1999 Project Abstract
for the period Ending June 30, 2002

TITLE:	Commercial Fertilizer Plant for Livestock Solids Processing Project:7(h) $400,000 FRF/ Match
PROJECT MANAGER:	Kazem Oskoui
ORGANIZATION:	AquaCare International, Inc.
ADDRESS:	P.O. Box 593 Morris, MN 56267 Phone: (763) 425-7496 Fax: (763) 425-7235
E-MAIL:	oskouike@wcec.com
WEB PAGE ADDRESS:	www.aquacareinternational.com
FUND:	Minnesota Future Resources Fund
LEGAL CITATION:	ML99, [Chap. 231], Sec.[16], Subd. 7h.
APPROPRIATION AMOUNT:	$400,000

The objective of the project is to establish a commercial grade fertilizer plant that will process and enhance 1,800 dairy cows waste through micronization technology. The project processes daily 90,000 gallons of liquid waste or 32,000,000 gallons per year. This process generates daily 40 tons of solids or 14,000 tons annually at 70% moisture. Historical disposal methods hauled waste to the fields by tankers each holding only 3,000 to 5,000 gallons resulting in18 to 30 trips per day. This disposal practice resulted in expensive capital investment, operating costs, ware and tear on the roads and field compaction resulting in eventual crop yield loss. This practice also generated extensive amounts of carbon dioxide, methane and other green house gasses (GHGs) from diesel burning and anaerobic degradation. Partial completion of the project enabled the irrigation of 90 milloion gallons of liquid waste in the past three seasons at a rate of 250,000 to 300,000 gallons per day eliminating 20,000 to 30,000 tanker trips. The application is applied during the growing season on standing crop thus reducing surface and subsurface runoff into the state's waterways saving eventual cleanup costs. GHG emission have been reduced by 12,000 tons per year. However, the micronizing of the solids to organic base fertilizer remains unfinished. The powermaster is unable to process the solids at current moisture levels (65 – 70%). The solution is to place a dryer in front of the powermaster which will reduce the moisture content from 70% to 40 to 45% level. The issue is that this dryer would cause expenditure to exceed both planned capital and operational cost. As a result, AquaCare International requested a halt to LCMR funds over a year ago. We are currently working with a small Arkansas company that is developing an infrared dryer that could possibly solve this problem.

LCMR Final Workprogram Report

Commercial Fertilizer Plant for Livestock Solid Waste Processing

ML99, [Chap. 231], Sec.[16], Subd. 7h.

Prepared By

AquaCare International, Inc.

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July 1, 2002

I. LCMR Final Workprogram Report

Total Biennial Project Budget (through October 31, 2000)

$ LCMR:	$400,000	$ Match:	$425,000
- $ LCMR Amount Spent:	$244,637	- $ Match Amount Spent:	$426,412
= $ LCMR Balance:	$155,363	= $ Match Balance:	$(1,412)

Legal Citation

ML99, [Chap. 231], Sec.[16], Subd. 7h.
(h). Commercial Fertilizer Plant for Livestock Solid Waste Processing

Appropriation Language

Carryforward Language: ML2001, 1st Special Session, Chp2, Sec. 14, Subd. 18, Paragraph (a): The availability of appropriation for the following project is extended to June 30, 2002: ML 1999, Chp 231, Sec.16, Subd. 7(h)

Kazem Oskoui
Aquacare International, Inc.

007h Commercial Fertilizer Plant for Livestock Solids Processing

(h) Commercial Fertilizer Plant for Livestock Solid Waste Processing
$400,000 is from the future resources fund to the agricultural utilization research institute for an agreement with AquaCare International, Inc. to establish a commercial grade fertilizer plant that will enhance and process animal wastewater solids through micronization technology. This appropriation must be matched by at least $425,000 of nonstate money. As a condition of receiving this appropriation, AquaCare International, Inc. must agree to pay to the state a royalty. Notwithstanding Minnesota Statutes, section 116P.10, the royalty must be two percent of gross revenues accruing to AquaCare International, Inc. from the application of micronization technology. Receipts from the royalty must be credited to the fund.

