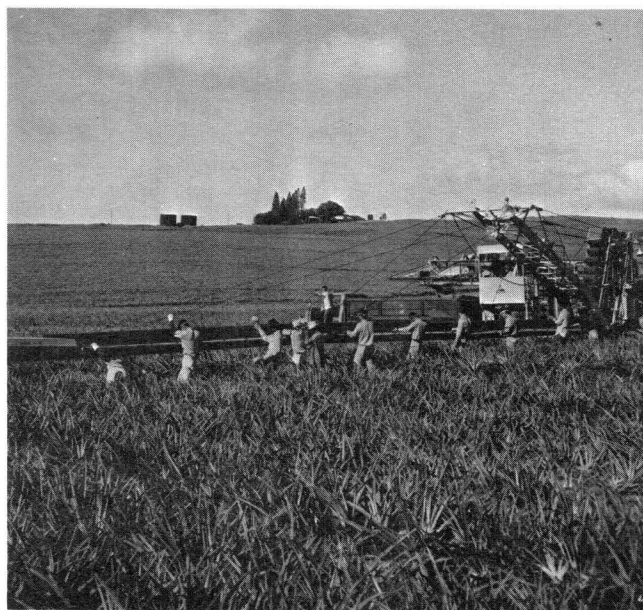


THE FEASIBILITY OF ALFALFA ON MOLOKAI

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Alfalfa is a crop which should be given serious consideration for commercial production in Hawaii. Under normal conditions, it is possible to obtain as many as 11 cuttings per year in Hawaii. The best soils for alfalfa production in Hawaii are deep, well drained, neutral or slightly alkaline, free of rocks, with slopes of less than 15 percent, and of relatively low elevation (1000 feet or less).

The physical conditions of the soils in the Hoo-lehua and Maunaloa regions on the island of Molokai meet the above conditions and can be expected to produce yields sufficiently high to justify the study of alfalfa production as an alternative use for the lands going out of pineapple production.



Pineapple fields in the Maunaloa area of Molokai are typical of lands that will be available for other crops after 1975.

Alfalfa Production in Hawaii

Goodell et al.(1972) suggest that alfalfa can be produced either for sale as hay or greenchop (forage). Greenchop can be dried artificially and converted into alfalfa meal or alfalfa pellets. Hay can be marketed in either baled or cubed form. "Well-grown alfalfa should produce 12 to 13 tons of dry hay or forage product (about 15 percent moisture) or 45 to 50 tons of fresh-cut forage per acre per year." In regions of low elevation, these yields can be obtained in about 10 cuttings in the year planted and 11 cuttings each year thereafter.

Alfalfa has one of the highest water requirements for optimum growth of any field crop, approximately 4 acre-feet or 1188 million gallons per acre per year, which can be supplied by either irrigation or rainfall. For most arid or semiarid conditions in Hawaii, such as on Molokai, a minimum feasible irrigation schedule for alfalfa would be 1.5 to 2 acre-inches per acre every 2 weeks or about 4 acre-inches per cutting, except during periods of heavy rainfall.

A major problem of alfalfa production for sale as hay in Hawaii is the curing or drying of the crop after harvest. The cut alfalfa must be dried to below 20 percent moisture (15 percent would be optimal) before baling. The alfalfa will usually have to be dried by artificial means during periods when rainfall and humidity are the highest. In areas with weather conditions such as Molokai, adequate conditions for natural drying probably exist during the summer months, but artificial

drying will be necessary during the winter months. If there is a market for both greenchop and forage, hay could be produced during the summer and greenchop during the winter.

Alfalfa production for final consumption on the same island, given adequate growth conditions, should be a viable economic activity in Hawaii. The per acre costs of production in Hawaii will probably be significantly higher than the per acre costs on the Mainland, but sale of the product on the same island as its production will avoid shipping costs, allowing Hawaii-produced alfalfa to compete favorably with alfalfa imported from the Mainland. If the product must be shipped to another island for final consumption, the addition of shipping costs to the costs of production will force the selling price of locally produced alfalfa above that of alfalfa imported from the Mainland.

Factors Limiting the Feasibility of Producing Alfalfa

I. *Cost of production.* For alfalfa production on Molokai to be feasible, the total per acre per year cost has to be sufficiently less than the gross per acre returns, to guarantee the owner or operator an equitable return on his investment. Two costs that will be particularly important in determining the feasibility of alfalfa production on Molokai will be the per unit cost of water and the per acre land rent. Another cost that may become highly significant is the cost of a hay drier, if one is needed.



November 1969 saw the first flow of water into Molokai's 1.4 billion gallon butyl-lined reservoir. One of the world's largest, it stores water for both rural and urban uses.

II. *Scale of operation.* In alfalfa production, as in almost all of modern agriculture, substantial economies can be realized by increasing the size or scale of the operation. On Molokai, the scale of operation will be limited by economic and physical factors. Two physical factors that directly limit the possible alfalfa acreage are the absolute quantity of land available and the quantity of water available for irrigation purposes. Economically, the feasible alfalfa acreage will be limited by the quantity of alfalfa demanded on Molokai, and by the relation between per acre returns, fixed costs, and variable costs.

III. *Infrastructure requirements.* The necessary market structures must either already exist or be created to handle, process, and sell the alfalfa produced. This would include such factors as storage facilities, drying and processing facilities and, most important, a market for alfalfa on Molokai. Shipping costs would force the price of Molokai-produced alfalfa out of any market not on Molokai.

