# "Self Screening" Assessment:

*"The Appropriateness of a*
***Community Manure Food Waste Digestion System****"*

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# "SELF SCREENING" ASSESSMENT: THE APPROPRIATENESS OF A COMMUNITY MANURE FOOD WASTE DIGESTION SYSTEM

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August 2003

## INTRODUCTION

State of Minnesota animal production complexes have come under increased scrutiny for possible environmental impact. Concerns include the potential for or actual measured presence of odors at property lines, nutrients and pathogens in surface waters and nutrients in ground waters.

Simultaneously, food-processing industries dispose of waste streams by expensive trucking to disposal sites or through regulated land application and sewer systems. Recipients of these waste streams are required to meet local, state and federal standards. Expenses are realized for trucking and disposal.

Anaerobic digestion is recognized as a means to reduce environmental risks of organic wastes and manure: reduction of flies, offensive odors, pathogenic organisms, volatile solids, weed seeds and methane emissions. Typically high in volatile solids concentration, food wastes pose significant odor potential when land applied. Placed in a sewage treatment plant, food waste requires high energy input and results in substantial sludge production. Given a limited plant capacity, community planning departments take into consideration incoming wastewater strengths when determining the advisability of permitting housing and industrial development. Reducing industrial waste strength will leave treatment plant capacity for residential waste loads. While the environmental value of the technology is clear, cost of construction as well as break even points are far more favorable when larger quantities of waste is being treated.

Size impacts the cost of installing an anaerobic digestion system. For the equivalent of a dairy with the 1000 mature milking animals, a system will cost from about $500 to $1200 depending on the technology employed. As a result of "economies of scale", doubling the size of the herd to the equivalent of 2000 mature milking cows will cost about $300 to $800 per cow for the next 1000 animals. However, reducing the size of the digestion system to the equivalent of 500 mature milk cows will increase the overall cost of the system to about $650 to $1600 per cow equivalent. Further reductions in cow numbers will similarly increase the cost per cow. The cost phenomenon holds for digestion systems for other animal species.

For the same size facility, breakeven points vary with the values placed on the manure digester treatment facility outputs. The number of animals to “break-even” is lower when electric prices are higher. Similarly, the number of animals to “break-even” is lower when prices of natural gas, propane or fuel oil used on the farm are greater.

The technology is good for the environment. Per head cost of implementation decreases as the herd size or number of animals increases. Economics associated with environmentally beneficial manure digestion technology improves with larger animal complexes. In the State of Minnesota, larger animal production facilities may find installation of manure digestion to be an economic boon, and will install the systems for reasons other than the environmental benefits the systems clearly offer.

Smaller animal production complexes may not find installation of such systems to be economically beneficial. Failing to install the systems, the smaller complexes will not benefit environmentally.

While the animals production industry is trending towards increased animal numbers in a smaller number of facilities, about half of the animal numbers remain in smaller herds. Manure digestion technology is less financially attractive to farms with smaller animal numbers. Whereas larger facilities may be able to take advantage of manure digestion technology, smaller facilities may not.

Smaller animal enterprises unable to install individual manure digestion systems, may be able to cooperate with other smaller enterprises to build and operate ***Community Manure Food Waste Digestion Facilities.*** The concept is to aggregate manure by maintaining a route between various farms where wastes are loaded into tanker trucks for transport to a central treatment facility. Once treated the liquid is returned to the contributing farm or otherwise distributed in a controlled regulated fashion. Treatment facilities are similar in concept to those observed on larger animal production facilities, with the exception that there are load out points for tank truck pickup and discharge. The centralized facility would also be subject to economies of scale. Consequently, the size would likely be larger than most single farm digestion facilities.

A certain minimum number of animals will be required to participate for the ***Community Manure Food Waste Digestion Facility*** to be economically viable. A rule of thumb is to have manure from the equivalent of 6000 mature Holsteins in a 5 mile driving range of the centralized facility. That number may not always be achievable.

An option is to seek other organic wastes for inclusion in the centralized system, with the intent of improving economic viability of digestion systems for smaller numbers of animals. Addition of food wastes increases system economics by:

- Providing tipping fee revenues,
- Permitting the generation of more biogas,
- Generation of more electricity and/or heat.

Not all communities with small animal production facilities and organic waste sources are suitable for installing a centralized facility. Decision makers in the community will want to gather all the important information necessary to determine whether to move forward with the implementation of a community system.

The Minnesota Agricultural Utilization Research Institute contracted RCM Digesters, Inc. of Berkeley, California to prepare a generic document, which will permit preliminary assessment of the feasibility of installing ***Community Manure Food Waste Digestion Facilities*** to treat manure and other waste streams. RCM had investigated several potential centralized systems since 1990 and was chosen to design the Tillamook, Oregon centralized manure digester, slated for startup in 2003.

## PURPOSE OF THIS DOCUMENT

The purpose of this document is the preparation of a preliminary self-assessment method to determine the appropriateness of a shared Manure Food Waste Digestion System. This method will identify characteristics important to the success of such a system. The likelihood of success of the system is increased or decreased in accordance to the degree of presence or absence of these characteristics. The various aspects of the methodology and tool should be given different “weights” of importance by the community according to the conditions.

**CAVEATE**

Information herein is meant to highlight critical issues associated with installing a successful manure food waste community digestion system. It is specifically and explicitly not intended to be a tool to formulate final decisions of whether installation of a system is advisable. A final decision on system installation should only be made after consultation with professionals experienced in the specific field.

## BACKGROUND

### TRENDS IN MINNESOTA ANIMAL AGRICULTURE

The Minnesota Environmental Quality Board published in October 2002 the “Generic Environmental Impact Statement on Animal Agriculture”. Trends in Minnesota animal agriculture are discussed. In summary, the Board documented there has been an increased trend towards consolidation of animals into a smaller number of animal production facilities. The trend is to access technology and systems necessary to achieve lowered costs of production improve product quality, result in more competitive volumes and labor simplification and improved efficiencies.

#### HOG INDUSTRY

Between 1982 and 1997, the number of farms with hogs declined 64% (20,813 to 7,512). The number of hogs decreased 28%. Over the same period the number of hogs per hog farm increased 254%, to about 700. Moreover, the distribution of hogs has shifted with great reductions in animal numbers in the north and several southern counties, while greatly increasing in a few counties (e.g. Pipestone >162%, Martin >150%, Blue Earth >124%). The industry is moving rapidly away from the traditional "farrow to finish" operation to a more decentralized approach, with sow units ("farrow to wean" enterprises) supplying 15 to 45 lb. pigs to separate and often-distant "grower-finisher" complexes under contractor-contracted business arrangements.

### DAIRY INDUSTRY

The number of dairy farms declined 60% from 1982 to 1999 (24,178 to 9,604). In 1945, Minnesota had over 150,000 dairy farms. From 1982 to 1999, the percentage of farms with dairy cows declined 49%. Declines were greatest across the north, southwest and south central. The number dairy cows decreased 35% from 1982 to 1999. In 1945 there were 1,660,000 dairy cows, in 1999 the number was 540,000, a decrease of 2/3's. The number of dairy cows per dairy farm increased 62%, to an average about 100 cows per farm. The number of acres per dairy cow in 1945 wows 19; in 1998 it was 54 acres per cow. Moreover, the productivity of dairy cows increased 300% since 1945, with an increase in output per cow of 62% from 1982 to 1999.