II. and III. Final Project Summary

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Project due to be completed by June 30, 2002.

IV. Outline of Project Results

A. Final Status of the Project

The project is all completed according to the original workprogram except on the issue of drying prior to micronization. All the processing terrain including, manure handling equipment, primary and secondary liquid/solid separation, mixer, micronizer and surge bin has been installed.

B. Unresolved Problems

As originally specified, the solids after separation were to go directly to the Powermaster micronizing equipment. However, the Powermaster is unable to handle the solids at current moisture levels (65-70%). In order to address this problem, production of an organic, granulated commercial grade fertilizer now requires placement of a more expensive dryer at the front of the Powermaster rather than a less expensive drier following the Powermaster as previously designed. The dryer will reduce moisture content of the separated solids from around 70% to around 40 to 45% level. This dryer would cause expenditures to exceed both planned capital and operational costs. As a result, AquaCare International requested a halt to expenditure of LCMR monies about two year ago. In addition to researching alternative processes, AquaCare personnel visited CAD Dynamics at Prairie Grove, Arkansas which has developed a conveyor based infrared dryer. CAD Dynamics personnel visited Little Pine Dairy on October 1, 2001 and assured us that their system will dry about 5 tons of moist solids per hour to a desired moisture content of 40% at a the reasonable cost of $3 to $4 per ton. CAD Dynamics tested the drier at the site in January 21, 2002 and collected necessary design parameters for inclusion into the final design. On October 5, 2002, following a telephone discussion they indicated that they will have a complete operational machine by November 1, 2002. Upon satisfactory completion of the machine additional tests will be conducted to test the suitability and operational completion of the equipment. Upon completion of the test, a unit could be purchased and installed. This unit will comply with our capital expenditure and operating cost schedule. This process, in addition to drying, will also sterilize the solids so that farmers can use dried solids for bedding. This has to be verified by further testing. This application potentially reduces cost to the dairies and could have major environmental benefits: (1) savings in cost of fresh bedding material, (2) eliminating the need for hauling waste bedding, and, eliminating the need for disposal waste solids. Upon resolution of the drier issue, the final completion of the project can be discussed.

C. Budget Updates

C.1. Lease of the building and land

November 1999 through June 2002			$88,000
LCMR Budget:	$0	Match:	$88,000
LCMR Expended:	$0	Match Expended:	$132,328
LCMR Balance:	$0	Match Balance:	($44,328)

Lease of the building and land necessary for staging, processing, and storage is $4,000 per month. Design labor expended by West Central Environmental Consultants, Inc. (WCEC) engineers is approximately $2,000 and administration and fees are $500.

C.2. Purchase, assembly, and start up of processing equipment.

November 1999 through June 2002			$445,000
LCMR Budget:	$360,000	Match:	$85,000
LCMR Expended:	$240,328	Match Expended:	$43,536
LCMR Balance:	$119,672	Match Balance:	$41,464

No additional equipment have been purchased during this period. No LCMR money has been expended during this period. Match includes labor in accounting, record keeping, procurement, and quality assurance with vendors, as well as equipment items. Through June 2002, approximately $3,000 in match labor and $1,200 in mileage has been spent. The total for this phase is $445,000.

C.3. Plant operation including collection, transport, purchase, and blending of ingredients.

November 1999 through June 2002			$252,000
LCMR Budget:	$0	Match:	$252,000
LCMR Expended:	$0	Match expended:	$241,608
LCMR Balance:	$0	Match Balance:	$10,392

This includes equipment for collecting, transporting, and staging micronizer solids, the operation of the micronizer, and the blending and transport of the ingredients necessary to obtain commercial grade fertilizer.

