



STATE OF HAWAII ■ DEPARTMENT OF LAND AND NATURAL RESOURCES ■ PROTECTING OUR PAST

Agricultural Field Systems 2016



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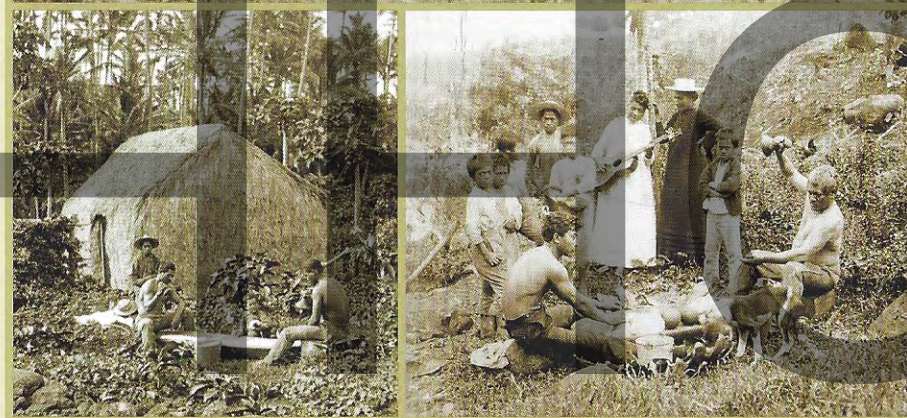
If you require this calendar in alternate formats, please contact DLNR at 587-1972.



Hawaii Heritage Center

Anyone wishing to obtain more calendars please contact:
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TIDE PREDICTIONS

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The tidal predictions are based on the high and low tides at Honolulu Harbor, O'ahu. To find the correct times and heights for other locations, use the chart below to adjust the times and heights.

Tidal corrections are listed in hours and minutes. A plus (+) sign means that the tide will occur later than in Honolulu, therefore, add this number to Honolulu time. A minus (-) sign indicates that a tide will occur earlier than in Honolulu, therefore, subtract this number from Honolulu time. For tide times at the following places, add or subtract from Honolulu time.

PORTS	HIGH WATER		LOW WATER	
	HR	MIN	HR	MIN
KAUA'I				
Waimea Bay	-0	20	-0	07
Port Allen, Hanapēpē Bay	-0	36	-0	22
Nāwiliwili Bay	-0	27	-0	25
Hanaumā'ulu Bay	-0	17	-0	21
Hanalei Bay	-1	28	-1	47
O'AHU				
Hale'iwa, Waialua Bay	-1	02	-2	05
Wai'ānae	+0	20	+0	18
Hanauma Bay	-0	59	-0	45
Waimānalo	-1	15	-1	09
Moku o Lo'e	-1	24	-1	14
Waikāne, Kāne'ohe Bay	-1	46	-1	18
Lā'ie Bay	-1	45	-1	46
MOLOKA'I				
Kolo	+0	05	+0	01
Kaunakakai	-0	05	-0	08
Kamalō Harbor	-0	37	-0	16
Pūko'o Harbor	-1	03	-0	48
LĀNA'I				
Kaunapau	+0	02	+0	03
MAUI				
Kahului	-1	53	-1	41
Hāna	-1	13	-1	23
Mākena	-0	32	-0	32
Kihei, Mā'alaea Bay	-0	01	-0	22
Lahaina	-0	35	-0	40
KAHO'OLAWÉ				
Kūheia Bay	-0	09	-0	09
Smuggler Cove	-0	15	+0	03
HAWAII				
Māhukona	-0	26	-0	17
Kawaihae	-0	04	-0	03
Kailua Kona	-0	26	-0	22
Nāpō'opo'o, Kealahou Bay	-0	16	-0	12
Honu'apo	-0	26	-0	16
Hilo	-1	04	-0	59

Traditional Agricultural Field Systems of Hawai'i



"Their tools were their hands and their backs—these were their cattle, horses and carts. Their hands were their lifting implements and their shoulders their carts for hauling rocks, great logs and all heavy things."