### ENVIRONMENTAL IMPLICATIONS OF ANIMAL INDUSTRY TRENDS

The implications of animal agriculture on environmental quality are reviewed in the GEIS. "As the size of animal operations increases, the nutrient available for loss to the environment also increase, and as the density of animals in a watershed increases, there is an increasing impact on surface water quality. The critical threshold density depends upon the type of animal, the region and its characteristics, waste storage, handling and application methods". Land availability at different animal concentrations is discussed. "Except for turkeys, the land available for application of manure increases linearly with the size of the feedlots". Also, the risk of polluting surface or ground waters by liquid storage techniques decreases in the order:

Earthen holding basins>concrete block>poured concrete block>above ground tanks

"In general, injection or incorporation of manure leads to smaller risks for polluting surface water than for all other methods". "Most animal manure in Minnesota is broadcast on the land. Injection tends to be more prevalent in hog operations. It is estimated that manure is broadcast and incorporated, or injected in 35% of hog operations, 11-15% of dairy or beef operations."

"Injection and incorporation of manure tends to increase in frequency as the size of class of hog feedlot increases. Winter application of hog manure is most likely from daily haul operations, but only 6% of hog feedlots are daily haul operations. Injection and incorporation of manure tends to increase with the size of the beef and dairy feedlots".

In dairy feedlots, "daily hauling decreases in frequency as the size of the dairy feedlot increases and the use of earthen holding basins increase in frequency as the feedlot size increases". In the hog industry, most (>70%) use poured concrete or earthen storage basins…only 6% use daily hauling (no storage)". About 85% of the large complexes use concrete storage, the rate of use increasing as the size of the facility increases.

Farm related odors are not size related. The GEIS reports: “As Farm size and animal concentration increase, there is an increased potential for odor and air quality concerns to be raised by members of the local community. An increased [sic] in the size and concentration of an animal operation does not necessarily mean that an increase in odor and air quality concerns will result. More comprehensive management practices are essential to reducing odor and air quality problems regardless of facility size”.

### INTERPRETIVE SUMMARY

Though the animal production industry is trending towards increased concentration in a larger number of larger facilities, over half of the animals remain in small complexes. These smaller facilities tend towards less specialized staff and operate on a more limited per animal budget. The smaller the operation are likely to be unable to take advantage of the same or similar manure management practices available to larger animal concentrations.

## DIGESTION SYSTEM BENEFITS

Methane digesters decompose manures and other organic wastes to produce methane and biologically stable byproducts. The technology and all of the benefits of the technology are desired and promoted in US Ag, Energy and Environmental policy. Methane digesters are a new technology in the US, though widely deployed in Europe. Manure and other organic material byproducts of the food production industry are placed in an oxygen free vat where conditions are maintained conducive to the growth of naturally occurring methane producing and related organisms.

Anaerobic digestion of manures and other organic wastes in methane digesters captures biogas methane, kills pathogens, reduces odor, reduces fly production, kills weed seeds and improves manure manageability. Digester electricity and hot water production is reliable. All of the benefits of the technology are US Ag Policy. Producing domestic renewable energy is a goal of US energy policy. Reduction of odors, flies, pathogens and water pollution are US environmental policy. Capturing and combusting methane reduces the impact of a key greenhouse gas is a national and international goal.

A centralized system has multiple benefits for farm participants and the environment surrounding the farms:

- Manure that may otherwise have not been treated will have a greatly reduced potential environmental impact,
- Responsibilities falls under a single management with specialized skills,
- Manure will more likely be processed to a higher, more predictable degree,
- Treated liquid nutrient levels will be more thoroughly assessed, under the single management,
- Potential for distributing nutrients over a larger acreage in a more controlled fashion,
- Treated facility could function as a “brokerage” of treated nutrients.

Food waste source participants in a centralized system will:

- Dispose of wastes more economically,
- Be able to demonstrate participation in a “Green” waste management program,
- Likely be able to expand activities otherwise limited by the waste disposal or sewer authority,
- Not have disposal rates vary with market pricing (where applicable).

## DESCRIPTION OF A SUCCESSFUL DIGESTION SYSTEM

A successful manure-food organic waste digestion system will be capable of receiving the design quantity, quality and variation in incoming materials without operational upset. System outputs will be reliable and predictable.

Manure digestion systems are simple to build and operate. See the attached conceptual design. Digesters operating with food wastes have been in operation in the US for many years. A few blended food waste-manure digesters have been in operation since the 1980’s. The organic material (manure and/or food waste) is introduced into the digester, gas is extracted for use, digested liquid is occasionally passes through a solids separator to recover fibrous suspended solids, the treated liquid is stored for land application.

The “hardware” fundamentals of the centralized digestion system would largely be the same as that of the single farm system:

1. Tank receiving manure for treatment,
2. Tank(s) receiving organic wastes for treatment
3. Digester (plug flow or complete mix depending on waste characteristics),
4. Tank to receive treated liquid,
5. Optionally (when dairy or feedlot manure is treated) solids separation equipment,
6. Optionally (when dairy or feedlot manure is treated) a structure to store and potentially further process separated solids,
7. Optionally (when dairy and feedlot manure is treated) a tank to store separated liquid,
8. An energy conversion room with boiler and or engine-generator set,
9. Gas and water plumbing,
10. Power distribution wiring and control,
11. A centralized treatment facility may or may not maintain a larger, multi-month liquid storage tank.

## “FIRST CUT” ASSESSMENT OF FEASIBILITY

Manure food waste digestion systems are not for everyone. The sooner a project is identified as unlikely to succeed, the less scarce resources are spent needlessly. This “Self Assessment” tool is intended to permit project developers an early on glance of the likelihood of success of the ***Centralized Community Manure Food Waste Digestion System*** they are considering.

Between initial conceptualization and final commissioning, a project passes through several key phases, generalized here as:

- Project development and study,
- Organization/definition of ownership,
- Legalization,
- Finance,
- Design,
- Construction,
- Startup,
- Operation.

Issues critical to the long-term success of the endeavor will surface in one or more of these areas. Project developers would do well to seek out or remove the risk of "fatal flaws" early on. Obviously, inordinately strong indications in one or more conditions may offset others. Use of a "first cut" assessment tool will assist in determining the likelihood of a successful centralized digestion system.

Fundamentally, the likelihood of a successful ***Centralized Community Manure Food waste Digestion System*** is governed by factors in four general categories:

1. Technical considerations: e.g. wastes, trucking, mechanical issues,
2. Human considerations: e.g. goals, implementers, cooperators,
3. Administrative considerations: e.g. Paperwork *nuts and bolts* of moving the project from concept to commissioning, legal, bidding, contracts and later operation,
4. Financial considerations: e.g. funding the endeavor initially, income, and expenditure.

## KEY ISSUES AND "POTENTIAL FATAL FLAWS"

Prior to fully entering into the project development stage, those interested in the project can assess Key Issues, which will later surface. Below are many of the Key Issues and the phase of the project they will be considered significant. Key Issues with the potential for making or breaking a project are identified as "Potential Fatal Flaws".

