Great Plains Biosciences Group, LLC's - AgraPlex® IRBPs
and
The eXpert Company, Inc's - EnviroFarm Systems™

WHITEPAPER

Swine Production System Optimization Program

Great Plains Biosciences Group, LLC's - AgraPlex® IRBPs
and
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PROGRAM VALUE PROPOSITION SUMMARY

GREATER PROFITABLITY vs. CURRENT PRODUCTION PRACTICE

ETHICAL, LOW-STRESS AND HEALTHY ANIMAL PRODUCTION SYS.

NO ADVERSE ANIMAL PRODUCTION ENVIRONMENTAL ISSUES

ODOR-FREE AND PATHOGEN-FREE FARM OPERATIONS

ELIMINATE SEVERE GREENHOUSE GAS PRODUCTION

ODOR-FREE, BIOLOGICALLY SAFE LAGOON WATER IS AUTOMATICALLY RECYCLED FOR CONTINUOUS BARN MANURE CLEANING;

ODOR-FREE, BIOLOGICALLY SAFE, NUTRIENT-RICH AND CROP READY LAGOON WATER USED FOR DIRECT CROP FERTIGATION;

ODOR-FREE AEROBIC LAGOON FERTILIZER INCREASES FARM'S SOIL-HEALTH, CROP YIELD AND CROPS NUTRIENT VALUES;

INCREASED ORGANIC, NUTRIENT-DENSE FEED PROD'N AT SCALE;

LOW STRESS HEALTHY SWINE RAISED *ANTIBIOTIC FREE* FOR MARKET PREMIUM REVENUE VALUE.

ENHANCED PROGRAM PROFITABILITY

ADDITIONAL TO SUSTAINABILITY AND ENVIRONMENTAL BENEFITS, FOR USA SWINE INDUSTRY STANDARD PRODUCTION COSTS AND AN ANNUAL PRODUCTION RATE OF 5,000 *ENVIROBARN*™ INTEGRATED AGRIPLEX PROGRAM PIGS, *$150,000/Yr IN ADDITIONAL REVENUE CAN BE REALIZED*

Citations:

1. **WP- WFTooley CIG_Report_NRCS69-BA75-9-123_Mar2013-Full Report pdf**
2. **Aerobic Treatment of Livestock Wastes – EPA – 9101HQAM-1972.pdf**
3. **Report - Bio-Sediment Reduction at Harbor Bay, Lake Madison, SD for the period June 18 through October 22, 2013, The eXpert Company Inc**
4. **Progress Toward Restoring the Everglades: The Seventh Biennial Review - 2018 http://nap.edu/25198**
5. **Addressing Externalities from Swine Production to Reduce Public Health and Environmental Impacts http://www.ncbi.nim.nhi.gov/pmc/ARTICLES/PMC1448520/**
6. **Low-Power Aerators Combined with Center Pivot Manure Application at a Northeast Nebraska Hog Finishing Facility Created an Easy to Manage, Turn - Key System, Animal Manure Management March 17, 2015**
7. **Clearing the Air, Dakota Farmer Sep'17http://www.dakotafarmer.com/hog/clearing-air**

WHITEPAPER

Swine Production System Optimization Program

THIS AGRICULTURAL PRODUCTION SYSTEM INCORPORATES INTEGRATED AMMONIA ABATEMENT PROGRAM FEATURES YIELDING HOLISTIC & COST - EFFECTIVE FOOD, ENERGY AND BIOFUELS PRODUCTION ARMAMENTARIA UTILIZING RURAL RESOURCES & ON-FARM TECHNOLOGIES OPTIMIZATION

A Systems Approach for the Sustainable Production of Safe and Nutritious Food concurrently supporting Domestic Energy Security and Agricultural Self-sufficiency; Programs Achieve Robust Economic Development, Heritage Employment and Environmental Stewardship Benefits with Integrated Rural BioEconomy Cluster Parks, yielding:

HEALTHY, ROBUST, FECUND POPULATION
ON-FARM & RURAL COMMUNITY PROFITS
SAFE & NUTRITIOUS FOOD
SAFE, CLEAN WATER & AIR
CLEAN ENERGY & FUELS
GOOD EMPLOYMENT

Note: Concepts, technologies and processes described herein are the Valuable, Confidential Trade Secrets and include Valuable IP Properties owned by, or licensed to, F.D. Parker/Great Plains Biosciences Group, LLC and Wm Tooley/ The eXpert Company, Inc. which may be subject to U.S. Patent Pending, Patent(s) Applied for and/or Patentable Documentation-in-Process status and are governed under terms of appropriate Non-Disclosure Agreements

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CONFIDENTIAL AND PROPRIETARY

Order of Presentation

FORWARD

VALUE PROPOSITION - The AgraPlex® Swine Production System Optimization Program

Great Plains Biosciences Group, LLC AgraPlex ***Systems Approach*** incorporating The eXpert Company, Inc.'s *The Circular Farm's*™ odor-free barn and odor free farming system will achieve and maintain a profitable, efficient, resilient and sustainable, ethical, sanitary, greatly reduced Green House Gases and odor - free Farm.

Harvard University/NASA's *Whitepaper* ***"Hidden Cost of US Agriculture Particulate Matter from Agricultural Emissions***" concluded that US Ag produces 90% of the reported National Ammonia and 74% of Nitrous Oxide emissions, with the majority of Ammonia Derived GHG Equivalents being emitted from the Nation's 20,000 Swine and Dairy livestock operations.

Harvard's Whitepaper reports that the impact on US Healthcare Costs due to atmospheric Agricultural Ammonia is **$100,000/Ton** with Annual US Healthcare Costs resulting from Agricultural Ammonia totaling **$ 180 Billion/Year**.

Farming operations avoiding these consequences incorporate these program elements:

1. Method to automatically remove manure from the barn, 24/7;
2. Immediate entry of manure into aerobic transformation environment;
    a. Manure Transformed to non-manure ***fertilizer*** state;
    b. 99% true liquid bio-fertilizer replaces commercial Nitrogen Fertilizer;
    c. Eliminate off-gassing of Ag Ammonia/PM2.5;
    d. Enables safe water recycling for barn cleaning;
    e. Eliminate solids for ease of crop fertigation;
    f. Increase crop-available Nitrogen by 2x-3x vs current practices;
    g. Eliminate Odors and Pathogens; Reduces Endocrine Disruptive Compounds (EDCs);
    h. No odor attractants at the lagoon or in the barn; No raw manure for insect or rodent food;
    i. No manure solids (99% true liquid) where flies might lay eggs to nourish larvae;
3. All lagoon/liquid surfaces are maintained in continuous motion;
4. Employment of Cover Crops and No-Till cultivation method;
    a. No Tillage-related erosion or runoff;
5. Fertilizer applied to crops when needed;
    a. Carbon remains sequestered in soil;
    b. Healthy Soil's microbial matrix retains water;
6. Heirloom (Non-GMO) seeds only are planted/cultivated
    a. No chemical fertilizers or herbicides are applied;
    b. Enables TRUE Organic Crops Production.

PLUS - Grows Topsoil at Rate of up to 1" per Year – Increasing Farm Land Values.

PLUS - Lowest Cost production of Organic Milk, Milk Products, Pork and Poultry.

PLUS - Eliminates Flies – Mosquitoes – Insects – Fleas, in Production Area.

While this Whitepaper refers to swine production systems, these AgraPlex and EnviroBarn™ and Integrated Ammonia Abatement Program elements are applicable to Cattle, Dairy and Poultry Farming systems as well.

Swine Production System Optimization Program

CLEAN WATER - CLEAN AIR - CLEAN ENERGY - SAFE FOOD - GOOD JOBS

1.0 OVERVIEW OF GPBG's *SYSTEMS APPROACH* – the AgraPlex®

Great Plains Biosciences Group, LLC's (GPBG) AgraPlex® demonstrates our proprietary ***Systems Approach*** which produces resilient Agricultural Production Enterprises and sustainable economic benefits from the efficient production of agricultural products and clean power, energy, chemicals and liquid transportation fuels from biomass and hydrocarbon feedstocks. In appropriate agricultural production units, GPBG's AgraPlex® incorporate The eXpert Company Inc.'s EnviroBarn™ and Integrated Ammonia Abatement Program in achieving elegant resources stewardship, environmentally responsible, humane and efficient production business enterprises.

