these emerging trends in agriculture.

[80] Youn, February 2004. http://www.hawaiibusiness.com/Hawaii-Business/February-2004/Roots-of-Change/
[81] Youn, February 2004. http://www.hawaiibusiness.com/Hawaii-Business/February-2004/Roots-of-Change/

Farmers are more likely to succeed through diversification. The Multiple Income Farming Families (MIFF) model is a strategy for strengthening agribusinesses through generating multiple revenue streams.

One example of a Multiple Income Farming Family is Molokai Meli in operation since 2004. Molokai Meli sells premium, organic, raw kiawe honey as a value-added product. The family markets "meli sticks" or honey sealed in straws as simple snacks. They also provide different grades of honey: premium silky honey, kiawe dark honey, and honey combs that they advertise and sell through their website. The family doesn't stop there. Their eldest child, Elijah developed his own business around a dressing recipe he perfected made with Molokai Meli honey. The younger daughters have also developed their own products: beeswax candles and chapstick that are sold at Kumu Farms and Molokai's specialty shops. All family members suit up in their beekeeping suits to care for the bees. Initially when they started their business, they had not fully reached their financial goal in securing all the start-up costs they needed. They learned to adapt and adjusted their business plan. When faced with a predicament that they would not receive their bees on time to start their operations smoothly, they turned this challenge into a new business opportunity by providing the island's sole bee removal services. They utilized this initial stock of bees for honey production and continue to replenish their stores by maintaining bee removal services.

Value-Adding & Going Organic

The community supports organic, value-added, and sustainable farming:[82]

- *Encourage and support organic and environmentally friendly farming methods/techniques.*
- *Support the production of value-added products.*
- *Support the farming of certified organic and/or non-GMO crops.*

An example of where Molokai farmers have achieved success is in producing certified organic papaya. Molokai is the only place in the world where organic papaya is grown commercially. A small airport runway that lacks the capacity to receive large planes and international carriers has kept Molokai biologically purer than the other islands, in that it has not been exposed to the papaya ringspot virus; likewise, the banana bunchy top virus has also not taken a strong hold on Molokai banana.

Kumu Farms is a local distributor of organic sunrise/strawberry papaya. In the mid-1990s, Kumu Farms invested in and built a forced-hot-air (FHA), chemical free treatment facility with the approval of the US Department of Agriculture to treat its certified organic papaya onsite and distribute directly to its various markets throughout the State of Hawai`i, the U.S. Mainland, and Canada.[83] Thirty percent (30%) of the organic papaya supply comes from

[82] *Molokai Future of a Hawaiian Island*. May 2008: 13. http://molokai.org/fileadmin/user/pdf/molokai.pdf
[83] Kumu Farms. www.kumufarms.com.

homestead farming families who are part of Kumu Farms "satellite program."[84] These farmers are paid by Kumu Farms $0.75/lb. for organic papaya which is more than double what farmers typically get for conventional GMO papaya at $0.30/lb. Molokai Organic Papaya retails in the mainland U.S. at $5/lb.

Producing crops organically is a way to value-add and enter a niche market. This is especially useful for small farms who cannot compete with large producers.

One of the satellite farms has expressed a desire to begin distributing and marketing its organic papaya independently of Kumu Farms, to realize direct market profits. In any case, Kumu Farms plays a valuable role in providing its own FHA chemical free treatment facility, doing outreach to small farmers to assume the costs of shipping, distribution and marketing. For many beginning farmers, these types of opportunities mitigate some of the costs of running an agribusiness and give them a leg up to grow and eventually expand their own enterprises.

The 2010 Comprehensive Economic Development Strategy (CEDS) process for Maui County identified the main economic sectors for Maui, Molokai and Lanai islands. They include: Agriculture, Arts and Entertainment, Government, Healthcare, Recreation and Sports, Renewable Energy, Research & Development (R&D), and the Visitor Industry. Molokai CEDS participants have identified priority goals and objectives under each sector. For Agriculture & Aquaculture, Molokai residents elected as a priority objective an effective "Buy Local" ("Buy Molokai" campaign) and the establishment of a "Made on Molokai" brand.