Within each Key Issue are four points of discussion:

**Significance**: what succinctly the issue influences,
**Concept**: the reasoning associated with the issue being of significance,
**Ideal**: condition the developer would find most desirable,
**Tip**: what the developer would find quite helpful in doing.

### 1.0 PROJECT DEVELOPMENT PHASE

1.1 Driver-Project Motivation

**Significance**:
The system must have "staying power" during challenges and difficult time.

**Concept**:
The project will only make itself through organization,

> **Potential Fatal flaw:**
> ***Unless the project is motivated by a high level of participant self-interest, don't bother.***

planning, funding, construction and operation if founded on a sound principle. The reason for the system should be more than “it is a neat idea”. There is certain glamour in the centralized digestion concept, the uniqueness having an appeal. This doesn’t pay the bills.

**Ideal**:
Ideally, the centralized digestion system is motivated by self-interests: future profits and net revenues. When participants recognize that failure of the system will impact them economically, the system is most likely to be successful. This may be manifest by risk of returning to previous and more expensive alternatives, by recovery of saleable product from costly wastes, recovery and reuse of otherwise costly supplies in the production chain (e.g. sawdust for bedding), but may also come about as threats of fines, losses of sanitation certificates, legal actions, loss of market share, loss of per unit revenue due to finished product quality.

There may be real but seemingly secondary benefits. For example, strong manure odors in a picturesque tourist area may drive away visitors, reducing hotel, restaurant and entertainment revenues in the community.

**Tip**:
Determine whether the reason for moving forward is intently felt by all key participants.

1.2 Point person

**Significance**:
Someone willing to “carry the water” will make the project happen.

**Potential “Fatal Flaw”:**
***Unless there is point person, don’t bother with the project.***

**Concept**:
Most important to the potential success of a system is the identification of a clearly defined individual who is spearheading the project. This individual sees the entire project holistically, knows the steps to successful implementation, gathers the commitments and oversees execution. This person is the conduit for all information and activities. Without a key person the project is nearly assured of failure.

**Ideal**:
Ideally, this individual has a vested interest in the success of the system, and has the resources (time and financial) to perform the necessary functions. This is an administrator, fund raiser, locally respected and known individual with adequate knowledge of the system to be installed and the agricultural facilities and the participating industry, with time and resources to devote.

**Tip**:
***Unless there is point person, don’t bother with the project.***

1.3 Lead Organization

**Significance**:
A lead agency will carry the project forward.

**Concept**:
An official entity (government, quasi-government or private) is needed for the project to move forward. This local office will perform basic administrative duties, office functions, and bookkeeping, provide meeting space, and provide a central location for communications. Failure to have such a locale will result in uncertainties, confusion and failures to perform in a timely fashion.

> **Potential "Fatal Flaw":**
> ***Unless there is a lead agency with committed resources, don't bother with the project.***

**Ideal**:
Ideally, the lead organization has a vested interest in the success of the installation, is visible, respected, historically capable and with the means for success. The preference would be establishment (and requisite budgeted funding) of an entity specifically for the purpose of the digestion project. Alternatively, the entity could be a specific waste producer (e.g. a food processing plant) or an entity associated with the animal industry: the local conservation district, local utility, marketing organization, production group, buying group. A utility or other service entity would suffice. A local agricultural or industrial park where the system is to be located is possible.

**Tip**:
***Unless there is a lead agency with committable resources, don't bother with the project.***

1.4 Availability of Competent Specialized Assistance

**Significance**:
Specialized skills are required to plan and implement projects.

**Concept**:
Project implementers will possess organizational, legal, financial, technical, marketing and managerial skills necessary to plan and implement a project, but will likely not have the level of expertise needed. To supplement indigenous capabilities, individuals with necessary experience and skill areas should be identified and made members of the project development team. These individuals should be determined to be readily and regularly available as well as capable of communicating in a productive fashion. Given an integrated holistic view these individuals bring to a project, each of these key issues and potential "fatal flaws" with hold more significance and definition.

> **Potential "Fatal Flaw":**
> ***Project success is more likely when the planning group includes Individuals experienced in Community Digesters.***

**Ideal**:
Ideally, very early on in the process, identify an experienced individual with multi-disciplinary skills, someone with a holistic view of the project and components.

**Tip**:
Bring the individual on board as early in the project as feasible. Further information on

assistance may be attained through the EPA-USDA-DOE AgSTAR program by calling 1.800.AgSTAR.

1.5 Group Interest

**Significance**:
A group of committed individuals will carry the project forward.

**Concept**:
A group of individuals will perform basic administrative duties, office functions, and bookkeeping, conduct meetings, and keep crucial communications moving. The group will provide backstopping in all aspects of the project from capitalization to byproduct market development. Failure to have such a group will result in incomplete, inadequate or sluggish implementation of tasks necessary for project development.

**Ideal**:
Ideally, this consortium of individuals has vested interest in the industries to be serviced by the centralized system. Producers, processors, waste producers, lending institutions, feed and other manufacturers, equipment installers and suppliers, builders will participate and eventually form a governing board.

**Tip**:
There should be a group of beneficiaries and related support individuals/entities with sufficient interest to dialog and eventually to speak with a common and legally binding voice.

1.6 Associated Community Support

**Significance**:
A community inclined to installing a system will be supportive; alternatively, construction approval will be difficult to secure.

**Concept**:
When there is perceived to be among the community of the perspective installation, a sense of self or “vested” interest, the facility will have backing. There will be project support and encouragement. Sewer authorities will likely wish for food processing waste streams to be reduced. Planners, local elected and environmental authorities will likely want to reduce industrial discharge into sewer so as to permit addition of residences to the sewer system. Crop farmers without animals of their own will see the installation as a source of fertilizer/nutrients. Soil manufacturing firms facing shortfalls of clean, weed seed free, low odor, organic matter or peat moss, will be interested in the recovered digested fiber. The tourist industry may want to extend the appeal of their region with reductions in manure-based odors. Industry wishing to cast itself as “green” may want to have its wastes managed in a way they will feel comfortable in publicizing. Government entities will make incentives available.

**Ideal**:
Ideally, individuals in the community join in the process of developing and siting an installation.

**Tip**:
Circulate extensively, listening for opportunities particularly among pre-organized groups.

1.7 Project Organization

**Significance**:
The project must speak with a single common and directed voice.

**Concept**:
Direction is needed during all phases of the project, even if the facility is constructed by some other entity.

**Ideal**:
A board of advisors is established early and evolves at the appropriate time to a legally empowered board of directors. The board should have representation from each element of the project: raw material suppliers, milk/meat/food processors, regulators, utilities, economic development, lending institutions, public services, university, Soil Water Conservation Board.

**Tip**:
Make it an active board, which supports the actions of the project manager during concept development.

1.8 Shared Expectations

**Significance**:
A common goal with a common quantifiable result is easiest to achieve.

**Concept**:
Multiple views of what is to occur are valuable at the inception of the project to assure complete coverage. Those visions for the future should be reduced and made a common goal.

One issue to be discussed early on is the potential cost to the farmers/waste contributor.