GPBG's ***Systems Approach*** achieves maximum efficiencies and minimum process and cycle wastes.

AgraPlex® synergistic business enterprises share resources and utilities for overall community vigor, prosperity, and well being. The systems approach achieves:

- Production of Value-Added Products versus Raw Material Commodities;
- Products, by-products and wastes of one activity are resources for other activities;
- Enterprises obtain added-value from low cost or otherwise discarded materials;
- Production and management of process energy utilities and marketing of surplus electrical power to the National Electrical Power Grid;
- The AgraPlex® creates direct and indirect legacy employment opportunities.

2.0 THE AgraPlex® PLATFORM

GPBG's AgraPlex® Platform utilizes a novel ***Systems Approach*** which efficiently addresses issues via a ***system*** of integrated optimized production and process loops.

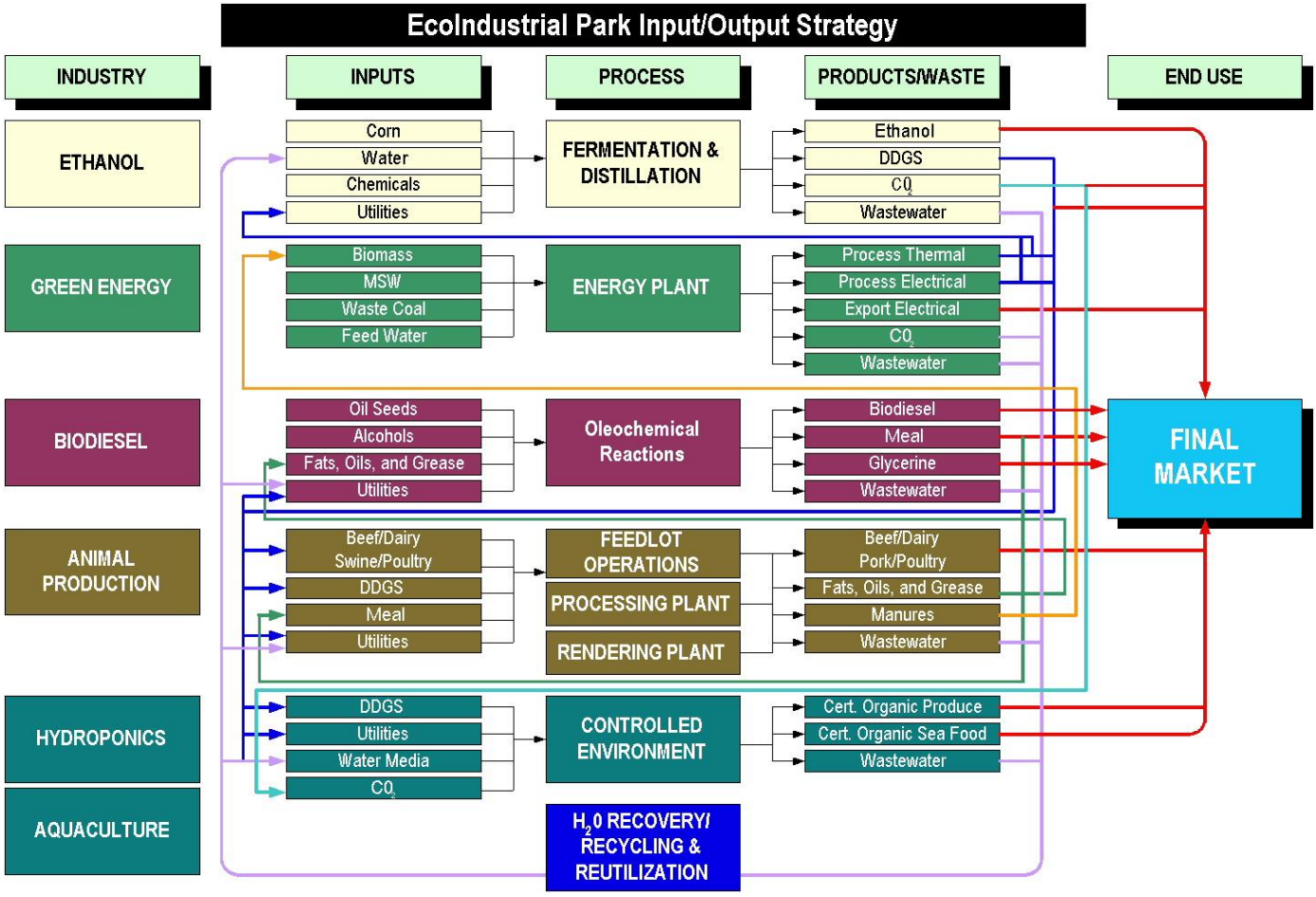
Wastes and byproducts of an upstream process become inputs to downstream processes in a series of energy and materials cascades. The ***Systems Approach*** achieves efficiencies capable of yielding food, energy and biofuel products at the lowest sustainably achievable production costs with the most environmentally responsible production consequences.

Significant additional attributes of the AgraPlex® include Ultra-Low Carbon Footprint, improved regional Air and Water Quality characteristics and improved, robust direct and indirect regional economic development programs benefit consequences resulting from these enterprise units.

The AgraPlex® models create resilient, sustainable, inter-generational and legacy employment based on system-appropriate, environmentally responsible added-value enterprise units.

Synergy: "The working together of two or more operations to produce an effect greater than the sum of their individual effect."

3.0 WATER RESOURCES STEWARDSHIP



Fresh water resources are critical to mankind's agricultural and industrial activities and our future generations' survival and wellbeing. The care, conservation and stewardship of this critically important resource are **central elements** of every GPBG project. Algae are a natural wastewater treatment media which can achieve significant phytoremediation benefits in cleaning numerous wastewaters. Microalgae can be grown in arid and semi-arid regions that have poor soil quality where woody or herbaceous crops cannot thrive. Saline water from aquifers, waste streams or the ocean can be used for growing microalgae.

Such water has few competing uses and cannot be used for agriculture, forestry or as potable water. Therefore, this technology is complimentary to ongoing efforts to grow lignocellulosic biomass in areas with good soil and water resources.

GPBG's technology platforms include aquatic phytoremediation of problem/toxic process and metabolic wastewater effluents, recovering and reutilization of clean, safe water and the catalytic production of valuable biochemicals and biofuels from synthesis gas which is produced by gasification of the photosynthetic aquatic biomass.

When integrated with animal production operations or municipal wastewater treatment systems, wastewater treatment costs are greatly reduced and valuable added value products can be created. For cattle feedlot, swine and dairy operations, **problem odors are *eliminated*** and problem effluent hormone and antibiotic Endocrine Disruptive Compounds (EDCs) components may be reduced or extinguished.

For GPBG liquid synthetic fuels and biofuels production programs, dramatically less water is consumed and toxic atmospheric and wastewater effluents are drastically reduced versus conventional petroleum refinery operational platforms.

GPBG's Biofuels Program **is designed to not compete** with food resources or fragile fresh water systems.

4.0 AGRICULTURAL SOURCES OF AIR POLLUTION AND GREEN HOUSE GASES

The Harvard University/NASA *Whitepaper* ***"Hidden Cost of US Agriculture Particulate Matter from Agricultural Emissions***" reports that US Agriculture produces 90% of the reported National Ammonia and 74% of Nitrous Oxide emissions, with the majority of Ammonia - derived Green House Gas Equivalents being emitted from the Nation's 20,000 Swine and Dairy Livestock operations.

This report concludes that the impact on US Healthcare Costs due to atmospheric Agricultural Ammonia is **$100,000/Ton** with US Healthcare Costs resulting from Agricultural Ammonia totaling **$ 180 Billion/Year**.