Additionally, a September 2009 report provided by the Maui Economic Development Board (MEDB) on "Entrepreneurship and the Future of Molokai" determined from multiple surveys of Molokai's business community areas for growth and opportunity for the island's economy. Respondents identified as opportunities "uniquely Molokai 'niche' products (organic papaya, coffee, cookies, Molokai bread, etc.)" and "value-added products (taro chips, packaged dried mango, coconut, and banana)." Increased production and marketing of new value-added food products provide longer shelf life, requires less volume of raw product, and have heightened demand by world markets wishing to try new and exotic foods. Value-adding and creation of niche products that play to the strengths of what farmers here can grow provides a greater advantage to Molokai producers and allows them to be more competitive in the market.

A few years ago, the Molokai Rural Development Project (RDP) offered Value-Added Food Production Training at the Lanikeha Commercial Kitchen in partnership with Hawaiian Homes, the Molokai Community Service Council, and Kūha`o Business Center. The training was geared to establishing successful value-added food businesses to fulfill a niche market and aid in the diversification of Molokai's agriculture industry. RDP designed the training along the MIFF model of providing multiple income streams for farming families. The local farmer through this training could supplement his income through value-adding or connect with an entrepreneur wishing to turn "waste" (discarded off-grade produce) into opportunity.

[84] Kumu Farms. www.kumufarms.com

Currently, Lanikeha holds a number of anchor tenants that regularly produce value-added items. Products that have come out of Lanikeha include poi, sweet potato chips, honey, sea salt, pesto products, baked and catered items. Utilizing Lanikeha as a Community Commercial Kitchen Incubator for additional value-added product development and training is key to developing new food entrepreneurs on Molokai and strengthening the islands agriculture economy.

Agri-Tourism

Priorities identified in *Molokai Future of a Hawaiian Island's* Agriculture/Aquaculture Section includes support of "agro-tourism endeavors."[85]

An area in which there is room for growth and diversification is the agritourism industry. According to the Hawaii Agritourism Association (HATA), agritourism assists farmers with supplemental income by providing a niche market that involves connecting the consumer to the land and the growers by educating them about agricultural products and providing a direct and interactive experience. Of the profits made from ag-tourism related activities, most revenues are gained through on farm sales direct to farm visitors. Additionally, many operations receive orders for products after visitors return home, suggesting gains made through building relationships with customers through agritourism venues.

According to HATA, agritourism is a growing global trend that provides farms with income in creative ways, enhances diversity of visitor experiences while at the same time supports cultural identity.

The Molokai Responsible Tourism Initiative: A Community-Based Visitor Plan provides a basis for identifying acceptable host-visitor experiences in keeping with Molokai's culture and rural pace.[86] Focus group sessions, interviews, and surveys revealed that residents favored sustainable, community tourism, the elements of which include:

- *Operations by local and traditional population to enhance the quality of life, protect and restore the environmental and cultural assets, and engage visitors on terms defined by the community.*

- *Activities evolving as a solution to economic, environmental, social, educational, and cultural growth challenges.*

[85] *Molokai Future of a Hawaiian Island*. May 2008: 13. http://molokai.org/fileadmin/user/pdf/molokai.pdf
[86] McGregor, Davianna. "Molokai Responsible Tourism Initiative: A Community-Based Visitor Plan For Moloka`i." *Ke `Aupuni Lōkāhi – Molokai Enterprise Community.* February 2006. http://huinet.hawaiirdp.org/molokai/Final%20Report%20-%20with%20cover.pdf

- *Advocating a fair exchange of value between the host and the hosted. Preserving the community's sense of place, that brings dignity and pride to the host.*

- *Featuring authentic and genuine activities for guests. Sharing real culture by the people who practice it.*

- *Creating a balanced ratio between the local population and visitor count so that the sense of place is not overwhelmed by large scale tourism.*

Some action steps identified to meet these principles included cultural exchange/educational tours; building the kama`aina visitor market; working with entrepreneur cohorts; establishing community networks and collaborative efforts. Success would be measured with an increase in the number of jobs in the visitor industry and an increase in contributions to the island's economy from visitor activities and retail purchases.