**Ideal**:
A board of directors is identified, each member of which espouses the same vision for the installation.

**Tip**:
Canvas the stakeholders to sense the intensity of their goals for the installation.

1.9 Skill Level of Developers

**Significance**:
Project success will be influenced by the abilities of the development team.

**Concept**:
Different groups of individuals bring varying combinations of skills and skill levels to any endeavor.

**Ideal**:
The development team has a full complement of members skilled in organizing, investigating, promoting, implementing and managing a centralized manure food waste digestion project.

**Tip**:
Inventory skill levels of the stakeholders.

## 2.0 TECHNICAL/LOGISTICAL PHASE

2.1 Waste Characteristics

**Significance**:
The system runs on the methane potential in the raw material to be processed.

**Concept**:
In general, the more concentrated the waste, the more desirable for digestion. Cost of transport per unit system output is reduced the more dense the material. The more dilute the material the greater the digestion vessel must be, with the related increases in construction capital costs.

**Potential “Fatal Flaw”:**
***Unless there is a year around minimum predictable quantity of adequate quality appropriate organic wastes, don’t bother with the project.***

**Ideal**:
Target waste concentrations should be at least in the 12-13% total solids (dry matter) range for manure from ruminates and other semi digestible materials, greater than 15% total solids for foodwastes and greater than 5% for hog manure and other fairly high digestible materials.

**Tip**:
Survey the region for appropriate wastes only, avoiding those that may only participate with developer effort.

A word about layer wastes. Though highly digestible, the manure in modern egg laying operations is very dry, as much as 80% dry matter in belted turbo houses. For digestion to be effective, layer waste must be introduced into the digester in the 4% to 7% total solids range, meaning about 3 gallons of water will have to be added to each gallon of manure. Layer waste in a dry, dusty completely stackable condition is diluted to very thin oatmeal, with a three-fold increase in volume.

2.2 Waste Distribution/ Geographic Concentration

**Significance**:
The greater the waste concentration in a geographic area, the more likely the system will be economically viable.

**Concept**:
Transport of the waste to the centralized facility will impact operating costs. There is a certain quantity of revenue expected from each volume of waste to be treated/processed. There is a

certain cost of processing this same waste. And there is a certain cost of transporting the waste. This has traditionally thought of as animals in a given driving radius. With the introduction of other revenue generating (tipping fee) wastes, the importance of the distance between digester and animals changes.

> **Potential "Fatal Flaw":**
> ***Unless 50% of the manure is <3 driving miles from the sit, don't even consider the project. don't bother with the project.***

**Ideal**:
A target is a minimum of 10,000 lb. of waste total solids as close to the treatment facility as possible or at the very least evenly spread over each square mile of service area driven. This is the equivalent of about 600 Holsteins per square mile driven (6000 cows/5 mile driving radius). This number will vary with the type of waste to be digested because, for example, drier beef feedlot manure will have less energy potential (and economic value) then thick finishing house hog manure.

> **Potential "Fatal Flaw":**
> ***Unless the organic waste is within a reasonable trucking distance, don't bother with the project.***

**Tip**:
Determine all the waste to be used in the digestion system, determine the revenue potentials for the wastes, estimate the cost of manure transport (e.g. $0.005/gal to load at the source, $0.005/gal to transport and discharge within 1.5 miles, $0.005/gal for each additional 2 miles) and organic wastes (e.g. $75/hr to transport 5-6000 gallons) to determine the cost of moving a waste product; compare with the economic value derived from each gallon of material to be processed.

2.3 <u>Effluent Storage</u>

**Significance**:
Digestion does little to reduce manure volume, which must be held for land application at agronomically accepted rates and intervals.

> **Potential "Fatal Flaw":**
> ***Unless there is someplace to store an adequate quantity of digester effluent, don't bother with the project.***

**Concept**:
Following digestion, treated liquid must be stored in a vessel sized for the duration between acceptable land applications. This presents little difficulty for operations with external storage. Those facilities employing under floor pits for storage will require new tanks as the current storage method cannot be used to hold returned treated liquid.

**Ideal**:
Ideally, raw manure is collected into tanks designed to hold 2 days volume. Digested liquid is held in separate storage vessels of 3 to 9 month capacity, which are already in place and currently in use. Trucks picking up manure at participating farms, first deliver or discharge treated liquid to that farm's long-term storage.

**Tip**:
Survey potential participants to determine surplus storage to share with other participants with

little or no storage other than their manure or waste collection tanks.

2.4 Energy Use

**Significance**:
Biogas energy must have a profitable use, once produced.

> **Potential "Fatal Flaw":**
> ***If project economics depend on energy sales, unless there is an available long term reasonably priced energy outlet, don't bother with the project.***

**Concept**:
Biogas, once produced, only has an economic value if somehow used in a beneficial way. Flaring off biogas in a manure odor control digestion system may be deemed a success. If the project economics depend on revenue from offset electric or fuel purchases, then there must be an outlet for the electricity, Btu rich gas or hot water. Transporting gas or steam up to several miles is feasible but subject to equipment costs, permitting and "right-of-ways" negotiation.

**Ideal**:
Ideally, if electric prices are very high (>$0.10/kWh) then the ideal may be to use all the biogas to generate electricity, offsetting purchases. When power is less expensive, then economics may favor the outright sale of methane rich biogas to another entity. Alternatively, economics of the installation may be best served if co-generated hotwater is sold to another entity. Advisability of selling and moving energy off site is a function of the energy value and cost of transport, including losses in transport.

**Tip**:
Identify energy consumption on or near the potential digestion system sites. Perform technical/financial feasibility studies early on.

2.5 Waste Utilization Practices

**Significance**:
Nutrients from incoming organic wastes will have to be managed.

> **Potential "Fatal Flaw":**
> ***Unless there is adequate acreage to receive all the nutrients in the incoming wastes, don't bother with the project.***

**Concept**:
Digestion conserves manure nutrients and volume, there is little noteworthy reduction. Almost all digested liquid will be land applied. Adequate acreages and nutrient uptakes are required.

**Ideal**:
Ideally, participating farms have adequate acreage to use all nutrients present in the digested liquid.

**Tip**:
Determine nutrients in the incoming wastes and all nutrient needs of the participating farms.

2.6 Scalability of the Project

**Significance**:
Successful project financing will be influenced by projected cash flow.

**Concept**:
Plants constructed for future capacity will not be producing maximum revenues until the facility is at full capacity. Debt associated with capital and fixed costs of a system must be serviced out of available revenues, or further debt. This in addition to day-to-day operating expenses. A large facility that is not fully utilized does not have the means to generate the revenue necessary for support. Though this phenomenon may be financed, still the idle capacity is unproductive. This will result when incoming waste quantities and by-product markets lag behind plant capacity.

**Ideal**:
Ideally, The digestion facility can be constructed to correspond to the increase in waste quantities to be processed and the increase in market of the end products.

**Tip**:
Seek scaleable technology.

2.7 Waste Type

**Significance**:
The system runs on the methane potential in the raw material to be processed.

**Concept**:
Methane potentials vary between types of wastes. Centralized digestion facilities under consideration are presumably predominately to process manure from animal production facilities. Other wastes in the region may be digested. Any non human originating waste currently being sewer disposed is a candidate: food production or processing wastes, "past code" food products, sweepings or floor discards, "out of spec" ingredients. Some organic materials are not readily digestible, containing what is referred to as recalcitrant organics. Examples would be boiler litter, turkey litter, horse stall bedding, and redwood sawdust. The chemical bonds are difficult for microbiological action, resisting the efforts of bacteria. Moreover, some potential digester feedstock high in compounds deleterious to digester microorganisms should be avoided, e.g. eucalyptus leaves, soy sauce fermentation residue/sludge, other wastes with extremely high sodium and other cations. Avoid human wastes or human waste products. Avoid materials categorized as "hazardous materials".