4.1 Agricultural Ammonia, Green House Gases and PM2.5 Air Pollution

Particulate matter two-point-five (PM2.5) is a tiny suspended particle of air pollution that can penetrate deeply into lungs, potentially entering the bloodstream. The 2.5 designation means that the particles are smaller than 2.5 micrometers (1 micrometer = One Millionth of a meter).

PM2.5 particles are formed from various sources. "Primary particles" are directly formed from a variety of sources including gasoline and diesel engines, wood smoke and soil erosion.

"Secondary" PM2.5 particles are formed through chemical reactions of atmospheric gas-phase components; secondary particles are formed when oxides of sulfur (SOx) or Nitrogen (NOx) combine with gas-phase ammonia (NH3). The most common forms of secondary PM2.5 are ammonium sulfate, (NH4) 2SO4 and ammonium nitrate (NH4 NO3).

Erroneously, the majority of this is attributed to livestock and not from ***underutilized field-applied fertilizer that did not get taken up by crops.***

The most significant PM2.5 precursors reported by the EPA through the National Emissions Inventory (NEI) are VOC, NOx, SO2, and NH3…. Vehicle and Power Plant air emissions contain Nitrogen oxides (NOx) and Sulfur Oxides (SOx) which combine with Agricultural Ammonia to create PM2.5.

Additional constituents of PM2.5 include heavy metals (such as cadmium, known to be carcinogenic) and **polycyclic aromatic hydrocarbons** (PAHs), all of which have known adverse toxic epigenetic effects.

Carbon Credit trading platforms should investigate monetizing reduction of Ammonia-PM2.5 and other particulates; these benefits result from high efficiency agricultural aerobic manure conversion systems.

4.2 Automotive Sources of Green House Gases and PM2.5 Air Pollution

For years, conventional wisdom held that pollution from diesel engines was far worse than from gasoline engines as diesel exhaust fumes are known to contain the principal GHG Carbon Dioxide, CO2, plus Nitrous Oxide emissions as well as often-visible soot particles.

However, researchers at the Materials, Science, and Technology Laboratory in Switzerland reports that particulate emissions from **modern high efficiency direct injection gasoline engines emit from ten to one hundred times more particulates than modern diesel engines**. In fact, they have higher particulate emissions than older diesel without particulate filters. The source of the problem is related to the gasoline direct injection systems technology, achieving improved vehicle CO2 and mileage benefits, **however at the penalty of PM2.5 emissions.**

Gasoline engines were also found to discharge unburned hydrocarbons in the form of **polycyclic aromatic hydrocarbons (PAHs)**, along with other liquid and solid toxins which accumulate on surfaces of the emitted particles that are so small they penetrate lung tissue and pass into the bloodstream, transporting those toxins into the body's organs, brain, placenta and the unborn fetus.

A number of German cities are moving to ban the oldest and highest-emitting diesels from entering center-city zones altogether, where it is now legal for cities to ban certain diesel vehicles from their urban cores in order to reduce vehicular emissions.

4.3 Air Pollution and Public Health

In the US, power plant air pollution contributes to four of the leading causes of death:

- cancer,
- chronic lower respiratory diseases commonly called bronchitis and emphysema,
- reversible in asthma,
- heart disease, and stroke.

The American Council for an Energy-Efficient Economy's (ACEEE) and Physicians for Social Responsibility's February 21, 2018 report ***Saving Energy, Saving Lives: The Health Impacts of Avoiding Power Plant Pollution with Energy Efficiency***, found that a 15% reduction in annual electrical power demand would save more than six lives every day, prevent nearly 30,000 asthma episodes each year and save Americans up to $20 Billion annually, sufficient to pay the annual health insurance premiums of 3.6 million US families.

How large are the health benefits of cleaner air? MIT has published **reports** that their researchers looked at three policies achieving the same GHG air pollution reductions in the US; MIT documented that **the savings on health care spending and other costs related to illness can be more than ten times its implementation cost**.

Air pollution is now humanity's greatest environmental health risk. The World Health Organization's most recent 2012 report totaled 570,000 children under the age of 5 died with more than 3.7 million premature deaths.

4.4 New Studies Link Air Pollution to Increased Global Diabetes and Dementia Cases

A study by the Washington University School of Medicine in St. Louis in collaboration with the St. Louis VA, and published in a recent edition of ***The Lancet Planetary Health***, links particulate matter air pollution with an increased risk of global diabetes, even at "safe" pollution levels.

More than 420 million people are affected by diabetes worldwide, with roughly 30 million in the US alone. **Previous research** showed how airborne particulate matter enters the bloodstream via respiration and affects function of the major organs of the body, including linkages to heart disease, stroke, cancer, and kidney diseases.

Researchers investigated airborne particulate matter's linkage to reducing insulin production and inflammation which prevents the conversion blood glucose into energy, making them more likely to suffer from diabetes.

In total, the team estimated that pollution alone contributed to 3.2 million new cases in diabetes in 2016, as well as an estimated 8.2 million years of life lost in 2016 because of pollution.

Air Pollution - Dementia Risks Linkage. **According to the St. George's University of London**, analysis showed that those living in suburbs with high air pollution levels were 40 percent more likely to develop dementia, similar to results of other international studies that found air pollution-dementia links. Similar linkages have been reported by **The Alzheimer's Society** and in the **Proceedings of the National Academy of Sciences**.

4.5 Air pollution is hurting human procreation

Air pollution significantly increases human morbidity and mortality consequences but what does air pollution do to unborn children? Or even to those parents who are trying to get pregnant?

New research shows that air pollution has a seriously detrimental effect on Human Procreation.

In a **study** titled, ***"Exposure to ambient fine particulate matter and semen quality in Taiwan,"*** researchers concluded that "Chronic, low-dose exposure [to PM] may contribute to significant spermatogenesis impairment." Researchers found that air pollution particulate matter's heavy metals (such as cadmium, a known carcinogenic) and polycyclic aromatic hydrocarbons (PAHs) have toxic effects on semen quality in animal studies.

A new **analysis** in "***Human Reproduction Update"*** reports sperm counts in Western men have **plummeted nearly 60 percent** over the last four decades, reporting that on average, Western men's sperm is falling 1.4 percent per year. The report found no similar trend among the male populations of less-developed countries, such as those in Africa and South America.

With more and more women wanting to have babies later in life when conception is considerably more difficult, there now a *"double whammy for couple fertility"* in Western societies.

In addition, once pregnancy is achieved, PM2.5 exposure threatens fetus' health. The **study** ***"Impact of London's road traffic air and noise pollution on birth weight"*** found that exposure to air pollution has detrimental effects on babies' health, contributing to lower birth weights and premature birth. Air pollution Particulate Matter from was found in placentas from London mothers, according to research **presented at the European Respiratory Society International Congress.** "Our results provide the first evidence that inhaled pollution particles can move from the lungs into the circulation and then to the placenta," Norrice Liu said.

"We do not know whether the particles we found could also move across into the fetus, but our evidence suggests that this is indeed possible," Liu said. "We also know that the particles do not need to get into the baby's body to have an adverse effect, because if they have an effect on the placenta, this will have a direct impact on the fetus." Low birth weight is a concern as it can result in slow growth, developmental delays, susceptibility to infectious disease and infant/early childhood mortalities.