Some Molokai farmers have shown interest in agri-tourism, as evidenced by a program supported by the Kūha`o Business Center, the County Office of Economic Development, and the Molokai Agricultural Development Program a few years ago to provide introductory agritourism workshops and site visits to various farms on Maui. Maui farms like Ali`i Kula Lavender and Surfing Goat Dairy have served as great mentors. These activities have inspired and prompted Molokai farmers to look at how they can improve their own farming operations and increase revenue through diversification.

Purdy's Mac Nut Farm is one example of agritourism on Molokai. The family provides farm tours and gives visitors the "macadamia experience" through an educational component and an opportunity to taste and purchase their product. Relationships built with visitors serve to create a loyal customer base. The Purdy's provide direct marketing by mail to customers who have visited them in the past. This method has been quite effective for them.

There are negative views on Molokai about tourism, or conventional aspects of tourism that exploit the Hawaiian host culture. One farmer who dislikes tourism stated, however, that he has welcomed hundreds of people of all ages to visit, tour, and work on his family farm. For him, no proprietary secrets are kept, just a desire to share knowledge and the family's passion for farming. In this sense, tourism takes a different meaning, one that is more about an educational exchange and an opportunity to volunteer and gain knowledge through experiencing a working farm firsthand.

Providing Greater Support for Local Agriculture & Small Family Farms

Laws must be enforced to make it favorable to the farmer to farm. Enforcement of the laws that accurately define agriculture and appropriate farm dwellings is critical to the maintenance of Hawai`i's inventory of agricultural lands, lest we forfeit a food secure future for Hawai`i.

Molokai is one of the few islands, if not the only Hawaiian island, that self-identifies its desired and primary economy to be agriculture, rather than tourism. The majority of our informants responded to the following question in this manner:

Question: What is your Agriculture Vision for Molokai?

"To truly be the agriculture breadbasket of the State"

Much of this sentiment can be attributed to our historic legacy as `Āina Momona and a culture that has never forgotten that the wealth of the land is determined by how much food can be produced and how much can be shared. This is the essence of Molokai's two economies: agriculture and traditional subsistence.

In keeping with a vision for Molokai to be the agriculture breadbasket of the State, farmers say that changes need to be made by the State government to provide a guaranteed market for Molokai farmers to supply urban and densely populated islands like Oahu; rather than perpetuating a losing proposition for Molokai's farmers who are forced to compete with others who have more direct access to the market.

Excerpts from *Molokai Future of a Hawaiian Island* makes community objectives clear as to the high priority given to protecting the interests of local agriculture:[87]

- *Protect and manage natural resources, land, and water for agriculture/aquaculture food production.*
- *Promote and support family farms on Molokai in order to protect agriculture/aquaculture resources from commercial exploitation.*
- *Promote activities and incentives that will help support the economic security of our farm families.*

Additional acreage for Agricultural Parks should be reserved to support the expansion of local, family farms. Practices that conflict with the spirit and policies identified for Ag Parks, such as leasing or sub-leasing to large corporate/industrial agriculture and biotech companies, should be prohibited.

[87] *Molokai Future of a Hawaiian Island*, (2008), 13.

New trends related to an increasing appreciation and demand for local and regional produce, encourage the return of small family farms.[88] Family farms are important to the soul and resilience of a community. Where industrial agriculture companies tend to cause erosion and pollution through destructive practices with the use of machinery and heavy application of chemical fertilizers, herbicides, and pesticides, independent, small family farms have a more intimate relationship with the land and are keen on preserving green and open spaces in alignment with community values.[89]

Related to the decline of small family farms is the aging of America's farmers. Molokai is no different. The average age of the farmers we surveyed were 54 years old, while the national average is 57.[90] The US Department of Agriculture estimates that 70% of the nation's agricultural land will change hands within the next 20 years due to the aging population of farmers.[91] If the next generation is not interested in farming, there is a real threat that these farmlands will be converted to non-agriculture purposes.[92] It is imperative then to cultivate a new generation of beginning farmers.