—Samuel Manaiakalani Kamakau



The first Polynesian voyagers to Hawai'i around a thousand years ago brought with them carefully nurtured plants which would eventually propagate and form the sustenance for an ever-expanding population and evolving society. Slowly the island settlements modified old practices and adopted new ones to develop vast and complex fields systems throughout the archipelago which included the development of powerful regional chiefdoms. At its full development all usable land in these islands formed a vast cultural landscape. Even marginal lands, defined as younger lava flows or areas of low rainfall were subject to ingenious techniques to enrich the soil and conserve water.

" My people have been cultivators from very ancient times; it was by agriculture that they made a living for themselves, for their families, and those dependent on them. For some it was a favorite occupation."

—Samuel Manaiakalani Kamakau

“With his hands he softened the earth, weeded, raked and spaded, with only the help of a wooden digging stick.”

—Samuel Manaiakalani Kamakau



Cover: Hā'ena Ke'e Beach and the peak of Makana on the north shore of Kaua'i with the *lo'i* terraces recently restored to their original use by the Hui Maka'ainana o Makana. The stone terraces of former fields extend under the forest from the base of the pali to the shoreline. The cliffs of the Na Pali coast extend westwards.

tion of the systems and the ingenuity implicit in their design and maintenance. These include Captain James Cook and Lieutenant King in Waimea, Kaua'i and Archibald Menzies at Kealahou, Hawai'i Island.

These systems were designed with a long-term vision of soil and water conservation with planting cycles guided by intimate understanding of local temperature and rainfall patterns and soil characteristics. Planting schedules were guided by attention to seasons and moon phases and specific plants were placed in microenvironments within these complexes most suitable for their growth.

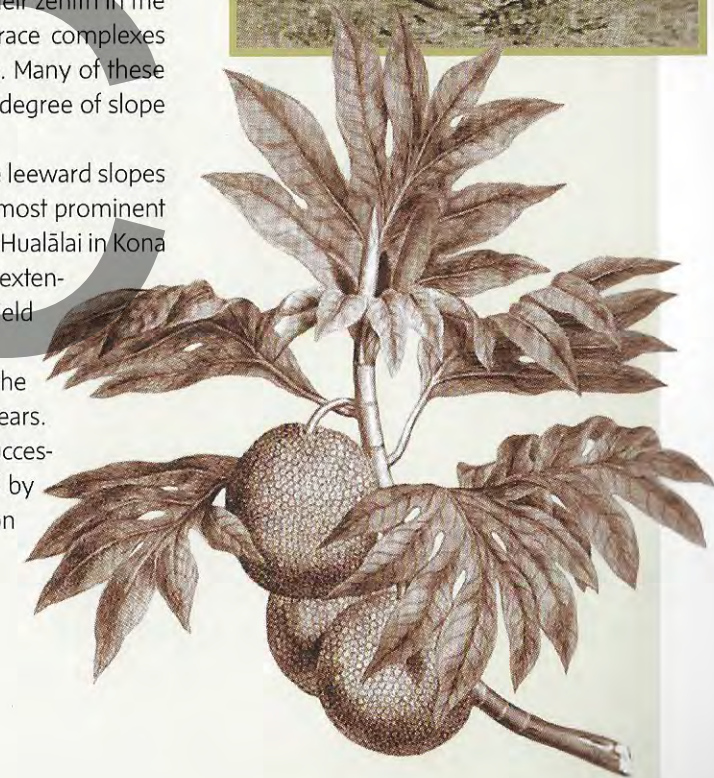
The most important food plant was of course taro (*kalo*), which can be grown in ponded fields (*lo'i*) as well as in dry land areas where rainfall was plentiful. Other crops included sweet potatoes (*uala*), which could be grown intensively in drier areas along with yams (*uhi*). Bananas (*mai'a*), bread fruit (*ulu*), gourd (*ipu*), sugarcane (*kō*), ti (*kī*), and other useful plants were grown on banks and along terrace walls and field boundaries.

These field systems can be divided into two basic types – 1) wetland- containing *lo'i* irrigated with water flowing through a succession of fields or channels (*'auwai*), 2) dry land or *kula* meaning supported by rainfall. In reality the traditional systems are often a combination of both types with the dry land crops along higher banks and borders of irrigated patches. Likewise, some irrigated patches are found in isolated portions of *kula* lands where surface water was available. A classic example of this interaction in land-use can be seen in the Kōloa system which covered nearly a thousand acres of the *makai* portion of the *ahupua'a* of Kōloa on the south coast of Kaua'i.