4.6 Americans Aren't Having Enough Babies

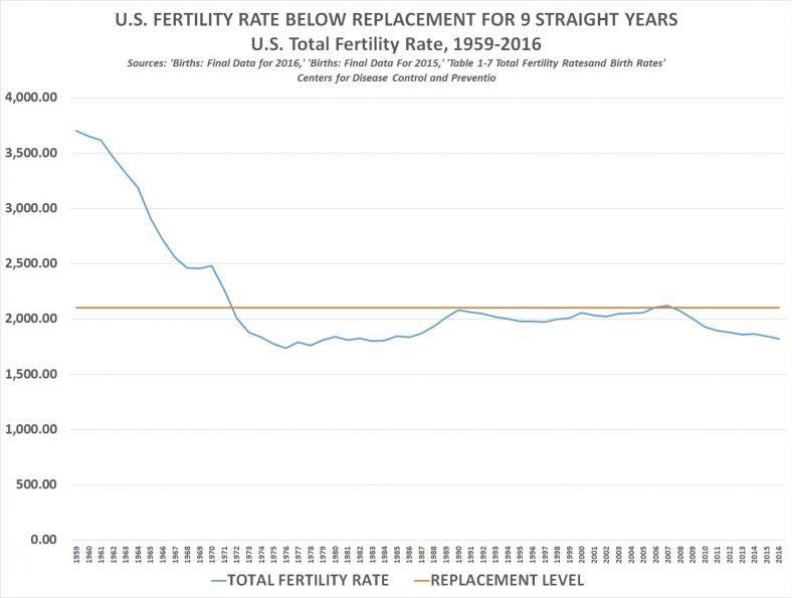
Since the 1970's the US Birth Rate has fallen below population replacement levels. Contributing factors additional to environmental pollution also included aging Baby Boomers, single-parent families, Millennial lifestyle habits delaying marriage and parenthood, greater female workplace participation, pernicious College Debt/Loans consequences and Anti-family Corporate Human Resources and Tax Policies.

Toys R Us and Mattel, Inc.'s declining business portfolios may warn of a demographic disaster. According to *The Washington Post*, the Toys R Us profit margin has historically been tied to US birth rates. With high birth rates, Toys R Us' profits were robust; however, given tsunami changes in US retail markets, led by Wal-Mart, Amazon, eBay etal and US record lows birth rates, Toys R Us has been forced into bankruptcy.

Eventually this trend translates into fewer adults, fewer workers and fewer taxpayers to sustain the US Economy.

CDC: U.S. Fertility Rate Below Replacement for 9th Straight Year

The total fertility rate of the United States fell below the replacement level for the ninth straight year in 2016, **according to the final birth data report for that year published by the Centers for Disease Control and Prevention.** According to the CDC's historical data, the U.S. **total fertility rate** (TFR) has now been below the replacement level in 43 of the last 45 years. "U.S. TFR has generally been below replacement since 1971".



Glyphosate Linked to Shortened Pregnancies in Central Indiana

Glyphosate, present in the herbicide ***Roundup***, was found in the urine of more than 90 percent of a small sample of pregnant women in Indiana, according to a new study.

Women with higher levels of the chemical herbicide in their bodies had shortened pregnancies.

This study by scientists from Indiana University and the University of California San Francisco, published **in the journal *Environmental Health*** reported that data "provides direct evidence of maternal glyphosate exposure and a significant correlation with shortened pregnancy."

High levels of glyphosate have been established to have harmful health effects in animals and humans.

The health effects of low levels of the chemical **have been a matter of scientific and popular debate. California has sought to label** the popular glyphosate-containing weed killer ***Roundup*** as a carcinogen.

Maternal mortality in the United States

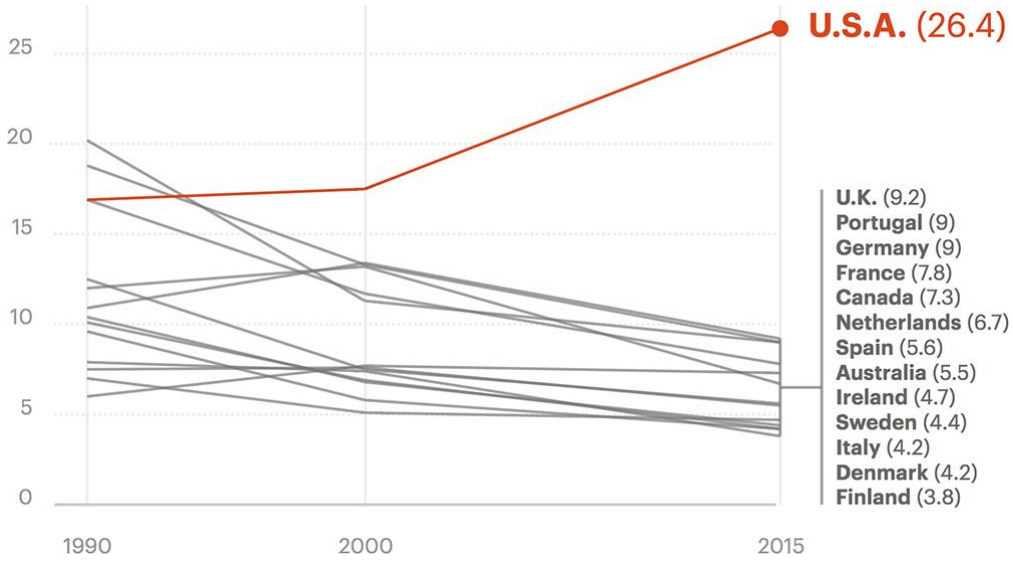
The U.S. has the "highest rate of maternal mortality in the industrialized world."

Since 2016, ProPublica and NPR investigated factors that led to the increase in maternal mortality in the United States.

They reported the "rate of life-threatening complications for new mothers in the U.S. has more than doubled in two decades due to pre-existing conditions, medical errors and unequal access to care.

Only data for 1990, 2000 and 2015 was made available in the journal.

Chart - Maternal Mortality Is Rising in the U.S. As It Declines Elsewhere



Maternal Deaths per 100,000 Live Births

"Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015," *The Lancet*.

CDC's USA Abortions Database, 1970-2014

The Centers for Disease Control and Prevention began abortion surveillance reports in 1969 to document the number and characteristics of women obtaining legal induced abortions; for the period 1970-2014, CDC reports nearly 44.5 million legal abortions.

4.7 Naled, Mosquito Vector Control Agencies' "Go-to" Aerosol Insecticide

Technically, Naled is Dibromo-2-Dichloroethylphosphate. This is a derivative of Dibromo-3-Chloropropane (also known as DBCP), which **farmers in all 50 states stopped using** by 1985.

Naled contains the organophosphate trichlorfon, a powerful neurotoxin associated with an increased risk of human cancers, autism and birth defects.

Naled is a ubiquitous component of the commercial mosquito-control insecticides and is applied as an aerosol mist by backpack, vehicular and aerial spraying or "fogging".

Naled/trichlorfon is an extremely toxic class of nerve agent known to cause respiratory problems, hypotension, incontinence, gastrointestinal disorders, blurred vision, and excessive sweating and is likely one of the contributing factors in many neuro-degenerative disorders, including Parkinson's disease.

Symptoms of exposure to Naled and all organophosphate insecticides include headaches, muscle twitching, nausea, diarrhea and difficult breathing. Naled kills insects by inhibiting acetylcholinesterase (AChE), an enzyme involved in the transmission of nerve impulses from one nerve cell to another.

This causes a "jam" in the transmission system resulting in restlessness, depression, seizures and loss of consciousness.

More severe cases can cause tremors, seizures, coma, convulsions, paralysis, a multitude of cancers of the organs, leukemia and even death.

A 2014 study conducted at the University of California showed that pregnant women living within a few miles of farms where pesticides like Naled were sprayed had a sixty percent (60%) increased risk of their child developing autism spectrum disorders or experiencing developmental delays.

Research provides strong evidence to support an environmental explanation for the large increases being observed nationally in children with attention deficit disorders (A.D.D.), learning disabilities and other behavior disorders such as hyperactivity, aggressive disorders and emotional handicaps (EH).

Florida students diagnosed with learning disabilities rose from **0.50%** in 1971 to over **6%** by 1998.

4.8 New UN report blames pesticides for food insecurity

The United Nations says it's time to overturn the myth that pesticides can feed the world and come up with better, safer ways of producing food.

Since the end of WW2, chemical companies and large-scale farmers have been telling consumers that pesticides are essential for keeping crop yields high in order to feed the world's growing population.

They are only partly correct.

These chemicals have been helpful in keeping up with unprecedented jumps in food demands, but their use has come at steep costs that now appear to outweigh the benefits.

In a **newly released report,** the UN takes a strong stance against the use of industrial agrochemicals, saying that ***they are not necessary for feeding the world.***

Pesticides contain ***Endocrine Disrupting Compounds*** that damage male sperm and cause many environmental problems as chemicals bioaccumulate in the food chain. Pesticides degrade the soil, increasing toxic components in the crops.