Outreach & Education

Increasing Consumer Awareness. Review of survey and interview responses stimulated lively informal inquiry and discussion among friends, family, and colleagues. One such discussion was about the need to raise greater consumer awareness of different kinds of foods, herbs, vegetables that attract the more experienced palette, but for which the local population may not be accustomed to outside of their own traditional foods. One observation that was made by Kumu Farms is that sales are low in the summer and pick up again at the arrival of snowbirds in the fall and winter months. Hearing local people talk about their appreciation of going to Kumu Farms to pick up fresh organic produce, but a reluctance to try some of the more exotic herbs because of their lack of knowledge on how to prepare them suggests a desire to explore different cuisines but not enough opportunity to learn about and incorporate these foods into their cooking. Hosting different tastings and cooking classes that integrate a farm to table approach may help to remove some these barriers to eating healthy new foods. With these types of activities, we create more educated consumers. Several of our informants have also suggested raising awareness at an early age, to educate the next generation of eaters through school garden programs that give children a direct experience and appreciation of cultivating,

[88] United States Department of Agriculture, National Institute of Food and Agriculture. *Family Farms Overview*. http://www.csrees.usda.gov/nea/ag_systems/in_focus/familyfarm_if_overview.html
[89] "the issues – family farms." *SustainableTable.org*, http://www.sustainabletable.org/issues/familyfarms/index_pf.html
[90] Shute, B. "A New Generation of Farmers." *The New York Times.* August 19, 2011. http://www.nytimes.com/roomfordebate/2011/08/17/could-farms-survive-without-illegal-labor/we-need-a-new-generation-of-american-farmers
[91] United States Department of Agriculture, National Institute of Food and Agriculture. *Family Farms Overview.* http://www.csrees.usda.gov/nea/ag_systems/in_focus/familyfarm_if_overview.html
[92] United States Department of Agriculture, National Institute of Food and Agriculture. *Family Farms Overview.* http://www.csrees.usda.gov/nea/ag_systems/in_focus/familyfarm_if_overview.html

preparing, eating, and eventually buying a delightful diversity of locally grown, nutritious and whole foods.

Educating Farmers. Molokai has great resources that assist both the prospective and current farmer in gaining in-depth agricultural knowledge and skills. The University of Hawai`i Maui College (UHMC) Molokai Farm confers an Associates Degree and Certificates in various Agriculture & Natural Resources topics:

- Certificate of Achievement and A.S. degrees in Horticulture and Landscape Maintenance, and Sustainable Tropical Crop Management.
- Certificates of Competence in Agricultural Science, Nursery Production, and Pest Management
- Certificates of Completion in Turfgrass Specialist, Sustainable Tropical Crop Production, and Landscape Maintenance
- Associates in Technical Studies Degree in Cultural and Natural Resource Management: Mālama `Āina.

In the past, the Molokai Rural Development Project sponsored the Agriculture Cohort training program which served 8 farming families (27 family members total) committed to developing sustainable family farms.[93]

The UH-CTAHR Molokai Office delivered the training. The project employed experiential learning and instructional methodologies as best practices for intergenerational transfer of technology and expertise for sustainable agriculture. Participants learned marketing; farm planning; production planning; record keeping; complete requisite tax forms (Schedule F); farm equipment safety and operation; site-selection assessment; irrigation set-up; soil fertility; plant nutrition; pest management (weeds, insects, diseases); harvesting commodities; post-harvest handling, grading, and quality management; organic certification; basic computing, business software, and custom agriculture-based software. Participants received training on using special agriculture software developed by UH-CTAHR Molokai extension agent Alton Arakaki. The first software they learned was on Production Mapping. With this program, farmers planned and projected their production activities throughout the year and determined when and how much resources would be needed to complete activities successfully. The program also provided farmers an opportunity to realistically estimate production cash flow of their farm plans. The second software they learned was the Schedule F financial recordkeeping program that maintains records in a template that would eventually complete their Department of the Treasury, Profit and Loss from Farming, IRS Schedule F, Form 1040. At the end of the training, the cohort participants received copies of the software. Other farming software developed by UH-CTAHR proved useful for farm entrepreneurs enrolled in the project. The software included Plant Tissue Analysis – Recording and Tracking for plant nutrition management and Calibrating Your Sprayer (published by CTAHR, http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PRRE-6.pdf).

