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ECONOMIC POTENTIAL OF GEOTHERMAL ENERGY USAGE IN AGRICULTURE AND AQUACULTURE: THE CASE OF NEVADA

John F. Yanagida

Department of Agricultural Economics
University of Nevada, Reno

ABSTRACT

Nevada is endowed with geothermally heated springs which can be utilized in agricultural and aquacultural production. This paper discusses current and potential uses of this resource and descrbes ongoing research in these areas.

INTRODUCTION

Geothermal usage has immense potential in Nevada. Six years ago, the U.S. government opened Federal lands to geothermal exploration. Today, there are about 600 leases covering a million acres of Federal land in Nevada (Nevada Bureau of Mines and Geology).

The three major uses of geothermal energy in Nevada are residential and commercial heating, agriculture and aquaculture. The most widespread use of geothermal energy today is for heating homes and buildings. However, usage of geothermal energy in agricultural and aquacultural production is novel. The primary objective of this paper is to discuss the development of the latter two uses in Nevada.

AGRICULTURAL USAGE

Geothermal energy is used as an input in Nevada's agricultural production. Gasohol has been produced in Wabuska, Nevada. Geothermally heated water from the Wabuska hot springs is the heat source to turn corn mash into alcohol. The major problem with alcohol production in this State is the unavailability of an inexpensive feed stock.

The search for an economical feed stock has produced three possible alternatives:

(i) Jerusalem artichokes
(ii) potatoes
(iii) fodder beets

Studies have shown the Jerusalem artichoke to be drought resistant, requiring minimal care, providing good yields and having by-products that are suitable for livestock. Potatoes have similar characteristics and yield about the same amount of alcohol per equivalent unit of production (Garthe). Fodder beets yield about the same amount of alcohol per unit as artichokes and potatoes. However, fodder beets are more susceptible to disease.

Geothermally heated water has also been used to heat greenhouses where vegetables and ornamentals are grown. Major concerns for these operations are the costs of an auxilliary heating unit and transportation costs to major marketing outlets.

WARM WATER AQUACULTURE

Nevada with its geothermal resource has potential for expanded aquacultural activity. Here, geothermal energy is used to heat holding ponds. Freshwater prawn Macrobrachium rosenbergii, catfish and stripped bass are currently grown in ponds at the Fort Churchill power station in conjunction with the School of Veterinary Medicine at the University of Nevada, Reno.

Prawn production in these ponds are estimated at 2,000 pounds (whole prawns) per acre (Onyeagbako). This is comparable to Hawaii's prawn yields of 2,500 pounds (whole prawns) per acre (State of Hawaii, 1978). Studies by Onyeagbako and Shang imply that the rate of return to freshwater prawn farming increases as the operation's size increases assuming normal management conditions.

Market test results (Taylor; and Liao and Smith) indicate that freshwater prawns is a favorable substitute for shrimp and an acceptable entree at seafood restaurants.

Reductions in production losses due to cannibalism and the development of less expensive feed are areas requring further research in prawn production. Increasing net revenue from polyculture of freshwater prawns with catfish, bass and other fish is currently being investigated at the University of Nevada, Reno.

CONCLUSIONS

Geothermally heated water is an important input in Nevada's agricultural and aquacultural growth. Though in its early development, expanded geothermal usage seems to be potentially feasible. Multiple usage of the geothermal resource through cascading (e.g., combining both agriculture and aquaculture production from the same hot water input) can further increase this economic potential. A proposed venture is to combine greenhouse production with aquaculture. In this case, hot water is used more efficiently while increasing monetary returns attributed to geothermal energy.

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