Water runoff from contaminated fields poisons waterways killing fish and other marine life.

Numerous **studies document** crop productivity and profitability can be maintained without the use of damaging chemicals.

4.9 Biosolids, the EPA's Dangerous Ersatz "Fertilizer"

According to the US EPA, biosolids, the physical residues that result from biological wastewater treatment systems' municipal sewage processing, can be buried in landfills, incinerated, or "recycled" as "fertilizer," meaning it is "approved" to be applied onto croplands.

While Federal bureaucrats have approved dumping of human waste biosolids as a "safe" use for crop "fertilizer," in reality, much of what's been flushed down America's toilets ends up getting dumped onto America's croplands.

Agricultural fields application of wastewater treatment plant **biosolids** spreads pharmaceutical chemicals and endocrine disruptive compounds, industrial pollutants, heavy metals and pathogenic protozoa onto crops, which in turn, are bioaccumulated into the crops and human food chain. The use of biosludge in farming has increased in recent years due to rural communities' financial pressures, increasing soil and crops contamination.

4.10 Nutritious Food is Produced from Healthy Soil

Healthy soil teems with life. Microbes recycle nutrients, breaking them into forms that plants can absorb. Microscopic fungi, bacteria and protozoa constantly consume dead plant and animal material in the soil, collectively known as soil organic matter. Microbes also extract inorganic minerals from rocks and soil, making these available to the crops. A teaspoon of healthy soil contains more microbes than there are humans on the planet and healthy soils contain 5% organic matter or more: depleted soils might have just 2% or less organic matter, rendering them much less productive.

Humans depend on only about 200 of the more than 20,000 of the world's edible plant species; and three—rice, maize and wheat—account for 60% of the calories humanity depends on from plants. The UN's Food and Agriculture Organization **estimates** that 75% of the world's food comes from only 12 plants and five animal species and that since the 1900s, we've lost about 75% of the agricultural diversity in crops.

An **article** from The Nature Conservancy magazine estimates that organic matter in cropland soil has decreased by 30 to 50% worldwide. Conventional agriculture, characterized by heavy reliance on synthetic chemical fertilizers and herbicides, degrades the soil's ability to grow crops, filter and hold water and store carbon. Chemical fertilizers give crops a few important nutrients, but not the diverse diet that microbes deliver and failure to replenish soil organic matter starves soil microbes.

Soil microbes metabolize the available micronutrients and when depleted, their populations dwindle and soil fertility declines. Additionally, fallow cycles make soil vulnerable to erosion by wind and rain.

Modern industrial agricultural practices emphasizing **monocultures** present concerns additional to soil health. Although animal and crop homogeneity enable the use of more efficient farming methods and greater production rates on large scale it comes with additional risks and at the possible expense of system collapse resulting from loss of topsoil, groundwater or the soil's ability to produce healthful, nutritious crops.

Drought, flood, disease or parasites can do more damage, more quickly, than when crops are diversified and the 1930s' "Dust Bowl" Economic Crisis resulted from massive topsoil loss in the Midwestern USA due to mechanization and bad management.

The United Nations says it is time to reverse the overuse of agricultural chemicals and develop better, safer ways of food production.

Poor soil health may be a looming crisis, but the news is not all bad. **Farmers can restore organic matter without abandoning agriculture** – in fact, it's possible to maintain and even increase crop yields while healing the soil.

4.11 The 1930's Dust Bowl was both a manmade and natural disaster.

World War One, 1914-1918, resulted in the death of millions and the destruction of farm land across Europe while American farms were able to continue in production.

The United States Food Administration mobilized her farmers and America's agricultural bounty prevented millions of deaths by delivering desperately needed food to a starving Europe.

With Ag-mechanization developed in the decade prior to World War I, American farmers were able to meet the War's production needs and then prospered in the post-war period.

Farmers over-plowed with new Ford gasoline tractors and over-grazed the Southern Plains. 1928's Great Depression was followed by years of drought that dried up the land and the Prairie winds stripped the topsoil away, now bare of the prairie grass that had anchored the Southern Plains' fertile topsoil for millennia.

"Black blizzard" dust storms were constantly events on the Plains states in the 1930s, with dust storms turning daylight to darkness; in addition, plagues of jackrabbits and grasshoppers would often destroy much of whatever meager crops survived.

5.0 ELIMINATING GAS & ODOR EMISSIONS from ANIMAL METABOLIC WASTES

5.1 Anaerobic vs Aerobic Organic Matter Decomposition

Objectionable odors from Animal Feeding Operations arise when animal metabolic wastes (organic matter) undergo biological stabilization **under anaerobic (oxygen deficient) conditions**. These conditions occur when solid manure is stored in large piles or liquid manure is stored in deep stagnant lagoons without access to oxygen. Under oxygen deficient conditions, microbial digestion of animal metabolic wastes produces as many as 25 undesirable gases and odors. Five of these gases in sufficient concentration can be toxic and have killed people and animals. One severe greenhouse gas (GHG), ***methane***, is dangerously explosive in the barn.

Conversely, when animal metabolic waste (organic matter) is biologically stabilized **under aerobic (oxygen available) conditions**, aerobic microbial decomposition ***does not*** produce any dangerous gases or bad odors; the carbon and nitrogen components are not volatilized as ***methane***, a potentially explosive and severe Greenhouse Gas (GHG).

When animal metabolic waste matter is aerobically decomposed, **Important Nutrients** are transformed in the lagoon water and retained as plant-available crop nutrients.

By the late 1950's, it was understood that odor and gas problems in manure storage lagoons could be managed and eliminated by converting the lagoon from an anaerobic state to an aerobic state using the process of oxygenation and circulation.

This process is referred to as ***liquid aerobic digestion (AD)*** and is typically appropriate for organic feedstocks with solid concentrations below 10%.

Aeration technology at that time relied on high horsepower air compressors to force large volumes of air into the lagoons, to bubble thru the lagoon water column. Due to the high surface tension of air bubbles, Oxygen Transfer efficiency is low. Compressed air produces limited oxygen transfer rates and even less effective lagoon circulation.

To treat the high Biological Oxygen Demand (BOD) wastewater, typical of livestock manure lagoons, air compressor energy requirements were very high with high associated electrical power costs.

Farmers concluded that liquid aerobic digestion treatment of livestock manure lagoons, while effective, was unaffordable due to high electrical power costs.

5.2 Soil Macronutrients, Micronutrients, Soil Bacteria and Fungi

With the development of **high efficiency, low power requirement livestock manure lagoon oxygenation and circulation technology**, manure storage can no longer be justified in lagoons that sit idle, stagnant and stinking.

The loss of nutritionally high value Nitrogen compounds from stagnant lagoon systems today cost farmers significantly more than the limited amount of electrical power required to operate State of the Art high efficiency lagoon oxygenation circulators.

Additionally, soil scientists know that significant percentages, if not most, of the plant food – critical nitrogen, carbon, trace elements, soil bacteria and fungi nutrients initially present in the excreted livestock manure can be lost if the organic matter is not oxygenated.

Currently 19 essential trace elements have been identified; the primary 11 essential trace elements vitally important for human health are iron, copper, iodine, zinc, chromium, cobalt, molybdenum, manganese, nickel, selenium and fluorine.

Dietary deficiency of these elements results in many world-wide diseases in both man and animal; amelioration of essential trace element deficiency-related diseases is an important task of modern Medicine and Agroeconomics.

Soil bacteria and fungi are important as decomposers in the soil food web. They convert hard-to-digest organic material into forms that other organisms can use.

Soil fungi are microscopic plant-like cells that grow in long threadlike structures or hyphae that make a mass called mycelium. The mycelium brings nutrients to and absorbs plant waste from the plant roots it has colonized which help build surface organic matter or topsoil.

This is part of the Photosynthesis process by which plants, after removing CO2 from the atmosphere, deliver carbon for storage in the soil - reducing atmospheric carbon believed to contribute to climate change.

Fungal hyphae physically bind soil particles together, creating stable aggregates that help increase water infiltration and soil water holding capacity.