[93] Akutagawa, Malia. "Agricultural Cohort Project Final Report." August 30, 2007.

Farm families increased their knowledge and experience in crop production and management, and applied their acquired skills to establishing or expanding their farm business. The crops produced by the 8 family farm enterprises included organic papaya (3 farms), yam *Dioscarea*, organic watermelon and taro, greenhouse lettuce, pumpkin, taro (lu`au leaf, table taro, and value-added kulolo product), and coffee.

Several participants were successful recipients of the Molokai Agricultural Development Program awards, having enrolled in RDP's Kūha`o Business Center Entrepreneurial Training Program to receive one-to-one business consultation and assistance in developing their business plans.

All cohort families made profit and exceeded benchmarks set by RDP. An estimated total of $105,000 was made in cumulative sales over the year, more than doubling the year 2, end project goal of $50,000. The farm products were marketed on-island, intrastate, and on the mainland. Organic papayas were marketed to mainland hubs in Los Angeles, San Francisco, and Portland. From these huge cities they were sold and shipped to inland markets.

From this comprehensive training, participants learned and experienced both the agricultural sciences and art of running a successful business. In the science curriculum participants learned subject matters in soil, plants, plant diseases, insects, weeds, plant nutrition, management of plant pests, and plant nutrition. In the agri-business curriculum, participants learned post harvest handling, grading, organic certification, marketing and farm production planning and management. Both experiential learning and classroom instruction proved invaluable. The majority of these families remain successful today, more than 5 years after the program ended.

Trainings like this give farmers the necessary tools to run a successful agribusiness. UH-CTAHR continues to assist by focusing on teaching beginning farmers as a way to cultivate the next generation of farmers and reverse the nationwide trend of an aging farming population.

Sust`āinable Molokai has also focused on complementing this work by bringing permaculture (ecological farming) in partnership with the Permaculture Research Institute USA to interested local adults and homesteaders to farm responsibly and sustainably. From here we've been teaching sustainable farming strategies to an estimated 100 Molokai High School students and installing the features of a mini-ahupua`a as a demonstration and teaching tool.

It is recommended that to build a strong farming community in the next generation, we will need to take proactive steps now and start preparing new farmers early on from grade school level with school gardens, up through middle and high school as youth begin to explore agriculture as a career. General agriculture classes can be supplemented with a curriculum that includes financial literacy, entrepreneurship/business, home economics, health and nutrition, science (biology, ecology, chemistry, conservation), and engineering aspects. From here students will be able to understand agriculture from diverse viewpoints and disciplines and develop different skills required for operating a successful farm enterprise. Creating a direct bridge to higher education through college and career pathway ladder programs available at

UHMC Molokai and other university institutions is ideal.

One farmer who has a strong business background and was a bookkeeper for many years prior to farming recommended that young people take courses in bookkeeping and accounting in addition to agriculture classes.

Perhaps the greatest ways to impart farming knowledge is between farmers. Several of our farmers that we interviewed indicated that they learn best from each other and that there is a desire to serve as mentors for new farmers who lack experience. This is felt particularly among Molokai's homestead farmers. One farmer remarked on the very close-knit community formed on the homestead and that most have the same mindset, that "new opportunities for one are opportunities for all." As a group, they rely on each other to share farming techniques, information on new equipment, and promote their produce together. Rarely is there competition amongst homesteaders, but a desire to demonstrate that agriculture is a viable economic engine for the island.

Other Resources to Assist Farmers, Landowners, and Ranchers

There are a number of incentive programs that assist farmers, ranchers, and landowners if they choose to integrate conservation and sustainable practices in their operations. This is one way that Molokai producers can access critical funding and work with conservation experts. Incentive Programs through the US Department of Agriculture include the USDA Natural Resources Conservation Service (NRCS) – Molokai-Lanai Soil & Water Conservation District (SWCD) which prepares local conservation and watershed management plans; provides conservation education; and propagates native plants to restore Hawaiian ecosystems; assists farmers and ranchers in a number of federal Farm Bill Programs that provides incentives for voluntary conservation practices to help reduce erosion, protect streams and rivers, restore and establish fish and wildlife habitat, and improve air quality:

- Environmental Quality Incentives Program (EQIP): responds to important, locally identified natural resource concerns. Funds cover conservation planning, design, and installation. It may include strategies such as noxious weed control, brush management, pasture hay land planting, terraces, and groundcover.