Equipment (including trucks and loaders) is leased at:	$9,400/month	$84,600 over 9-month.
Operation and maintenance costs (electricity, fuel, and equipment repair):	$1000/month,	$9,000 over a 9 month
Ingredients		$0
Labor, including mileage and lodging:		$0
The new total for this phase is:		$505,600.
Amount spent to date in this category:		$164,150

C.4. Market of processed fertilizer by bag or bulk to potential users.

November 1999 through June 2002			$70,000
LCMR Budget:	$40,000	Match:	$30,000
LCMR Expended:	$ 4,309	Match Expended:	$ 8,940
LCMR Balance:	$35,691	Match balance:	$21,060

No LCMR or matching funds have been expended in this category as explained in section IV(B).

V. Dissemination

Information about our product will be disseminated via our Web site, and will also be available in hard copy upon written request.

VI. Context

A. Overview

Organic matter acts as a reservoir for nutrients and moisture. During the past 100 years, the organic matter content of arable soils in Minnesota has decreased from 9.5% to 4.5%; each 1% drop in organic matter results in a 10% drop in crop yield. Farmers in the state currently import 80% of their fertilizers; the bulk of these are chemical fertilizers that do not add substantial amounts of organic content to soils. Nutrients that are applied to soils low in organic matter will quickly leach from the root zone, creating a potential for contamination of surface and groundwater sources.

Minnesota hog and dairy production has increased considerably in the last decade. Resources to support larger facilities are limited. In order to produce one 250-pound hog, a land area of 0.4 acre is necessary for food production and waste disposal. When large numbers of animals are concentrated at a site, it becomes impossible to maintain such a ratio. For example, to dispose of waste generated by 10,000 hogs, 4,000 acres of land are required, an area that is becoming less available over time. Similarly, in an 1800 head dairy operation, over 3600 acres of land is required for food production and waste application. In addition, the liquid waste must be stored until it can be spread, which can cause odor and space availability issues.

Odor reduction is one of the most important indicators of the effectiveness of a waste management system. Waste management is not generally economical for the generators and does not improve their cash flow. It is often viewed as a financial burden to the livestock operation and is done only to improve the work environment, to comply with state regulations, and to placate neighbors. In addition to odor, some

of the other challenges faced by waste generators include: short and long term waste storage space, waste handling and transportation logistics, shortage of adjacent or nearby land to spread the waste, and increased concentrations of pathogens and pollutants due to prolonged storage.

We have developed several wastewater treatment technologies that substantially reduce the odor associated with wastes. This reduction is accomplished by separating the solids from the liquids, and processing the liquid into clean, reusable water (not within the scope of this project). This technology eliminates odor from confined liquid storage, but does not address the challenges posed by the remaining separated solids. After working in the development of this project for the past three years, we are still convinced that a centralized fertilizer processing facility, would be most feasible solution for treating the solids.

The processing facility would dry the waste and blend it with amendments such as other types of manure, nutrients or plant material. The blended material then passes through a micronizer. This machine processes the augmented material into uniformly-sized (any desired size) pellets of value added fertilizer, which can be sold to potential users such as farmers, gardeners, golf courses or anyone else who has a need for a natural, rich fertilizer. Fertilizer made in this manner will add much needed organic matter to depleted soils, and will boost the capacity of the soil to retain nutrients and moisture.

B. Time

The project was initiated in November 1999 and was scheduled to in operation by the summer of 2000 (approximately one year). The first phase of this project (not in the scope of this appropriation) has been in operation since late 1999, but due to unforseen problems, the operation of the second phase has been suspended and it is subject to further evaluation of the goals of the project.

C. Budget context

AquaCare has a matching loan from AURI for $84,000 to build and install a SBEACR™ wastewater treatment system.

