

9132-6207 QUEBEC INC.
et Fiducie M.Labbé et D.Lapointe
(Ferti-Val and Agrior)

Greenhouse Gas Emission Reductions Report
Ferti-Val and Agrior Greenhouse Gas Emission Reductions Composting Project

Presented to: Mr Sylvain Richer and Mr Maurice Labbé

Prepared by: L2i- Financial Solutions inc.

2015 Victoria, suite 200
Saint-Lambert (Québec)
J4S 1H1

September 12th 2007

Table of Content

INTRODUCTION	3
Introduction of the editing and quantification team.....	3
Profile summary of the team members	3
Supervision	3
<i>EXECUTIVE SUMMARY</i>	4
Chapter 1: The Company and the Projects.....	7
1.1 Description of the Company	7
1.2 Data Collection	7
1.3 Composting Description	8
1.3.1 Composting General Information.....	8
1.4 Project and reference Scenarios	9
1.4.1 Composting Project Scenario	9
1.4.2 Landfilling Reference Scenario	9
1.4.3 Greenhouse Gases Identification	9
1.4.4 Sources, sinks and reservoir identification	10
Table 1 : Sources and Sinks comparison	10
1.5 GHG monitoring plan.....	10
1.5.1 Data Management.....	10
1.5.2 Environmental impacts	11
Chapter 2: GHG Emissions Quantification.....	12
2.1 Methodology selection and discussion	12
2.2 Methodology and emission factors description.....	13
2.3 Project GHG emission reductions quantification	14
Table 2 : Project scenario (food discards) vs landfilling scenario.....	14
Table 3 : Project scenario (yard trimmings)	14
Table 4: Total GHG Emission Reductions (food discards and yard trimmings)	15
2.4 Uncertainty & limitations.....	15
Conclusion	15

INTRODUCTION

Introduction of the editing and quantification team

L2i- Financial Solutions is a firm specialized in non-traditional corporate financing. These past two years, we have developed an expertise for the quantification of carbon credit. In that capacity, we help companies to count, quantify and accrue their carbon credits and ensure their selling. Our expertise consists of elaborating calculation methodologies to quantify the emissions based on reputable international principles. The reports are drafted in accordance with the following guidelines: ISO 14064, CCX and the Over-The-Counter Market (OTC).

Profile summary of the team members

Hélène Lahaie, B.Eng.

Mrs. Lahaie obtained a degree in Electrical Engineering (Industrial Processes). She also has a significant experience in Network management as well as in Project Management (national scope). She reoriented her career towards environmental projects. Mrs. Lahaie is skilled in Carbon Chemistry and in research - applied Mathematics. She is currently completing postgraduate studies in Environmental Sciences.

Donald Ratté, M.Env.

Mr. Ratté has a Bachelor of Geography and a Master's Degree in Environmental Sciences. In addition, graduated from the environmental assessment micro program. He also participated in the quantification of greenhouse gas for the City of Laval and Domtar. He is concerned about applying the general rules and concentrates on implementing methodologies of work that comply with the requirements of the auditors responsible for the quantification reports.

Supervision

Mr. Yves Legault (Finance) and Mrs. Christine Lagacé (Management) are responsible for supervising the carbon credits quantification team. For many years now, they have been on the look-out for their customers needs regarding the quantification of greenhouse gas. They created a methodology allowing the calculation and the selling of the carbon credits on the organized markets such as the CCX and the voluntary market.

EXECUTIVE SUMMARY

Project Title:

Ferti-Val and Agrior Greenhouse Gas Emission Reductions Composting Project

Type of GHG project:

This emissions reduction report was written according to ISO 14064-2 Specifications Requirements for quantification, monitoring and reporting of greenhouse gas emission reductions and removal enhancements assertions.

GHG project proponent:

9132-6207 Quebec inc. and Fiducie M.Labbé et D.Lapointe, two management companies, acts for *Ferti-Val and Agrior* which ceased their operations at the end of March 2007. Thus, for the purpose of this report, Ferti-Val and Agrior are the project proponents since the composting project was their missions.