- Ground & Surface Water Conservation (GSWC): supports installation of irrigation related conservation practices. Strategies funded are water catchment basins, micro-irrigation, roof runoff, etc.

- Grassland Reserve Program (GRP): assists landowners and operators in the restoration and protection of grassland, including rangeland and pastureland.

- Wildlife Habitat Incentive Program (WHIP): utilized for the creation and improvement of fish and wildlife habitat on private land. Some practices funded include developing wetland, riparian, and upland areas.

- Wetlands Reserve Program (WRP): wetland restoration, enhancement, or creation on private land.

- Farm & Ranchland Protection Program (FRPP): helping state, tribal, or local government to purchase the development rights to keep productive farm and ranchland in agricultural use.

- Conservation Security Program (CSP): rewards farmers for protecting and improving the environment. Pays producers who historically practice good stewardship on agricultural lands, and provides incentives.

Other programs administered through NRCS and its affiliates include:

- Agricultural Development Program (ADP): provides funds to Resource Conservation and Development Councils throughout the nation to administer grants for community driven projects that promote agricultural development.

- Conservation Innovation Grants (CIG): stimulates the development and adoption of innovative conservation approaches and technologies while leveraging federal investment in environmental enhancement and protection, in conjunction with agricultural production.

- Cooperative Ecosystem Studies Unit (CESU): provide opportunities for interdisciplinary and multi-agency research, technical assistance, and education. Function as "virtual" organizations, linking several institutions to increase access to expertise and facilities.

Improve Ranching Practices & Maximize Use & Potential of Slaughterhouse

The broader impact for the island in having its own slaughterhouse, the most advanced facility in the State of Hawaii, is the revitalization of Molokai's ranching industry. Where quality and increased volume are paramount, ranchers with the right tools may take advantage of consumer trends towards making healthier food choices through offering Molokai-grown, grass-fed, organic beef as a value-added niche product.

There have been criticisms about the quality of Molokai beef in terms of taste. While visitors and health conscious individuals tend to be more willing to spend up to $5/lb. on local grass fed beef, the average Molokai consumer tends to be more concerned about taste. According to the slaughterhouse manager, high quality pasture yields high quality beef, and is a pre-requisite for entering a niche market. Ranchers here are not focused on grass finishing their cattle. High quality grass grown under best management practices is needed to create a great beef product. It will take time for the ranching industry to see the value of adopting greater measures in alignment with organic ranching precepts to capture a niche market.

Venison and lamb show market potential. It will be interesting to track the progress of these

potential enterprises in the years ahead. It is recommended that Molokai's state-of-the-art slaughterhouse be utilized to process and distribute more local meat and a variety of animals for retail processing as well as value-added food development. Additionally, the possibility and requirements for processing goat through the slaughterhouse and the potential market for these animals should be further explored as a way to get feral goats (and more deer) down from the mountain as a threat to upland native forests and onto the plate. We must begin to look at ways to turn threats into opportunities.

Sustainable Ranching

The community has identified as a priority the support of "continued livestock-raising operations on Molokai that use sustainable land/water management practices to minimize the risk of erosion and to protect Molokai's limited water resources."[94]

Sust`āinable Molokai has been researching ways to bring the tools of Holistic Management to Molokai ranchers. The holistic management framework touches upon the ways that animals can play an important role in renewing the land through careful management and understanding the water cycle, mineral cycle, energy flow, and ecosystem dynamics. Through this method grasslands can be improved to minimize negative effects of drought, rebuild soil and sequester carbon, as well as provide good pasture for hooved animals who are integrated into the management plan. With holistic management, livestock actually provide a healing effect on the land through mimicking nature and wild herding behavior. Animals can be utilized to aerate the soil and aid in the planting of grass seed with their hooves, while contributing nutrients to the soil from their feces with high density grazing for short periods followed by a restorative period. Outcomes of this sustainable way of management include reduced costs and increased profits for the ranch; more productive range land; biologically active soils; reversal of desertification of eroded lands; drought protection; restorative effect on the watershed; improved wildlife habitat and ecosystems; and food security. Ranchers around the world have met with great success through this method. There are some examples on the Big Island of successful ranching with Holistic Management principles. With appropriate planning, collaboration, and raising the necessary funds, Sust`āinable Molokai would like to bring a Holistic Management training workshop to assist the ranching community.