For 1994 through 1998:

1. Budget History

LCMR Budget History:	none	
Non-LCMR Budget History:		$84,000 from AURI
Total:	$84,000	

2. Budget Summary

Personnel:			No LCMR $
Equipment:	micronizer		$200,000
	bagging line	$ ~~80,000~~	$ 40,000
	mixer	$ 25,000	
	conveyors (stationary)	$ ~~20,000~~	$ 30,000
	dryer		$ 31,000
	monitoring and lab equip	$ 15,000	
	secondary separation, additions		$ 19,000
Acquisition:		No LCMR $	
Development:			No LCMR $
Marketing:	advertising, printing, travel telephone, staging, labor, and consulting		$ ~~60,000~~ $ 40,000
TOTAL		**$400,000**	

3. A Revised detailed budget with all specifics has been forwarded as Attachment A in previous reports.

VII. Cooperation

Cooperators on this project are: Kazem Oskoui, John Malinka, Prince Wallace, Bruce Galer, Patrick Kinney, Paul Peterson, Douglas Stahman, and others at WCEC and AquaCare. Payments to these individuals will be with matching funds not LCMR funds. It is anticipated that these individuals have spend over 5,000 hours (combined) on this project.

VIII. Location

This facility is located in Perham, Minnesota, Ottertail County.

IX. Project: Commercial Fertilizer Plant for Livestock Solid Waste Processing

AquaCare has successfully developed an organic based process that converts various organic substances such as feedlot effluent, dairy, swine, and poultry manure solids, and other process effluent into high grade commercial fertilizer. AquaCare's fertilizer plant will:

- create a profit venture that has the potential to grow into a major industry;
- benefit the environment surrounding the plant by removing large volumes of organic wastes that have the potential to pollute or negatively impact the environment; and

- stimulate the local economy, both the private and public sectors, by creating jobs and encouraging support business in the area.

We have laid the foundation for a full scale commercial fertilizer production plant. Phase I (Liquid/Solid) and some of the Phase II of the project has been completed. All necessary research and development have been also been completed. Upon solution of the drier issue, we can proceed to establish a 10,000-tons-per-year plant that can be expanded to a 40,000-tons-per-year production facility within two years. AquaCare's plant can will be able to produce fertilizer with prescribed nutrients for high value crops (horticulture and nursery applications), specialized markets (golf courses), and other recreational establishments. In addition, the plant can provide nutrient input for the rapidly growing prescription farming industry.

AquaCare installed a waste treatment system at the Little pine dairy near Perham. The installation of additional plants have temporarily been halted. The system has substantially reduced odor by eliminating long term storage of manure. The livestock waste at the farm is separated into liquid and solids streams. The liquid is treated for irrigation and some re-use (in winter for recharging in-barn collection pits). The separated solids are currently transported to a field at about 15 miles away from the farm, with highly erodible sandy soil and are land applied at convenient times. This farm due to its soil structure will benefit more from these organic matter additions than the farms with heavy soils close to the livestock production plant. Another important benefit of this project is to create mobility for the solids and provide the farmer with more flexibility in managing the livestock waste. Instead of hauling 90,000 gallons (18 to 30 tanker loads) of liquid per day, the farmer now hauls 20 tons (one Semi load) which contains the same amount of nutrients and organic matter content. This will provide the ability of transporting this material to further fields where the ingredients are most needed instead of saturating (both hydraulically and with nutrients and organic matter content) the land adjacent to the farm. Although not functioning, a mixer has been installed which will facilitate the augmentation of the separated solids with fortifying ingredients. A programmable logic controller, which is part of the mixing unit, has been installed which will ensure that the materials are mixed according to specifications. The mixture will then be micronized into an homogenized, sterilized product with a known moisture content (about 4%). The final granular product is ready for retail bagging or bulk transportation to the end user. The plant, as proposed, is capable of producing small (~5 ton) batches of highly specialized product without loss of efficiency or production capacity. Our automated system will easily modify the formulation and nutrient profile to produce client-

specific fertilizer.