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August 15, 2015

**Ms. Lisa M. Brines, Ph.D.**
National List Manager
**USDA/AMS/NOP Standards Division**
1400 Independence Avenue S.W.
Room 2648 – So., Ag Stop 0268
Washington, D. C. 20250-0268

Dear Dr. Brines:

We are pleased to submit to you *two (2) copies* on behalf of our client, **Jones-Hamilton, Co. Addition to our Sodium Bisulfate Petition and Corrections to the NOP TAP as follows:**

**. Addition-**

**Please add a Summary Report, Comparative Life Cycle Greenhouse Gas Emission and Benefits from Poultry Litter Treatment (PLT) Application in Poultry House Operation**

**. Corrections-**

**Reference TAP Report Page 3,**

**Line 67, replace Sodium sulfate with *Sodium Bisulfite***

**Line 68, replace sodium sulfite with *sodium bisulfate***

**This concludes our formal Addition and Corrections to the TAP, if, you have any questions, please do not hesitate to contact me.**

Thank you very much for your professional assistance.

Sincerely yours always,

**LVOG, Inc.**

Thomas Harding

**Thomas B. Harding, Jr.**
**President & CEO**
**Organic Program Consultant**
**Lehigh Valley Organic Growers, Inc.**
**(LVOG, Inc.)**

# Comparative Life Cycle Greenhouse Gas Emission and Benefits from Poultry Litter Treatment (PLT®) Application in Poultry House Operation


**Summary Report Prepared for:**

**Jones-Hamilton Co.**
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**Life Cycle Assessment (LCA) Summary**

This study evaluated the life cycle greenhouse gas emission from the production and distribution of Poultry Litter Treatment (PLT®, Sodium bisulfate), including all aspects of raw material extraction, manufacturing, energy use, transportation and operation. The life cycle greenhouse gas emission was found to be about 700 pounds of $CO_2$-equivalent per ton of PLT®. $CO_2$-equivalent refers to the weighted summation of all gaseous emissions responsible for global warming; these include carbon dioxide, methane, nitrous oxide and several fluorinated gases.

The application of PLT® in poultry house operation reduces heating fuel and ventilation electricity usage through reduced ammonia levels. Field study conducted by Jones-Hamilton during winter in eastern and south-eastern U.S. regions showed an average reduction of 625 gallons of propane and 4,350 kWh of electricity from the operation of a single 500 feet by 40 feet poultry house over a 6 week grow-out period through the use of 1 ton of PLT®. The avoided life cycle greenhouse gas emission from these energy usage reductions was estimated to be about 16,200 pounds of $CO_2$-equivalent.

Field study conducted during summer and spring indicated an average reduction of 200 gallons of propane from the use of 1 ton of PLT® in a poultry house; ventilation electricity usage was not monitored in this study and would have shown a corresponding reduction as well. The avoided life cycle greenhouse gas emission from the propane usage reduction was estimated to be about 3,100 pounds of $CO_2$-equivalent.

The results show an enormous environmental benefit in reducing greenhouse gas emission and energy conservation from poultry farming with the use of the product.

Further, the field studies have recorded significant bird weight improvement in poultry house operation with the use of PLT®; the winter study showed an average weight increase of 3,600 pounds per house. While weight increase would have associated increase in feed requirement, a portion of weight improvement could be attributed to improved bird performance and feed conversion through the use of PLT®. This advantage of the product has not been modeled or quantified in terms of greenhouse gas emission in this study. Various life cycle assessments conducted on poultry farming and meat production in the U.S., Europe, Australia and Brazil indicate greenhouse gas emission in the range of 2.5 to 5 pounds of $CO_2$-equivalent per pound of chicken[1].

Additionally, the field studies have also recorded the reuse of poultry litter through the beneficial effect of PLT® in lowering litter pH. Avoided greenhouse gas emission from litter reuse has not been quantified in this study.