Strengthening Molokai's Food Security & Disaster Preparedness

One farm business, Kumu Farms, has taken an active role in responding to food security concerns for Molokai. Kumu Farms after the recent tsunami scare began to consider how they could help in increasing Molokai's food security and resilience to disaster events. Kumu Farms adopted a policy that makes Molokai first priority in terms of supplying the island's produce needs. Molokai needs are taken care of first, with the surplus exported to the rest of the State and U.S. mainland.

[94] *Molokai Future of a Hawaiian Island*, (2008), 13.

UH CTAHR will be providing an `Ohana Gardening class for subsistence gardening. Family gardens are the best way to provide food security. There is a phrase by Geoff Lawton, a renowned permaculture teacher, "One can solve all problems in a garden." In a garden, distribution and transportation issues are automatically resolved. Other measures that can be taken to make food readily accessible to families and minimize the amount of time and resources to travel by foot is to work with families to plant breadfruit trees, sweet potato, bananas, wet or dryland taro. Many Hawaiian families, particularly living on kuleana lands already have these plants and trees in the ground as direct beneficiaries of their kupuna who commonly provided for the family's needs right in their own backyard.

One farmer would like to see food forests on the mountain sides in every ahupua`a. Collaboration with large landowners, community groups, and the aha ki`ole leadership would be a good starting point to coordinate this type of work.

Molokai's strength also lies in its diversified agriculture and family farms. The use of large acreages of farm land for biotech seed crops utilized for research purposes only impacts the island's food security and ability to produce food. Typical industrial monocrop culture also leaves the island more vulnerable to mass crop failure.

Greater resilience is found through diversification of food crops. Reintroducing the practice of seed saving and growing many varieties of heirloom seeds adapted to specific growing regions and climate regimes is a way to increase food security. Greater effort must be placed in creating a seed bank; preserving and planting existing seed varieties, particularly created by the early Hawaiians and passed down to the present generation; and cultivating new varieties adapted to one's growing area.

Restoration of Waikolu Valley was identified as a priority project under the Maui County Comprehensive Economic Development Strategy (CEDS) process. The restoration project would entail allowing homesteaders to restore the taro terraces in the valley and replant taro.[95]

Molokai's great inventory of fishponds and massive fringing reef system are also assets to the island's ability to produce food. Care must be taken to restore upland forests to stop siltation and runoff into the ocean and fishponds. Work must be undertaken to restore more fishponds and put them back into production.

[95] *Hawai`i Statewide Comprehensive Economic Development Strategy (CEDS)*, Chapter 4 – Maui County Comprehensive Economic Development Strategy 2010, Short Range Priority Projects, p. 51.

Conclusion

Farming is challenging on Molokai due to limited water resources; high operational costs; shipping hurdles; and the ability to get a fair price for produce farmed. These challenges are not insurmountable if approached systematically and continued efforts and commitments are made by Molokai's community to support local agriculture through education and creating structures that pool resources and people together.

The island is made stronger by the assets we have: a rich cultural legacy of `āina momona, a population that maintains traditional subsistence practices, and upholds agriculture as the economic mainstay for the island; lands, fishponds, and reefs capable of producing vast amounts of food; a strong Hawaiian Homestead farming community engaged in diversified agriculture; a college and demonstration farm that offers agriculture certificate and degree programs; local state-of-the-art slaughterhouse; a community run commercial kitchen facility for value-added food production and training; dedicated educators and agriculture extension agents from the University to help farmers in the field; and an environment that is more cooperative than competitive in terms of sharing knowledge and best practices.