**Ideal**:
Ideally, fairly fresh organic wastes should be available in a condition suitable for digestion. This may include dairy, hog, beef and clean foodwastes such as meat scraps, grease trap pumping, food trimmings, pre- and post consumer wastes, processing/cooking facility sludges and pipe cleanings. A rule of thumb is that anything that may be fed to a cow may be fed to a digester. Layer waste may be used, but is rarely in a form suitable for digestion.

**Tip**:
Circulate to find wastes. Keep in mind that different wastes will influence digester management as well as output; e.g. grease systems will have to be monitored for crust build ups.

2.8 Management Practices at the Waste Sources

**Significance**:
Digestion system technical and economic viability will be enhanced with predictable, regular collection of high quality manure.

**Concept**:
Production facilities are not all managed the same. Management style and level will impact the wastes to be digested. Tightly run farms produce regular and predictable quantities of manure, as well as milk, meat and eggs. Animals are bedded and fed regularly. Manure or food processing wastes removed or collected for treatment daily will have a greater methane production potential. Manure held in a holding vessel greater than a week will lose methane potential. Wastes diluted with rainwater, excessive cleanup water, or fresh water from uncontrolled sources will cost more to transport per unit of energy recovered per unit volume waste. Water is managed and not wasted. Operators find ways to reduce and reuse water and other resources on the farm. There may be management practices unique to the region.

**Ideal**:
Ideally, the facility operates on a set routine, with practices tightly scheduled. Water is metered for management. Wastes are predictable quality.

**Tip**:
Survey potential participants for likelihood of excursions from acceptable management practices.

2.9 Waste Collection Practices

**Significance**:
Thicker fresher manure favors the economic and technical viability of the digestion system.

**Concept**:
Manure is removed from animal housing and loafing areas regularly. Depending on the facility, manure may be removed multiple times daily or at as long as six month or year intervals. The longer the interval between cleanouts, the greater the manure biological degradation. Freshly collected manure has less loss of potentially digestible organics.

Multiple means of removal are in practice, some more conducive to manure digestion system efficiencies then others. Manure may be removed with equipment (tractors with scrapers, front end load tractors or mechanical alley scrapers), by flushing with water or recycled liquid, or by pulling plugs in waste collection areas. Manure collected mechanically will usually be thicker.

**Ideal**:
Ideally, all manure is scraped continuously into collection tanks. Hog manure is scraped daily or under floor pits emptied at less than 3 week intervals. Food wastes are collected daily.

**Tip**:
Survey potential waste contributors for collection practices for an indication of manure quality from the facilities.

2.10 Waste Quantities

**Significance**:
The system runs on the methane potential in the raw material to be processed.

**Concept**:
The economics of the system is dependent on the quantity of the raw material arriving for treatment. The equipment is sized as per the quantities. Economics determine the minimum quantity of waste to make a system viable. Sufficient waste is required for the digestion system to have the desired product outputs: biogas, methane, electricity, steam, and hotwater. Traditionally this has meant manure in a given area. Now, other types of organic matter available in the area may be used in the digester.

The minimum quantities of waste will vary with the types, distances of wastes to be processed in the digestion system and system costs. Traditionally, the minimum quantity of waste has been thought to be manure from 6000 Holsteins, 12,000 animal units of beef, 50,000 farrow to wean hogs or 60,000 grower/finisher hogs. These wastes may be combined with foodwastes. Incoming foodwaste tipping fees will impact system economics, reducing the need for animal manure.

**Ideal**:
The equivalent of manure from 6000 mature Holsteins within a pumpable distance.

**Tip**:
Carefully determine “real” or historic manure and numbers, not book or estimated numbers.

2.11Availability and Reliability

**Significance**:
The system runs on the methane potential in the raw material actually delivered to be processed.

**Concept**:
Some animal production enterprises have periods of the year when either there are no animals present or they are not confined. If the manure is not available or not collectible, then it will not be available for the digestion system. Similarly, food processors may have seasonal products and production levels, impacting the quantity of wastes to be made available to the digestion system.

**Ideal**:
All manures and organic wastes are available daily throughout the year.

**Tip**:
Determine from production facility records what the waste levels have been historically, adjusting for anticipated changes in production and practices.

2.12 Haulers

**Significance**:
Haul costs will be a prime contributor to the cost of doing business.

**Concept**:
Experienced haulers will make accurate and reasonable offers to move manure and other wastes over the road. They will have “over the road tractor trailers”, insurance, funding to gear up, experienced staff, and the assorted equipment necessary to perform on a timely and environmentally acceptable fashion. He will provide quotes and assist in project development.

**Ideal**:
Ideally, a hauler with multiple sets of equipment.

**Tip**:
Look for and involve experienced haulers early on in the project.

2.13 Transport logistics

**Significance**:
Products must arrive and depart from the site.

**Concept**:
Roads will have weight limits (perhaps seasonal) and clearance maximums. Some roads are prone to frequent closures. For the most part, roads suitable for milk tank trucks and cattle trailers will be acceptable for manure and organic waste hauling.

**Ideal**:
Ideally, there will be well-maintained roads to all contributing facilities and purchasers of products recovered from the system.

**Tip**:
Involve the Highway department very early on in the project.

2.14 Compatibility with Waste Production Sites Operations

**Significance**:
The easier manure and organic wastes move on and off sites, the more likely it will do so and with the least expense.

**Concept**:
Scheduling, frequency, road in, maneuverability, spill control, clearances, truck/tank, tire cleaning, space competition, agitation, pump, liabilities, who’s equipment

**Ideal**:
Ideally, pickup and discharge points are immediately adjacent to the roadways. Quick disconnects are in use and dimensions universal.

**Tip**:
Very early on in the project determine norms for the region and current practices.

2.15 Development Site

**Significance**:
A good site will make the project more viable.

**Concept**:
Economic viability of the digestion system also depends on capital costs and operational expenses impacted by the siting of the facility. Construction costs are obviously different from site to site and is part of the siting process. Not so apparent is the value that may be derived by siting the facility near an entity that can use the by-products of the system.

**Ideal**:
Ideally, the central digestion facility site is as close to the center of all manure as possible for transportation reasons. The quantity and source of food wastes will impact location. The site will have a minimum of construction challenges. Ideally the facility would be located adjacent to a user of heat and/or electricity. A preferred site will also be close to a food waste source.

**Tip:**
Prioritize selection criteria before searching for the site. Don’t let the site be the predominate driver of the project.

2.16 Proximity To Technical Backup

**Significance**:
To be successful, the system must operate at design levels.

**Concept**: Equipment maintenance and repair requires skilled labor. Skills levels vary with complexity of equipment. Highly specialized skills may have to be brought from some distance.

**Ideal**: System maintenance skill levels are no more demanding than those required be industry in the immediate region.