Ferti-Val and Agrior had their head office as well as their composting and recycling operations on the same site at the following addresses:

Ferti-Val:

800, de l'Ardoise Street
Sherbrooke (Québec)
Canada
J1C 0J6

Telephone : (819) 566-5103
Télécopieur : (819) 566-7903
Web site: www.ferti-val.com

Latitude : 45°27'8.33"N
Longitude : 71°57'42.38"W

Agrior:

270, Chemin Belfast
St-Patrice-de-Beaurivage
Beauce (Québec)
G0S 1B0

Telephone: (819) 596-2583

Latitude : 46°25'38.95"N
Longitude : 71°12'48.51"W

Project Brief Description:

The project consists in quantifying the greenhouse gas emission reductions attributable to the composting of food discards and yard trimmings. In order to prove the additionality of this reduction project, GHG (Greenhouse Gas) emissions associated with the composting scenario will be compared to a land filling reference scenario for the same wastes. The project started in 2002 and ended with the shutdown of the operations in March 2007,

Offsets use and users

The target users are the potential offsets VER (Verified Emission Reduction) buyers on the carbon voluntary market.

Presentation of the programs

The GHG project will be part of the CSA program called the GHG Clean Project Registry.

Risks and/or limits of the report

This quantification report has been prepared and has been written based on several information sources. Site visit and data collection were completed on March 22nd 2007. Thereafter, some complementary demands were made to complete the production data for composting as well as the energy consumption data.

Even then, we faced some constraints when preparing the report:

- Scarcity of studies or researches in existing literature;

Despite this constraint, we were able to collect sufficient information allowing us to quantify the emission reductions and to write a report.

The demonstration was performed with the aid of indirect sources: references from scientific studies, public literature documents, direct interviews and site visits.

Methodology

This project was based on a quantification methodology proposed by the Environmental Protection Agency (EPA, USA) titled: *Solid Waste Management and Greenhouse Gases, A life-Cycle Assessment of Emissions and Sinks*, published in September 2006.

The GHG emission sources or sinks identified in this project were analysed in conformity with the requirements of ISO 14064 part 2 standards.

GHG Emission Reductions:

Année	Total Reductions (t CO₂e)
2002	-12 004
2003	-30 931
2004	-28 833
2005	-21 199
2006	-19 438
2007	-7 073
Total	-119 478

Presentation of the programs

Verified Emission Reductions (VERs) were assessed according the ISO 14064 part 2 international standard. Also PDD was drafted in accordance with the provisions and guidelines stated in the GHG Protocol and the IETA Voluntary carbon Standard.

The GHG project will be part of the CSA program called the GHG Clean Project Registry and publicly listed. CSA requires conformity with ISO 14064-2 standards for GHG emission reductions projects.

Verification Notification

Initially quantified by L2I – Financial Solutions Consultant, the verification of the VERs was conducted by the external verification entity Carbon Quantum according ISO 14064 part 3.

Chapter 1: The Company and the Projects

1.1 Description of the Company

Ferti-Val and Agrior are companies specialized in the composting, recycling and the conversion of residual materials since 1993. **Ferti-Val and Agrior** developed the innovating infrastructures permitting them to manage, treat and recycle more than 1.5 million tons of residual materials. Their composting sites, multi-material sorting center and external projects allowed the recycling of more than 200 000 tons of residual materials per year.

The companies' activities quantified in this project were limited to the composting.

Foundry wastes reclamation



Composting



Multi-materials sorting center



1.2 Data Collection

The data collection was achieved from primary and secondary information sources. The primary sources were consulted via two methods: direct interviews and site visit, documents and official sources. The secondary source of information consists of Internet sites and various data official sources.

1.3 Composting Description

The information presented in this section comes from Ferti-Val and Agrior documentation available on their web site: <http://www.ferti-val.com>

Ferti-Val and Agrior have used their experience of over ten years in the production of compost to develop an innovative composting system, *CIS 100*.

The *CIS 100* system includes three significant features as follows:

- an efficient forced-air platform (composting reduced to 30 days)
- automated management of biosolids handling and feedstock in the composting
- treatment of odours by bio-filtration

The *CIS 100* system implements a logical approach in managing all aspects of composting. Every consideration has been given to an efficient management of the material – from the delivery and unloading of the feedstock, through the mixing process, to the location of the material in the aeration cells. The *CIS 100* model is capable of treating 100 000 m³ of feedstock annually from all sources.