Without bacteria and fungi components, "soil" is just plain "dirt" lacking the ability to support plant life. Healthy and robust populations of bacteria and fungi in the soil support nutrient-dense, healthful crop production at increased yield rates.

5.3 Reduced Energy, Increased Crop Yields and Retained Nutrient-Density

Efforts to retain the value of organic matter for plant food have led to the emergence of solid composting techniques for dry manure.

Manure lagoon oxygenation circulators provide the benefits of composting for liquid manures stored in lagoons, and do so at significantly greater efficiencies, much lower cost and less effort than solid composting requires.

Well-designed aerobic manure lagoon systems virtually eliminate solid manure, transforming organic wastes into odorless, safe and pathogen-free, non-volatilizing, crop ready, 99% true liquid fertilizer with 2x-3x's the available Nitrogen compared to untreated manure.

The farmer/operators, landowners, investors, community and consumers all benefit from the installation of manure lagoon circulator systems to oxygenate lagoon animal waste nutrients, achieving positive returns over power consumption cost in terms of the nitrogen availability alone.

Considering the additional direct economic benefits from reduced electrical power, reduced manure handling and increased crop response, farmers lose money by not utilizing high efficiency wastewater lagoon circulator systems to oxygenate and beneficially convert lagoon nutrients to crop-ready compounds.

This strategy eliminates currently non-monetized externalities and their associated liabilities, including:

- quality of life costs from odor, public health costs from ammonia off-gassing,
- food safety concerns from pathogens,
- food security issues from non-resilient topsoil,
- ecological impacts from fertilizer losses,
- farm sustainability concerns from loss of healthy topsoil, water quality issues, and
- resources protection and conservation are achieved in addition to the increased farm profits and other direct economic benefits.

5.4 The US Swine Growers' Current Odor vs Profits Dilemma

The contemporary domestic swine industry by and large uses the highest cost methods available for livestock manure storage, transport and spreading, that is, using grow barn pit storage followed by tanker or umbilical cord transport and injecting or knifing of raw manure into the ground during the spring or fall.

Unfortunately, these methods produce the lowest nutrient value and crop response.

Contemporary North America swine production facilities in vogue since the 1970's employ basement pits, located beneath a slatted growing floor, to collect and store animal urine and manure.

Although more expensive to construct, this type of barn became popular because it made the growing floor easier to keep clean.

In pit barns, manure and urine simply drop between the slats into the basement manure collection and storage pit where it sits and produces ever-increasing amounts of odor.

In addition, popular belief among farmers, county commissioners and livestock permitting authorities at that time, and continuing to the present day, held that "out of sight, out of mind" was the only available solution for swine manure odors.

The basement manure pit receives and stores animal urine and dung. Among the undesirable outcomes, this facility has pigs living above their accumulated wastes, continuously exposed to unhealthful levels of volatilized gases produced by the anaerobic decomposition of metabolic wastes stored immediately beneath them.

University studies have documented that pigs in pit barns grow more slowly, taking more days to market and requiring **12%-15% more feed** to finish.

Nevertheless, farmers enjoyed the reduced labor requirement to keep barn floors clean and the fact that the manure was out of sight (out of mind?) for neighbors.

Continuing long-term studies of pig health in pit barns need to investigate the effects and potential contribution to the widespread increase in newly emergent swine diseases today as the consequence of pigs living in the high stress environments of manure gas and odor in the pit barn growing atmospheres.

Objectionable livestock odors and gases from untreated manure are not limited to the immediate barn area and are often a nuisance problem for long distances away from the farm.

Recently conducted rural studies assign a 30% loss of neighboring property values for upwards of five (5) miles from pig production barns.

This reflects a significant loss of community personal property value and property tax revenue.

5.5 Manure is NOT Fertilizer

Nitrogen is a significant component in crop nutrition and the ability to retain the most manure nitrogen for crop production is very important for farmers. However, most of the Nitrogen in raw manure is not in a crop-ready form available for plant uptake until it is transformed by aerobic microbial action. This occurs in the soil or in an aerobic lagoon.

When raw manure is injected into the topsoil, usually in spring or fall when no plants are present, the manure is still demanding oxygen in its original anaerobic form. This has the immediate effect of inactivating beneficial aerobic bacteria in the topsoil which may take up to a year or more to recover.

In the soil, Manure-N is converted to the Nitrate form which unfortunately is easily volatilized, leaches out or runs off with spring rains, before crops are able to find and metabolize it.

The first nitrogen component to appear in decomposing and stabilizing animal metabolic waste is ammonium (NH_4^+), a crop ready, plant food that emits no odor.

However, at higher lagoon wastewater pH ranges in untreated lagoons, liquid ammonium (NH4+) can convert to ammonia (NH3), a gas with a distinctive, pungent odor that can be toxic for both animals and plants.

Ammonia and ammonium readily convert back and forth, based on wastewater pH. The Power of Hydrogen (pH) is an index of the relative acidic (H^+) or alkaline (OH^-) state of a material, in this discussion, lagoon water.

pH has a fixed range between Zero and Fourteen (0<pH<14) with Seven (7.0) being neutral acidity/alkalinity.

Values below 7.0 are Acidic solutions; values above 7.0 are Bases; the Scale is Log10.

A solution pH value of 5.0 is 10x the Acid strength of a pH 6.0 solution; a solution pH value of 4.0 is 100x more Acidic than a solution pH value of 6.0.

- **At pH ranges of 7.8 and above, Ammonia (NH3) gas volatilizes out of the wastewater.**
- **At pH ranges of 7.6 and below, Ammonium (NH4+) liquid does not volatilize and has no odor.**

Under **aerobic (Aerobic Digestion - AD)** conditions, pH remains low, ammonia does not form and nitrogen is not lost as ammonia gas NH3 volatilization out of the lagoon wastewater.

In the same manner, manure's carbon does not volatilize as severe GHG Methane, CH4.

Aerobically digested livestock manures provide the complete range of crop nutrients, nitrogen, phosphorus, potassium, carbon, micronutrients, soil bacteria and fungi, available in the soil.

The resulting aerobically decomposed manure is converted to **plant-ready** ammonium (NH4+) fertilizer that lacks undesirable odor and avoids problem GHG gas.

In this model there is sufficient nutritional high-quality plant-ready fertilizer produced aerobically from livestock manure to provide the soil's nutritional demand to help the farmer to become fertilizer self-sufficient, which also allows him to grow nutrient-dense crops and to avoid having to purchase synthetic chemical fertilizer for his crops.

5.6 Undesirable Transformations and Loss of Lagoon Water Nutritional Value

Aerobic (AD) process transformation of metabolic wastes for maximized agricultural soil fertilization purposes is fundamentally different from that of municipal wastewater treatment systems which are designed to meet Federal NPDES Discharge Criteria.

Municipal wastewater treatment systems discharging treated wastewater into the waters of the Unites States are required to minimize effluent water nutrient values; farmers need and desire the highest nutrient value wastewater with which to fertilize their fields for maximum crop production and crop nutrient value.

NPDES municipal wastewater treatment plants are required to release Nitrogen from their wastewater before it can be discharged into the surrounding waters.

This accomplished the costly process sequence of nitrification and denitrification.

5.7 Nitrification is the sequential conversion of ammonium (NH4+) to nitrite and then to nitrate:

Ammonium → Nitrite → Nitrate
$NH4^+ + 2O2 \rightarrow NO3^- + 2H^+ + H2O$

Nitrification is a bio-chemical reaction that occurs inside bacteria; two species of bacteria are involved in the process:

- **Nitrosomonas and**
- **Nitrobacters.**

These bacteria, collectively known as nitrifiers, are autotrophic, i.e. they get their carbon energy source from inorganic carbon (carbonates, bicarbonates) or carbon dioxide.