**Tip**: Keep the technology levels at a low level.

## 3.0 Legal Phase

3.1 Ownership Structure

**Significance**:
Long-term viability of the installation depends on rapid poignant AND BINDING decisions.

**Concept**:
Different ownership structures have differing management styles and performance expectations. Facilities run as a community service may operate at a different level of efficiency than a facility

with a profit incentive or lacking in long term subsidy.

**Ideal**:
Ideally, the ownership structure should not impact efficiencies or the cost of doing business, reducing economic viability. Timely installation management is critical. Waste contributors should have an opportunity to participate in ownership.

**Tip**:
Seek investors, owners, operators that facilitates project development.

3.2 Regulatory Issues

**Significance**:
A project must be allowed to be built and operate to be successful.

**Concept**:
Local, state and federal regulatory rules, laws codes and ordinances may come into play. CAFO and AFO regulations may impact nutrient management intentions. Typically, manure spreading requires little regulatory scrutiny when spread on land owned or controlled by the owner of the animals producing the manure. Manure spread on lease or rented land doesn’t typically bring about more review than written assurances of land availability and landowner permission. Manure spread on land owned by other but not under lease or rental agreements usually requires owner permission only. These nutrients may be monitored under nutrient management plans. Food wastes may be monitored in a similar fashion. Blending food wastes and manure may require definitions of responsibility. That responsibility structure may have to be developed. Food waste sources may have to demonstrate disposal outlets.

**Ideal**:
Ideally, regulatory bodies and individuals are familiar with and supportive of the food waste manure digestion facility. Only documentation required of mixed digester effluent applied at agronomically acceptable levels.

**Tip**:
Determine early on the regulatory climate for and rules (et c.) governing the project.

3.3 Bidding and Contract Process

**Significance**:
A project must be built and function to be successful.

**Concept**:
Varying levels of rules govern bidding and contracting, impacting pricing and timing. The major contributor to the difference is any requirement to pay “prevailing wage rates”. Another reason for higher cost is the bidder’s perception that government projects are more difficult to administer. Also, a publically constructed project may simply take longer to build, with the added debt service associated.

**Ideal**:
Ideally, purchasing and contracts may be conducted as though between private parties.

**Tip**:
Determine early on the rules dictating bidding and contacts.

## 4.0 FINANCE PHASE

4.1 Industry Future

**Significance**:
Economic viability and return on digestion system investment requires the system to operate a minimum number of years.

**Concept**:
Contributors of manure to the digestion system must remain in business, shipping manure, for the system to operate at design loads.

**Potential "Fatal Flaw":**
***If the slated project life is less than 10 years, don't bother with the project.***

**Ideal**:
Centralized digester participants will all stay in business at planned performance levels for a minimum of 10 years.

**Tip**:
Carefully interview those knowledgeable of the industry in the area, as well as potential participants to determine the likelihood of complying with long-term commitments.

4.2 Marketing-Proximity to Population Center

**Significance**:
The system is to be economically viable. Byproduct sales may improve overall economics.

**Concept**:
During the digestion process there may be marketable byproducts produced. Likelihood of finding a market for these by products is increased with proximity to population centers. An example would be recovered fiber in the post digestion liquid. This fiber could be used to replace some portion of the peat moss in soil blends in the nursery industry.

**Potential "Fatal Flaw":**
***If project economics depend on by-product sale and there is no potential for by-product sale, don't bother with the project.***

**Ideal**:
Ideally, the facility will be within a 1.5-hour drive of a population of 5 million people. Alternatively, the facility will be in a region with active growers of small to large wholesale plants and/or there is a soil manufacturing industry to support the nurseries.

**Tip**:
Seek a large nursery industry in less populated areas with good road access to a more distant market.

4.3 Reasonable Cost Expectations

**Significance**:
Installations will be more likely to move forward with acceptable capital, operating and maintenance cost range estimates.

**Concept**:
Project economics include capital, operating and maintenance expenditures. If these are determined early on in the project to not be reasonable, then different approaches can be taken or the project development suspended.

**Ideal**:
Expenditures are at a level similar to what has been observed at community systems or farm digestion systems.

**Tip**:
Secure cost estimates from vendors early on in the development process.

4.4 Reasonable Income Expectations

**Significance**:
Installations will be more likely to move forward with acceptable, defensible income range.

**Concept**:
Project economics include income from various sources. If these are determined early on in the project to not be reasonable, then different approaches can be taken or the project development suspended. These perceived values might not always be directly tangible or subject to accounting principles. Assessing value to perceived risk or liability of odor and other environmental risks, which will be reduced or eliminated by the digestion system, may influence economics. Waste producers are notorious for failing to assess the true value of waste management and disposal

**Potential “Fatal Flaw”:**
***If project economics depend on reasonable tipping fees and there is no potential for a reasonable tipping fee, don’t bother with the project.***

**Ideal**:
Ideally, tipping fees are at a level similar to local land filling per ton disposal rates. Utility “Net Metering” is in place.

**Tip**:
Determine landfill costs to estimate tipping fees and energy supplier rate structures to determine potential energy cost offsets. Speak openly with potential waste suppliers about costs.

4.5 Funding

**Significance**:
Without significant investments, the project will not be possible.

**Concept**:
A manure digestion system for the equivalent of 6000 mature Holsteins will cost about $2.5 to $3.0 million if constructed by producer owners and $4.5 to $6.0 million if constructed by a government body. Grants may be available for a significant portion of the investment. Industrial development bonds may be available. Tax incentives may encourage investment. Straight commercial debt may in some rare cases also be available. Acceptability and return expectations will vary with the investment merit of the installation. Funding methodologies may impact project costs with demands placed on the fund recipients, e.g. wage rates, guarantees, bonds, design standards, expectations from previous projects.