Alfalfa Production on Molokai

The number of acres that can be planted to alfalfa on Molokai is directly limited by the available supply of water for irrigation. Given the temperature, wind, and humidity conditions existing on Molokai and the implied evapotranspiration rates, an acre of alfalfa would require as much as 6 acre-feet of irrigation water to achieve adequate yields. If we assume that, on Molokai, an average of 4 acre-feet of irrigation water is required to produce an adequate alfalfa crop during a normal year, and we allocate half of the water currently being delivered by the Molokai water project to alfalfa irrigation, no more than 600 acres of alfalfa could be irrigated.

If alfalfa is to be produced for sale as either greenchop or hay, an operation of 100 or more acres would be feasible if there is a market for the final product. Alfalfa production requires mechanized methods to become an economically feasible activity, and 100 acres should be the minimum size to effectively utilize the needed equipment. The per acre cost of production of alfalfa would decrease significantly as the size of the operation increased, due to the better utilization of the equipment and the ability to use efficiently more expensive equipment of greater capacity.

If hay-drying is a necessary part of production activities, the minimum feasible scale of operation increases significantly due to necessity of effec-

tively utilizing this expensive piece of equipment. The minimum acreage of alfalfa needed to support a small hay drier would probably be at least 600 acres.

The production of alfalfa pellets requires large scale and expensive pieces of equipment and is not feasible on Molokai due to the small potential production base.

The potential demand for alfalfa and the form in which it is demanded also limit the number of acres that can rationally be dedicated to alfalfa production on Molokai. The sale of Molokai-produced alfalfa to other islands is infeasible due to the high interisland shipping costs. Assuming that there is at least some potential demand for alfalfa on Molokai, it will be highly inelastic because of the limited demand and the lack of alternative uses. The price ceiling will be fixed by the cost of the nearest imported or locally produced substitute for alfalfa. The potential acreage of alfalfa will be limited by the demand for alfalfa on Molokai, as

there will be no market for any production in excess of the quantities demanded on Molokai.

At present, Molokai does not have a feedlot or dairy operations, typically the two large users of hay and forage. The cow-calf operations on Molokai (about 2000 head altogether) could represent a small potential demand for alfalfa.

Conclusions

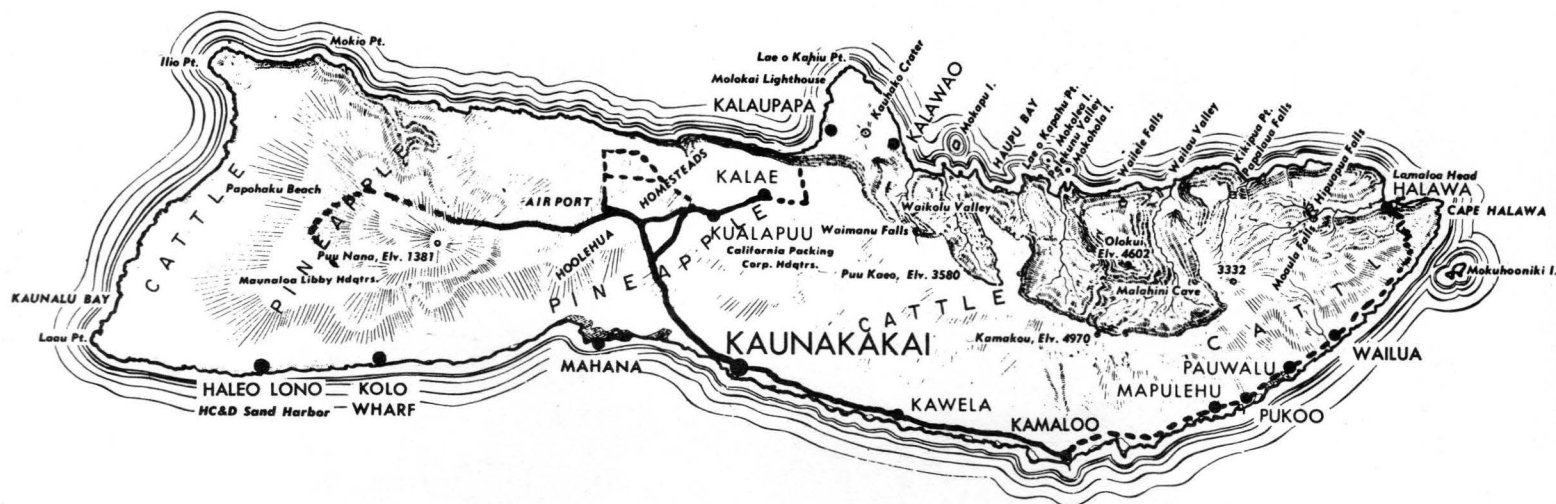
Although alfalfa is expected to produce substantial yields on Molokai, the lack of effective water supply limits the physical possibilities of growing alfalfa. The lack of demand for alfalfa on Molokai forces the author to conclude that the *production of alfalfa on Molokai would be an extremely questionable economic activity at present*. However, if the demand conditions were to change due to increased livestock production, for example, the feasibility of producing alfalfa would still be limited by the cost and supply of water for irrigation purposes.



Molokai cow-calf operations represent a potential outlet for limited alfalfa production on the Island.

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Map and photos courtesy USDA Soil Conservation Service.

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