**LCA Overview**

The study was conducted following guidelines provided in the ISO 14040 series on LCA, and covered the four phases of goal and scope definition; inventory analysis involving the compilation and quantification of inputs and outputs for products and processes; impact assessment aimed at evaluating the magnitude and significance of potential environmental impacts of products and processes; and interpretation of results. The study utilized the widely used GaBi[2] LCA modeling software; inventory data from the U.S. Life Cycle Inventory Database[3] created by the National Renewable Energy Laboratory (NREL); the TRACI[4] method of impact assessment, LCA data and resources from the U.S. Environmental Protection Agency[5]; and emission data and factors from the U.S. Department of Energy – Energy Information Administration[6].

The goal of this LCA was to evaluate the comparative life cycle greenhouse gas emission (in units of $CO_2$-equivalent and also termed as global warming potential) and benefits from Jones-Hamilton's Poultry Litter Treatment (PLT®, Sodium bisulfate) application in poultry house operation. The scope included a cradle-to-use system boundary, which was broader than just point-of-use considerations, and involved the life cycle approach of considering up-stream emissions resulting from the extraction and provisions of raw materials, manufacturing, transportation, energy and fuel use, and operation.

The functional unit, which provides a basis for equivalence and comparison between alternative systems, was chosen as the operation of a standard-design poultry house, 500 feet by 40 feet, for a 6 week grow-out period in typical eastern and south-eastern U.S. climate regions. Two operational scenarios with and without the application of PLT® were considered for separate comparative analyses during winter condition and during summer/spring condition. At a standard application rate of 100 pounds per 1,000 square feet of floor space, a poultry house requires 1 ton of PLT® and the LCA data analysis and results for scenario with PLT® application are representative on a per ton basis of the product. Results from field studies[7, 8, 9, 10] conducted by Jones-Hamilton on effects of PLT® on poultry farm's heating and ventilation requirement were utilized for analyzing scenario without the product's application. The entire poultry house operation over the 6-week period that would include animal feed, water, bedding, total heating fuel and electricity use was not modeled in this comparative study; only the additional propane and ventilation electricity in operation without PLT® was modeled.

## LCA Methodology

The method involved modeling the production and transportation of raw materials sodium chloride and sulfuric acid needed for the production of 1 ton of PLT® (Sodium bisulfate); modeling the production, packaging and transportation of PLT®; allocating emission results for co-product hydrochloric acid in the PLT® production process; and modeling the usage reduction in propane (for heating) and electricity (for ventilation) in poultry house operation from the application of PLT®.

For the production of 1 ton (2000 lb) of PLT®, 0.51 ton (1020 lb) of sodium chloride and 0.82 ton (1640 lb) of sulfuric acid is needed[11]. Production of sodium chloride was modeled in GaBi using unit process inventory data from U.S. LCI[3] with input flows of electricity, natural gas, diesel and coal, which in turn were accounted for all their up-stream use of natural resources and energy. Production of sulfuric acid was modeled using aggregate inventory data that included all up-stream resource and energy usage and did not require additional input flows; in the absence of

U.S. LCI data, aggregate data from the European Union was used and was co-related to sulfur (raw material for sulfuric acid) production data for the U.S. and several European countries for consistency. Inventory data for both sulfuric acid and sulfur production indicated substantial energy recovery in the production processes; however, results showed positive net greenhouse gas emission from both the sulfur and sulfuric acid production processes. Raw material transportation involved life cycle modeling (using U.S. LCI data) of all of the sodium chloride shipment by rail for 250 miles, 75 percent of the sulfuric acid shipment by rail for 350 miles and 25 percent of the acid shipment by truck for 10 miles[11].

Production of 1 ton of PLT® requires inputs of electricity, natural gas and water[11]; each was modeled separately in GaBi with aggregate inventory data and added together. Packaging was modeled with aggregate data for plastic (high-density polyethylene) resin and poly-bag manufacturing unit process with energy input flows; 1 ton of PLT® was assumed to be packaged in 40 bags, each with 50 lb of the product, and requiring 0.2 lb of plastic per bag. Finished product transportation was modeled for shipment by truck for 350 miles[11].

Production of PLT® (sodium bisulfate) generates hydrochloric acid as a co-product; total production records showed that sodium bisulfate and hydrochloric acid were produced in the ratio of 53 percent to 47 percent by weight[11]. The greenhouse gas emissions from raw material production, raw material transport and PLT® production are attributable to both sodium bisulfate and hydrochloric acid, and co-product allocation on a weight basis was done accordingly.