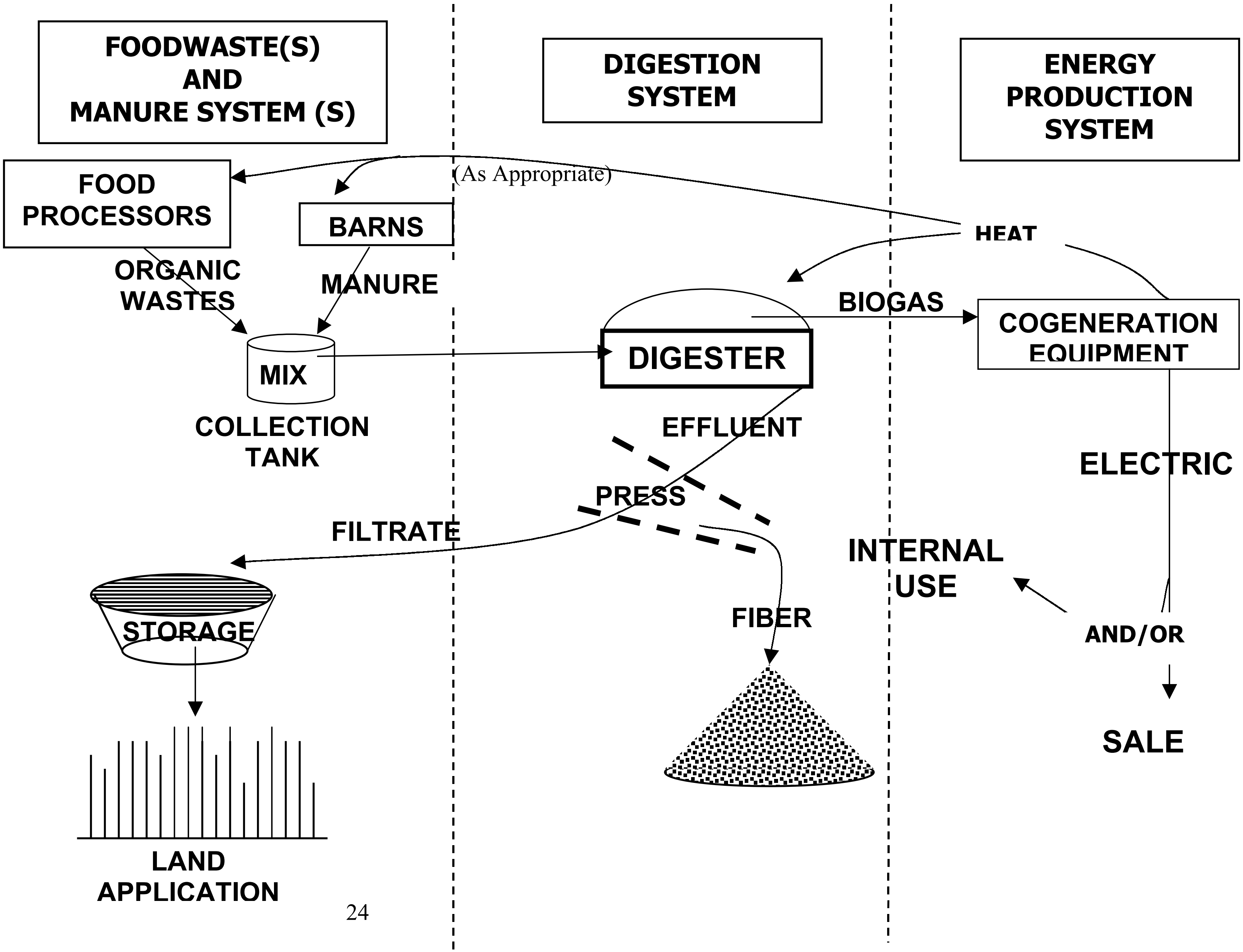
**Ideal**:
Ideally, maximize grants that don't have restrictions that impact project economics. Seek investors who through understanding the technology don't expect exorbitant perceived risk returns.

**Tip**:
Early on in the project begin identifying potential funding sources, including them in project development.

## 5.0 Analysis

An objective analysis of the potential project in light of the key issues will provide some indication of the likelihood of success. Care should be given to identify those positive and encouraging points. Challenges should be clearly and openly identified. There should be open discussion and group recommendations with a plan of action.

# CONCEPTUAL DESIGN MANURE DIGESTION SYSTEM



# SELF ASSESSMENT TOOL

# "SELF SCREENING" ASSESSMENT: THE APPROPRIATENESS OF A COMMUNITY MANURE FOOD WASTE DIGESTION SYSTEM

Centralized community manure digestion systems are frequently considered for those regions of the country where animal facilities are too small to be economically or technically feasible. Manure food waste digestion systems are not for everyone. The sooner a project is identified as unlikely to succeed, the less scarce resources are spent needlessly. This "Self Assessment" tool is intended to permit project developers an early on glance of the likelihood of success of the ***Centralized Community Manure Food Waste Digestion System*** they are considering incorporating issues frequently observed during feasibility studies.

This document is a preliminary self-assessment tool designed to assist the assessor in determining the appropriateness of a shared Manure Food Waste Digestion System. This methodology identifies characteristics important to the success of such a system. The likelihood of success of the system is increased or decreased in accordance to the degree of presence or absence of these characteristics. The various aspects of the methodology and tool should be given different "weights" of importance by the community according to the conditions.

Key Issues with the potential for making or breaking a project are identified as "Potential Fatal Flaws".

Developers of community systems are encouraged to use this tool as a mere base to adapt and build upon.

**INSTRUCTIONS**:
For each question, circle the appropriate answer for the condition observed in the community. There are two responses possible for each issue under assessment; when a "No" is circled in the *Critical Issues* column, the project may have a fatal flaw; when an entry in the *Weighted Issues* column is circled, then a weight must be determined. Some weights for an assessment issue may be added together (e.g. both dairy processing wastes and other wastes may be available for processing). Write the "weight" of each answer, in the last column: *Score*.

Tally all the Scores.

**EXAMPLE**

A "real life" example follows, employing the assessment tool to determine the appropriateness of installing a centralized system on a dairy which has been actively pursuing a food waste manure digester, Little Pine Dairy in Perham, Minnesota.

## PRELIMINARY ASSESSMENT OF THE FEASIBILITY OF A COMMUNITY DIGESTER TO PROCESS MANURE AND OTHER FOODWASTE PRODUCTS

(Circle appropriate answer, see example)

| Issue to Assess: | Critical Issues* | Weighted Issues | Weigh+ | Score |
|---|---|---|---|---|
| 1.To be built for other than the project being a “neat idea”? | No | Environmental benefits<br>Financial | 5<br>10 | |
| 2.Pointperson/Organization in charge? | No | Yes | 10 | |
| 3.Is there a “lead agency” | No | Yes | 10 | |
| 4.Foodwaste-manure mixtures permitted? | No | Yes | 10 | |
| 5. Is long-term storage available? | No | Yes | 10 | |
| 6. Is there acreage to receive effluent nutrients? | No | Yes | 10 | |
| 7.Will the industry be alive in 10 years? | No | Yes | 5 | |
| 8. Are roads open for use? | No | Yes | 5 | |
| 9. Experienced advisors involved? | No | Yes | 5 | |
| 10.If important, are tip fees possible? (Current tip fees are?) | No | High<br>Moderate<br>Low | 10<br>7<br>4 | |
| 11.Foodwaste proximity to the site | No (50% >15 miles) | <1 mile<br>1-5 miles<br>5-15 miles | 10<br>8<br>5 | |
| 12.Is the biogas usable? | No | Yes, Electric<br>Yes, Hot Water | 5<br>8 | |
| 13.Is manure close to the site? | No (50% >3 miles) | 50% is : <1 mile<br>< 2 miles<br>< 3 miles | 10<br>6<br>3 | |
| 14.Waste available year around? | No | 7 days/wk, 52 weeks/yr<br>Frequent | 10<br>5 | |
| 15.Financing/grants available? | No | Yes: 100%<br>50%<br>25% | 10<br>8<br>5 | |
| 16.Wastes available? | No | Dairy processing<br>Other food process’g | 5<br>3 | |
| 17. Waste availability | | >50,000 lb. solids/day<br><50,000 lb. solids/day | 10<br>5 | |
| 18. System Scaleable? | | Yes | 10 | |
| 19.Community support? | | Yes | 5 | |
| 20.Potential for byproduct sales? | | Yes | 5 | |
| 21.Clear facility ownership structure? | | Yes | 10 | |
| 22.Is there a committed facility operator? | | Yes | 4 | |
| 23.Legal entity identified to act? | | Yes | 5 | |
| 24.Formal public construction bid process | | Yes | -5 | |
| **TOTAL** | | | | |

* **“GO-NO GO” ISSUES**; Any “**NO**” in the critical issues column would signify the assessor should seriously reconsider going forward with the project.