Nitrifiers are obligate aerobes, i.e. they require free molecular oxygen and die off under anaerobic conditions; a healthy and stable population of nitrifiers will not exist without the following conditions:

- Significant nitrification occurs at a Dissolved Oxygen level of 2.0 to 2.9 mg/l.
- Maximum nitrification occurs at a Dissolved Oxygen level of 3.0 mg/l.
- Nitrification ceases at Dissolved Oxygen levels below 0.5 mg/l. Nitrification is temperature sensitive. The optimum temperature for nitrification is generally considered to be 30°C.
- Approximately 4.6 kg of oxygen are required for every kg of ammonium ions oxidized to nitrate; similarly, 1 kg of oxygen is required to oxidize 1 kg of carbonaceous B.O.D.
- An absence of oxygen for less than 4 hours does not adversely affect nitrifiers when oxygen is restored.
- To ensure effective nitrification we maintain a Dissolved Oxygen level of ≥1.5 mg/l by the program; the actual desired range is measured in ORP of ±150;
- We target oxygenation reactions and rates sufficient to retain ammonium and avoid nitrification to nitrate, optimizing nitrate production.

5.8 Avoiding Nitrification and Retaining Ammonium (NH_4^+)

Dissolved Oxygen levels in lagoons need to be controlled and held below the Nitrification level (<.5mg/L).

Dissolved Oxygen levels are best measured as ORP ±150 to balance oxygen supply with oxygen demand, controlling lagoon wastewater Dissolved Oxygen in order to prevent Nitrification conversion of the Ammonium - not difficult or energy intense.

In a further reaction occurring only with excess Dissolved Oxygen in the manure lagoon organic matter AD decomposition process, Nitrification of Ammonium will result.

- It is mandatory to control the Dissolved Oxygen levels in the manure lagoon wastewater to support ammonification of organic waste to ammonium, but to avoid reactions proceeding further from Ammonium to Nitrification.
- The Nitrification process uses 4x-6x the amount of Dissolved Oxygen for ammonium formation alone to create Nitrates which are more difficult to retain in the soil.

6.0 THE eXPERT COMPANY INC.'S RIBC™ FLOATING OXYGENATION CIRCULATOR

6.1 The eXpert Company, Inc.'s RIBC 9000 Series Circul–O^2–Rater ™ (US Patent 8191868B2)

The **Rotating Inverse Biological Contactor (RIBC™)** technology combines continuous surface renewal and re-oxygenation with gentle, Toroidal Liquid Circulation™ (TLC™) to maintain a ***fully aerobic water column*** and avoid dead spots where muck/sludge can accumulate to ***anaerobically*** release offensive gases and odors.

The Floating Oxygenation Circulator *Circul–O^2–Rater ™ Toroidal Liquid Circulation™* (*TLC™*) to deliver benefits from

- Wastewater Oxygenation,
- Wastewater Lagoon Circulation and
- Wastewater UV Exposure.
- With a good installation, each unit circulates 9+ million gallons of water and supplies 20lbs of Dissolved Oxygen (DO) per hour, plus an estimated 5lbs of microbial oxygen from direct atmospheric contact.
- One Circul–O2–Rater supports reduction of approximately 20lbs of BOD per Hour.
- UV exposure from sunlight assists pathogen inactivation and large molecule degradation;
- Research and Field Experience both validate that Full-Spectrum Solar Radiation dramatically diminishes Endocrine Disruptive Compounds (EDCs) from antibiotics and other armamentaria and destroys adverse virus and bacterial contamination present in the animal metabolic waste streams.

6.2 Functional Characteristics of the RIBC 9000 - Circul–O^2–Rater ™

- A toroidal vortex gently sweeps across the lagoon bottom collecting available nutrients.
- Enzymatic nutrients travel up the vortex, mixing with aerobic microbes.
- At the water surface, nutrients, microbes and water are infused with oxygen.
- Lagoon entrained biomass travels outward in direct contact with the atmosphere and into quiescent waters where microbial digestion readily occurs.
- At the surface, pathogens are deactivated and large molecules degraded by repeated exposure to UV radiation from sunlight.
- Down-flows move colonizing algae off the surface to prevent algal bloom.
- Cross-flows carry dissolved oxygen and aerobic microbes back across the bottom of the pond to digest sludge and avoid costly mechanical removal.
- Toroidal Liquid Circulation™ (TLC™) combines microbes into bio-flocs and bio-films where complex microbial transformations and further large molecule degradation occur.

6.3 Principal Advantages of the RIBC 9000 - Circul–O^2–Rater ™

- **Rotating Inverse Biological Contactor (RIBC™)** is labeled "inverse" as the liquid rotates and tumbles its microbial contents **into direct biological contact with atmospheric Oxygen & sunlight UV**; conversely, ordinary Rotating Biological Contactors (RBC's) utilize solid disks to establish atmospheric O2 contact. **RIBC™** Oxygen transfer rates are dramatically greater than RBCs.
- The RIBC™ contact surface is calculated as the "area of influence" x "frequency of surface renewal."
- RIBC™ delivers more BOD reduction than available from disk-based RBC devices without bearing failures and maintenance required when using large rotating machines.

6.4 Additional Benefits of the RIBC 9000 - Circul–O^2–Rater ™

- More Manure-N recovery in crop available ammonium form
- Energy Savings: up to 90% versus blower/aspirator/venturi systems
- Pathogen reduction, Endocrine Disruptive Compounds (EDCs) and large molecule degradation yield odor-free "safe water" available for beneficial reuse

6.5 Circul–O^2–Rater^{tm} Model: *RIBC 9000 Series*

Horsepower: **Fractional, less than 1 HP/ RIBC unit**
Circulation/Pumping Rate: **6,266 Gallons per Minute Delivered to Water Body Surface**
Circulation: **Toroidal Vortex, Minimum = 9 CuM/Sec**
= 318 CuFt/Sec = 8.5 Million Gal/Hour

6.6 Oxygen Transfer, Mixing and Dispersion:

For BOD reduction @ 77^{0}F water temp at sea level:

Standard Oxygen Transfer Rate = 25 lbs/Hr of Dissolved + Microbial Oxygen
Nominal BOD Reduction = 15 lbs from DO + 5lbs from Microbial/Hr x 24Hr
= 480 lbs BOD Reduction/RBIC Unit/24 Hr

Table - Oxygen Transfer, Mixing and Dispersion

Oxygen Dispersion:	**600'R in lake water**	**100'R in waste water**
Mixing Zone :	**600'R in lake water**	**100'R in waste water**
Effective Depth	**Min 6'**	**Max 33'+**

7.0 SUPERVISORY, CONTROL AND DATA ACQUISITION (SCADA) SYSTEM

The Farm (swine, dairy, beef cattle or poultry) must be continuously monitored for real-time air and water quality parametrics utilizing an integrated SCADA system in conjunction with independent laboratory testing.

Farm environmental values are integrated in real-time onto Predictive, Advisory and Out-of-Range Alarm conditions automatically reported by the SCADA system to the enterprise's Farm-Operator, to *GPBG* and to *The Circular Farm*™ management and technical monitoring staffs for appropriate corrective response.

7.1 Predictive Status Reports indicate that an Out-of-Range data-point event had occurred, was detected and flagged in the database, and this Out-of-Range event has the potential to develop into a future condition requiring an appropriate corrective action by the Responsible Party for that level of corrective action.

A Physical Action is not required at this Condition Level.

7.2 Advisory Status Reports indicate that one or more Out-of-Range data-point excursions have occurred, or that data analysis trends indicating a possible Alarm Condition was detected and flagged in the database, indicating these Out-of-Range events or trends may developing into a future condition requiring an appropriate corrective action by the Responsible Party for that level of corrective action.

A Physical Action may or may not be required at this Condition Level.

7.3 System Alarms indicate that one or more Out-of-Range data-point excursions have occurred, or a data analysis trend indicating an Alarm Condition was detected and flagged in the database. A Physical Action is required at this Condition Level.

The system surveys and reports numerous water and air quality parameters:

- Barn air-quality including Temperature, Humidity, Oxygen and Carbon Dioxide levels and Ammonia.
- Lagoon water quality including Depth, Temperature, pH, Total Dissolved Solids, ORP, Turbidity and other appropriate water quality nnjvalues are monitored.
- Lagoon circulator(s) including voltage, amperage, current, motor winding temperature, ground fault/loss of ground and duty cycle.
- Atmospheric air quality conditions for fugitive odor and ammonia emissions, wind direction, temperature, humidity, rain/snow fall and solar radiation.