Field studies[7, 8, 9, 10] indicated that application of 1 ton of PLT® in a poultry house during a 6 week grow-out period in winter months resulted in an average reduction of 625 gallons of propane as heating fuel and 4,355 kWh of electricity in ventilation requirement, and 200 gallons of propane during summer/spring months (electricity was not monitored in summer/spring study and would have shown a corresponding reduction); this reduction is related to PLT®'s ability to reduce ammonia levels significantly in comparison to poultry house operation without the product application. Avoided life cycle greenhouse gas emission for the propane production and electricity generation were modeled in GaBi using U.S. LCI aggregate inventory data, and that for propane combustion in on-farm heating equipment was modeled using emission factors from U.S. EIA[6].

**LCA Results**

The following tables list the greenhouse gas emission (global warming potential) in pounds of $CO_2$-equivalent for poultry house operation in winter condition and summer/spring condition with and without the application of PLT® on a per ton basis of the product.

| Comparison of Greenhouse Gas Emission (Global Warming Potential) for 1 Ton PLT® - Winter Operation | | | |
|---|---|---|---|
| | | | |
| Description | Poultry House Operation with PLT® Application | Poultry House Operation without PLT® Application | Unit |
| Sodium Chloride Production | 75 | | lb CO2-equivalent |
| Sodium Chloride Transportation | 5 | | lb CO2-equivalent |
| Sulfuric Acid Production | 223 | | lb CO2-equivalent |
| Sulfuric Acid Transportation | 9 | | lb CO2-equivalent |
| PLT® Production | 184 | | lb CO2-equivalent |
| PLT® Packaging | 15 | | lb CO2-equivalent |
| PLT® Distribution | 188 | | lb CO2-equivalent |
| | | | |
| Additional Propane Usage[a] | | 9,719 | lb CO2-equivalent |
| Additional Electricity Usage[a] | | 6,468 | lb CO2-equivalent |
| | | | |
| Total | 699 | 16,187 | lb CO2-equivalent |

[a] This represents only the additional propane and electricity usage in poultry house during winter without the application of PLT® and reflects the life cycle greenhouse gas emission advantage of the product; total propane and electricity usage over the entire 6 week grow-out period was not modeled in this comparative analysis.

| Comparison of Greenhouse Gas Emission (Global Warming Potential) for 1 Ton PLT® - Summer/Spring Operation | | | |
|---|---|---|---|
| | | | |
| Description | Poultry House Operation with PLT® Application | Poultry House Operation without PLT® Application | Unit |
| Sodium Chloride Production | 75 | | lb CO2-equivalent |
| Sodium Chloride Transportation | 5 | | lb CO2-equivalent |
| Sulfuric Acid Production | 223 | | lb CO2-equivalent |
| Sulfuric Acid Transportation | 9 | | lb CO2-equivalent |
| PLT® Production | 184 | | lb CO2-equivalent |
| PLT® Packaging | 15 | | lb CO2-equivalent |
| PLT® Distribution | 188 | | lb CO2-equivalent |
| | | | |
| Additional Propane Usage[a] | | 3,110 | lb CO2-equivalent |
| | | | |
| Total | 699 | 3,110 | lb CO2-equivalent |

[a] This represents only the additional propane usage in poultry house during summer/spring without the application of PLT® (summer/spring study did not monitor ventilation electricity usage and would have shown a corresponding reduction with PLT® use) and reflects the life cycle greenhouse gas emission advantage of the product; total propane usage over the entire 6 week grow-out period was not modeled in this comparative analysis.

## Conclusion

LCA results indicate that 1 ton of PLT® application in a single poultry house operation for a 6 week grow-out period has the benefit of reducing life cycle greenhouse gas emission by about 16,200 pounds of $CO_2$-equivalent during winter and by about 3,100 pounds of $CO_2$-equivalent during summer/spring through reduced heating fuel and ventilation electricity usage, while the production and distribution of 1 ton of PLT® only generates about 700 pounds of $CO_2$-equivalent life cycle greenhouse gas emission. The use of PLT® shows a significant advantage in reducing life cycle greenhouse gas emission from poultry farming.

## References


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