+ The assessor should determine the relative “weight” to be placed on each.

## INTERPRETATION

A definitive “one time for all” scoring system is not possible. As various conditions, manures and food wastes are included in the assessment, the potential total score changes. Similarly, circumstances may dictate altering the weights. The intent of this document is to prompt the assessor to think through and place weights on the various conditions, waste type and related questions, adding issues as appropriate to the circumstance.

Note: the assumption is made that any “NO” in the Critical Issues column signifies the project is a “**NO-GO PROJECT”** and should not move forward. Presuming there are no negative Critical Issues, then scores are attached to each issue to be addressed. These values are not scientifically derived in the example, but do represent the best opinions of the author as to relative importance.

How the scores are to be interpreted is the prerogative of the reviewer. The scores should, however, be divided into four categories:

- Very low likelihood of success, “NO-GO”
- Success is questionable,
- Success is possible,
- Greatest likelihood of success.

In this example, representative weights were placed on each Issue. The greatest score is 200, the lowest 100. The scoring may be broken down into:

| | |
|---|---|
| Very low likelihood of success<br>**“NO-GO” Situation** | Presence of a “No” in any of the Critical Issues |
| Success is questionable | Score of 100-130 |
| Success is possible | Score of 131-170 |
| Greatest likelihood of success | Score of 171-200 |

# PRELIMINARY ASSESSMENT OF THE FEASIBILITY OF A COMMUNITY DIGESTER TO PROCESS MANURE AND OTHER FOODWASTE PRODUCTS

**LITTLE PINE DAIRY**



| Issue to Assess: | Critical Issues* | Weighted Issues | Weigh+ | Score |
|---|---|---|---|---|
| 1.To be built for other than the project being a "neat idea"? | No | Environmental benefits<br>Financial | 5<br>10 | 15 |
| 2.Pointperson/Organization in charge? | No | Yes | 10 | 10 |
| 3.Is there a "lead agency" | No | Yes | 10 | 10 |
| 4.Foodwaste-manure mixtures permitted? | No | Yes | 10 | 10 |
| 5. Is long-term storage available? | No | Yes | 10 | 10 |
| 6. Is there acreage to receive effluent nutrients? | No | Yes | 10 | 10 |
| 7.Will the industry be alive in 10 years? | No | Yes | 5 | 5 |
| 8. Are roads open for use? | No | Yes | 5 | 5 |
| 9. Experienced advisors involved? | No | Yes | 5 | 5 |
| 10.If important, are tip fees possible? (Current tip fees are?) | No | High<br>Moderate<br>Low | 10<br>7<br>4 | 7 |
| 11.Foodwaste proximity to the site | No<br>(50%<br>>15 miles) | <1 mile<br>1-5 miles<br>5-15 miles | 10<br>8<br>5 | 8 |
| 12.Is the biogas usable? | No | Yes, Electric<br>Yes, Hot Water | 5<br>8 | 13 |
| 13.Is manure close to the site? | No<br>(50%<br>>3 miles) | 50% is : <1 mile<br>< 2 miles<br>< 3 miles | 10<br>6<br>3 | 10 |
| 14.Waste available year around? | No | 7 days/wk, 52 weeks/yr<br>Frequent | 10<br>5 | 10 |
| 15.Financing/grants available? | No | Yes: 100%<br>50%<br>25% | 10<br>8<br>5 | 5 |
| 16. Type Wastes available? | No | Dairy processing<br>Other food process'g | 5<br>3 | 3 |
| 17. Quantity Waste availability | | >50,000 lb. solids/day<br><50,000 lb. solids/day | 10<br>5 | 5 |
| 18. System Scaleable? | | Yes | 10 | 10 |
| 19.Community support? | | Yes | 5 | 5 |
| 20.Potential for byproduct sales? | | Yes | 5 | 5 |
| 21.Clear facility ownership structure? | | Yes | 10 | 10 |
| 22.Is there a committed facility operator? | | Yes | 4 | 4 |
| 23.Legal entity identified to act? | | Yes | 5 | 5 |
| 24.Formal public construction bid process | | Yes | -5 | 0 |
| **TOTAL** | | | | 180 |

* "GO-NO GO" ISSUES; Any "**NO**" in the critical issues column would signify the assessor should seriously reconsider going forward with the project.

+ The assessor should determine the relative "weight" to be placed on each.

# Discussion of Example: Little Pine Dairy

Little Pine Dairy milks about 1400 cows. The dairy is 5 miles North of Perham, Minnesota, in the East Ottertail Watershed. The owners are careful managers as exemplified by their high milk production and good herd health. As responsible citizens and environmental stewards they constructed a large manure storage basin and have repeatedly improved manure management. The dairy has substantial electric bills and heat their barn floors. Dairy management has diligently sought funding for various demonstration projects benefiting both the dairy itself and the overall dairy industry.

In this example, there are no "Potential Fatal Flaws" or "Show Stoppers" in the critical issues columns. The dairy scores 180, suggesting a high likelihood of success should they install a community manure foodwaste digestion system. The scoring was assessed on the following basis:

| | | |
|---|---|---|
| 1.To be built for other than the project being a "neat idea"? | Offset dairy expenses and reduce environmental risks | 15 |
| 2.Pointperson/Organization in charge? | Dairy owner pushing the project | 10 |
| 3.Is there a "lead agency" | The dairy | 10 |
| 4.Foodwaste-manure mixtures permitted? | Yes, after discussion with regulators | 10 |
| 5. Is long-term storage available? | Yes, already on site | 10 |
| 6. Is there acreage to receive effluent nutrients? | Yes, including the nutrients anticipated from the food processor | 10 |
| 7.Will the industry be alive in 10 years? | Yes, dairy's corportate has young adults | 5 |
| 8. Are roads open for use? | Yes, milk truck passage daily | 5 |
| 9. Experienced advisors involved? | Yes, RCM Digesters, Inc. committed | 5 |
| 10.If important, are tip fees possible? | Food processor paying less than landfill cost | 7 |
| 11.Foodwaste proximity to the site | 5 miles | 8 |
| 12.Is the biogas usable? | Cogenerators (with maximum heat recovery for floor heat) | 13 |
| 13.Is manure close to the site? | Immediately adjacent | 10 |
| 14.Waste available year around? | Food wastes and manure year around | 10 |
| 15.Financing/grants available? | Dairy has commitments and is seeking more | 5 |
| 16.Type Wastes available? | Manure & hi carbohydrate food proc. waste | 3 |
| 17. Quantity Waste availability | <50,000 lb. solids/day manure & food waste | 5 |
| 18. System Scaleable? | To be designed for expansion | 10 |
| 19.Community support? | Town of Perham State of MN encouraging | 5 |
| 20.Potential for byproduct sales? | Fiber usable to replace current bedding | 5 |
| 21.Clear facility ownership structure? | Dairy | 10 |
| 22.Is there a committed facility operator? | Dairy | 4 |
| 23.Legal entity identified to act? | Dairy | 5 |
| 24.Formal public construction bid process | None | 0 |
| **TOTAL** | | 180 |