The geographic extent of these field systems were widespread and reached their zenith in the few hundred years before European contact in the late 18th Century. Extensive terrace complexes existed on every island in virtually every valley and coastal plain with a flowing stream. Many of these terraces remain today and are of imposing height, six feet or more, depending on the degree of slope in the valley.

The predominant dry land field systems or rainfall fed systems occurred on the leeward slopes in areas with rainfall exceeding 15 to 20 inches and on more mature volcanic soils. The most prominent and best documented of these, the Kona field system, is found on the leeward slopes of Hualālai in Kona on Hawai'i Island and stretches northwards from Kealahou to Kailua Town. The other extensive system covers the leeward slopes of the district of Kohala. Other well-known field systems occur in Kula, Maui, Ka'ū, Hawai'i Island and Kalaupapa, Moloka'i.

Remnants of these fields and boundaries can be seen most effectively from the air even in areas that have been chained, dragged, or modified for pasture over many years. Many of the traditional irrigated systems were later converted to rice cultivation and successively back to taro. In more recent times some of these systems have been revitalized by nonprofit groups and are now enriching lives through sustenance as well as education and cultural practices.





january

The barren and extremely rocky lands of Kōloa on the south coast of Kaua'i were transformed into productive fields through intensive labor many centuries before European contact. The *auwai* entered from the upper left and the water filtered downslope to irrigate the intricately designed terraces.



february

Hanalei on the north shore of Kaua'i was in ancient times—and still is—
one of the major wetland taro growing areas of Hawai'i.
These fields are tended by the Waipā Foundation established over 20 years ago
as managers of 1,600 acres of the Ahupua'a of Waipā.



march

Lo'i terraces of the *'ili* of Luluku in Kāne'ohe Ahupua'a with the Ko'olau mountains in the background. These terraces are associated with the famous *kahuna* Hewahewa Nui a confidant of Kamehameha I.



april

This taro *lo'i* in Waimea valley on the west side of Kaua'i is one of the few remaining fields of a once immense system which covered the entire width and length of the valley as evidenced by extensive abandoned stone terraces. Captain Cook in the late 1700s remarked on the high productivity of this area and Nathaniel Portlock in 1787 observed taro corms "as large as a man's head".



may

The *lo'i* of Kē anae peninsula are fed by a single *mauka* source of water. The layout of these fields has not significantly changed since they were recorded in the maps of the *mahele* in the mid 19th Century.



June

The prominent stone alignments of the Kona Field System are obvious in this pasture in the North Kona district on the lower slopes of Hualālai. The Kona Field System was distinct from the other well known "dryland" field systems in that the walls are parallel to the slope. These walls are referred to as *kuanwi* and they defined land boundaries which transected different elevations designating planting zones for sweet potato (*uala*), breadfruit (*ulu*) and in the upland regions, taro (*kalo*).



july

Ancient *lo'i* terraces in Luluku, Kāne'ohe Ahupua'a restored and put back into production. The *lo'i* are watered by *'auwai* diverted from the nearby stream and the taro is grown on earthen mounds in the *lo'i*. Ti plants lining the sides of the *'auwai* stabilize the banks.



august

Portions of the Kōloa Field System are preserved in the midst of a golf course and residential neighborhood. This system once covered nearly 1,000 acres of the *maka'i* portion of the Ahupua'a of Kōloa and was irrigated with a series of *'auwai* extending in a complex dendritic pattern nearly 3 miles from present day Kōloa town to the coast of Po'ipū.



september

Ancient terraces along the slopes of the Wa'ianae Mountains have been restored and put into production by Ka'ala Farm a non-profit cultural learning center.

These terraces extend far upslope to the base of the mountains and once supported a large community in the Ahupua'a of Wai'anae.



october

Remnants of the once vast agricultural complex known as the Kohala Field System include stone and earthen terraces perpendicular to the slope. These terraces are visible from the air as parallel lines perpendicular to the slope even after many years of pasture improvement.



november

The terraces of the extensive "Kula Field System" on Maui extending up the slopes of Haleakalā are still visible after many years of pasture improvements. These terraces typically run perpendicular to the slope.



december

A large 'auwai paralleling the Waihe'e stream as it enters the ocean irrigates the *lo'i* in the valley of the Waihe'e Ahupua'a. Intensive labor was needed to channel along the front of the hill to irrigate the large expanse of land on the left side.