VI. APPENDICES

A. Food Production & Security Survey
B. Interview Questions for Farmers
C. Interview Questions for Businesses

Appendix A - Food Production & Security Survey

Sust'aina ble Molokai Survey
Food Production & Security

Do you care or think about where your food comes from? ___yes ___no
Do you prefer to buy local Molokai food products? __ yes ___no __no preference
Would you eat more local food if it were available? __yes __no. If yes, what would you like to eat or buy if made/ grown on Molokai?_____

Do you feel you have access to locally grown food in the grocery stores and open markets? ___yes ___no. If no, what do you suggest to improve this situation?_____

Are you a farmer or interested in farming? ____ yes ____no If yes, how old are you?_____

If yes, what do you feel are the challenges farmers face on Molokai? (check all that may apply)

__High cost of water
__Lack of capacity/education
__Not enough demand for goods
__High operational costs
__High equipment costs
__Other _____

What produce do you (plan to) farm?_____ _____
How much land are you farming (or is available for you)?
a. Less than one acre b. 1 – 5 acres c. 15 - 40 acres d. 40 acres or more

Do you grow your own food (farm, gardening)? _____ yes _____no. If no, what is the primary reason for not growing your own food? __Too busy __ Not interested __ Relying on others __Disabled __ Don't know how Other Reason: _____

Approximately what percentage of the food you eat is:
Prepared at home _____ % Purchased from a restaurant _____ % (total should equal 100%)

Of the food you prepare at home, approximately what percentage is grown, caught, and/or produced (total should equal 100%):
a. By you and/or your family _____ % b. On Molokai_____%
c. In Hawaii _____% d. Outside Hawaii_____%

Would you grow food for sale if there were a viable market (guaranteed customer)? (or more food if you already grow)
__Yes __No

What subsistence activities do you do? If none, why (no interest, no time, don't know how)?
a.Hunting b. Fishing/Diving c. Gathering (what?_____)
Other _____ None because _____

To practice subsistence on Molokai, we need our natural resources to be in good condition/protected and we need access. Which one is a bigger concern for you?
___Condition/protection of our natural resources ___Access to natural areas/resources ___Both – equally.

Overall how important is subsistence to your family? ___Very Important ___Somewhat important
___Somewhat Unimportant ___Not Important at all

About what percent of your family's food comes from subsistence activities ? (fishing, hunting, gathering, raising animals, cultivation) _____%

PLEASE FEEL FREE TO WRITE ADDITIONAL COMMENTS ON THE BACK OF THIS PAGE.

Appendix B - Interview Questions for Farmers

Food Production – Informant Interviews – Farmers

Sustainable Molokai is creating an online database where we are inputting information about the island's food production. We want to share what you are growing as well as include your mana'o on the status of Molokai's food supply. Once this information is available to the public, the island community would have a picture of what is going on in terms of food security and how we can all get together to fill in the gaps and meet needs.

How old are you, how long have you been farming?

What produce do you farm or are interested in farming? How much land is available for you?

What has been your best cash crop?

Has farming your specific product/produce been successful?

What do you feel are the challenges farmers face on Molokai? (check all that may apply)

__High cost of water __High operational costs

__Lack of capacity/education __High equipment costs

__Not enough demand for goods __Other_____

Do you sell or plan to sell food mostly on island?

What is your vision for an agricultural future for this island?

Appendix C - Interview Questions for Businesses

Food Security Interview Questions for Businesses

Sustainable Molokai is working on a database project which is collecting information about Molokai's food production. We are surveying the community and would like to talk story with the island's grocery stores.

Out of a 100%, how much percentage of what you sell out of the store is locally grown/produced/made?

If it's not Molokai made, where does the produce come that is being sold out of the store?

What Molokai made/grown products do you sell out of the store?

What are the requirements for local food to be sold out of your store, (e.g., business license)?

What is the most popular/successful or fastest selling local product sold?

What do you consider to be the challenges that farmers face on Molokai?

What would you like to sell that is Molokai made?

Do you have any suggestions to potential farmers, food businesses on Molokai? What to sell, when to sell, etc.?