Maintaining proper aerobic lagoon water-quality conditions assures odor-free barn, lagoon and fields conditions.

7.4 Management Reports. The SCADA continuously surveys, logs, reports all relevant air and water quality parameters and notifies the appropriate stakeholders of any potentially developing adverse conditions, providing appropriate proactive corrective measures to the designated responder to appropriately act to prevent potential manure lagoon system upset conditions and potential odor releases, and produces management reports.

8.0 SWINE PRODUCTION OPTIMIZATION PROGRAM

GPBG and our collaborating Teams can provide Best Practices Full Service Design, Turn-Key Construction and Operations Management programs for Swine Farms; alternately, we provide Consultancy Programs (Item 9).

GPBG's ***Systems Approach*** program incorporates ***The eXpert Company Inc.'s EnviroBarn™*** and ***Integrated Ammonia Abatement Program*** which achieve significant environmental, sustainability and improved profitability benefits.

8.1 Program Goals and Results

The eXpert Company Inc.'s EnviroBarn™ and ***Integrated Ammonia Abatement Program*** **i**ntegrated with **GPBG's *Systems Approach*** support programs that focus on the goals of each participating Producer.

8.2 ***The eXpert Company Inc.and*** **GPBG** support improved profit opportunities resulting from:

- improved production efficiency and yields,
- reduced production costs,
- increase farm resilience and sustainability,
- eliminates barn and lagoon odor and
- minimized Green House Gases production.

The ***EnviroBarn™*** and ***Systems Approach*** programs resolve issues that plague the pork industry everywhere.

Producers experience lost profits primarily from:

- disease and down animals,
- heat stress,
- increased feed costs,
- barn and lagoon odor and Green House Gases, and
- environmental risks that additionally include lost nutrient value from traditional manure handling.

After feed costs, manure management is the single largest unsolved problem in the pork industry.

The ***EnviroBarn™*** and ***Integrated Ammonia Abatement Program*** achieves complete control of manure management issues and eliminates problem environmental risks issues under **GPBG's *Systems Approach***.

This integrated program eliminates barn and lagoon manure odors, pathogens and severe greenhouse gases with their associated PM2.5 particulate emissions health risks, and, concurrently, reduces production costs, improves farm sustainability and significantly improves profitability.

Gases and odors are signs of poor farm design and management.

What we propose is at all times under the control of each individual operator. Choices are not forced on producers and technical and agricultural improvements proceed at the owners' pace and discretion.

We identify production optimization pathways, explain which may be most appropriate for each situation and provide the resources to pursue the strategies selected by each Producer.

8.3 Summary of Program Features and Benefits

1. Operation is odor and pathogen-free – with no environmental issues;
2. Safe, odor-free nutrients will be suitable for direct fertigation onto growing crops;
3. Odor-free, safe water is recycled to continuously clean the barns – automatically;

   - Clean, odor-free barns allow pigs to grow @ 10% faster using 12.5%-15% less feed;
4. Liquid feeding program increases efficiency and reduces feed cost by a further 7%-10%;
5. "Odor free" Aerobic fertilizer's increased nutrient value yields an additional $10 per pig.
6. In this environment, pigs are healthy and can be raised "antibiotic free" for premium market pricing;
7. ***Continuous Pig Flow*** maximizes thru-put, increases production in the same barn space.
8. Profits from an ***EnviroBarn™*** constructed or renovated facility increases Farm Profits $30 per pig;
9. **Profitability**: Based on USA Swine Industry factors, for an annual production rate of **5,000** ***EnviroBarn™*** pigs, **$150,000 in additional Revenues** can be realized.
10. ***Similar additional Efficiencies and Profits*** **can be achieved for Dairy operations!**

9.0 CONSULTANCY PROGRAM

GPBG and ***The eXpert Company Inc.*** can work for the Producers as their professional paid consultants.

Our program provides consultancy services and the simple manure management equipment required to assure odor, pathogen and environmental control over animal waste nutrients required at the project site.

Beyond that we use years of experience in the design of efficient production systems to achieve desired goals and profits for each business.

Invoicing is submitted at each stage of work so that the Producers clearly see what is accomplished at each project phase.

At the start, we meet with the interested owners, government and industry stakeholders to help them understand the profit opportunities that accrue from improved production systems and environmental controls.

We will invite the appropriate stakeholders and participants to meet us at operating ***EnviroBarn™ Systems*** for tours of these facilities and review of systems operations.

The first phase starts with an initial visit and site inspection to review current circumstances, identify problems and propose profit opportunities. This is done to assess the state of the facilities and to estimate the costs and economics for improved pork production and profitability.

We understand that before authorizing work it would be prudent to see a project overview and understand the process and program "end result"; the following summary is an outline of the process.

9.1 Project Phase I (Typical Effort Duration: 4 Months)

Task 1. Site inspection and Client Preliminary Project Finance Commitments

- 1.1 Master Planning meetings to discuss desired outcomes with stakeholders
- 1.2 Site visits to assess existing barns, feed systems and other facilities
- 1.3 Inspection and evaluation of existing lagoons and water supply
- 1.4 Determine the improvement status of the site

Task 2. Nutrient Management & Environmental Requirements (with Task 3)

- 2.1 Identify acres available for nutrient application to crop ground
- 2.2 Evaluate alternative methods for nutrient application
- 2.3 Negotiate nutrient application arrangements and costs
- 2.4 Negotiate nutrient application arrangements and sales

Task 3. EnviroBarn™ Capital Costs for Profitable, Odor-Free Production

- 3.1 Preliminary Plans and budgets for costing on the following items:
- 3.2 Estimate repairs needed to buildings, feed systems, waterlines, curtains, etc
- 3.3 Estimate costs to install “flo-thru” gutters for automated manure handling
- 3.4 Estimate costs to install liquid feeding systems to replace existing feeders
- 3.5 Estimate cost to bring lagoons up to aerobic “odor-free” operation
- 3.6 Select desired systems and procedures to bring production back on line
- 3.7 Assess finance requirements and additional profitability based on costs
- 3.8 Present Renovation Budget to Finance Sources for projects commitment

9.2 Project Phase II (Typical Effort Duration: 2 Months)

Task 4. Pig supply, Feed Sources and Marketing Arrangements

4.1 Identify alternative pig supplies

4.2 Identify feed alternatives and costs

4.3 Identify/assess improved marketing arrangements

4.4 Identify finance for improvements desired

Task 5. Estimate Improved Management, vet services and labor savings

5.1 Identify management resources and savings

5.2 Identify veterinary health services and savings

5.3 Identify labor and training requirements, sources and savings

Task 6. Prepare Business Plans to Support Financing Requests

6.1 Assemble data from preferred alternatives

6.2 Develop cash flow and operating expenses

6.3 Identify operating finance requirements and sources

6.4 Identify capital finance requirements and sources

6.5 Present Project to Finance Sources for Firm Finance Commitments

9.3 Project Phase III (Typical Effort Duration: 1 Mo for Bidding, 3-6 Months for start-up)

Task 7. Preparation of Detailed Plans, Specs and Bid documents for Contractors

7.1 Prepare plans and specs for renovation components, including civil work, plumbing, electrical, etc.

7.2 Plans and specs for required installed equipment

7.3 Advertise for Bids and Distribute Documents

7.4 Receive Bids, Evaluate and Supervise Bid Selection

7.5 Lock in Financing and Award Bids

7.6 Establish renovation schedule and contractor supervision

Task 8. Establish Management Team

8.1 Schedule incoming pig deliveries to populate barns

8.2 Schedule feed supplies to feed the pigs

8.3 Identify requirements and recruit management team

8.4 Establish training program for employees

8.5 Recruit and Train Employees to Operate Site

8.6 Start up and operate the facility

Task 9. Further Development Options

9.1 Crop production, storage and feed processing mill

9.2 In-house Breeding and Farrowing

9.3 Slaughter, Process and Packaging

9.4 Brand Name/Specialty Meats/Processing

9.5 Renewable Energy options