The system *CIS 100* facilitates the composting of organic material whatever the conditions. Even in winter, the average temperature of the compost pile increases rapidly while the exterior temperature remains broadly below 0°C. Also, the forced ventilation system generates and maintains a high level of oxygen permeating through the pile, although there is a high requirement of oxygen needed for the decomposition of the organic material by the bacterial flora. In fact, the microbial activity consumes oxygen and releases a great quantity of energy in the form of heat.

Temperatures reached in the pile contribute to the destruction of pathogenic agents, thus guaranteeing the harmlessness of the compost and ensuring certification by the BNQ.

1.3.1 Composting General Information

Decomposition is important for biodegradable residual matters, as yard trimmings and food discards. They are broken down by microorganisms into simpler chemicals and, this way, allow for the circulation of organic compounds in the soil eventually. There are two different categories of composting processes: anaerobic occurring when microorganisms do not require oxygen for the decomposition process and aerobic when the microorganisms require oxygen to perform the decomposition. Aerobic compost will be produced in the upper layer of soil, close to the surface, with specific moisture conditions. Although there is no consensus about the numerous potential benefits of composting, it is

generally considered as a valuable soil amendment for agriculture and improves the humus composition.¹

Ferti-Val and Agrior composting technology were developed according to the general composting principles.

1.4 Project and reference Scenarios

1.4.1 Composting Project Scenario

Ferti-Val and Agrior project consist in composting yard trimmings and food discards from residential and institutional sources including agri-food industry sludge.

The project is based on the fact that the enterprises use an effective composting process allowing them to complete a rapid decomposition of the inputs and to obtain good quality compost used as soil amendments.

1.4.2 Landfilling Reference Scenario

Landfilling is the most common alternative to composting both in the US and Canada.² This is the reason why EPA methodology proposes the comparison in between landfilling and various waste management strategies including composting. Recyc-Quebec objective for 2008 is the valorization of 60% of yard trimmings and food discards.³

1.4.3 Greenhouse Gases Identification

The major gases involved in the composting and landfilling processes are carbon dioxide (CO₂), nitrous oxide (N₂O) generated by fuel combustion with the use of heavy machinery and with transportation and methane (CH₄) from the anaerobic degradation processes in landfilling.

¹Shindo Haruo and al., (2005), Effect of continuous compost application on humus composition and nitrogen fertility of soils in a field subjected to double cropping, *Biology and Fertility of Soils*, vol. 42 (5): p 437-442. Available at: <http://www.springerlink.com/content/56q7770j344531q3/>

² Recyc-Québec (2007), Fiche d'information, Les matières compostables, consulted on september 11th 2007. Available : http://www.recyc-quebec.gouv.qc.ca/Upload/Publications/zFiche_452.pdf

³ Recy-Québec (2007), Gérer les matières résiduelles dans les municipalités consulted on July 16th 2007. Available at : <http://www.recyc-quebec.gouv.qc.ca/client/fr/gerer/municipalites/gestion-efficace.asp>

1.4.4 Sources, sinks and reservoir identification

All controlled and associated sources are identified in the following table.

Table 1 : Sources and Sinks comparison

(t CO₂e)

Reference Scenario Landfilling		Project Scenario Composting	
Emission Sources and sinks		Emission Sources and sinks	
SR1 : Waste transportation	Not quantified Same in the two scenarios	SP1 : Feedstock Transportation	Not quantified Same in the two scenarios
SR2 :Waste reception	Quantified	SP2 : Feedstock Reception	Quantified
SR3 :Waste landfilling	Quantified	SP3 : Composting production and maturation	Quantified
SR4 : Leachate transportation for external treatment	Quantified	SP4 : Wastewater transportation	Quantified
SR5 : Storage	Quantified	SP5 : Fine Screening and bagging	Quantified
		SP6 : Distribution	Not quantified Source outside the boundaries
Carbon Capture (sink)		Carbon Capture (sink)	
STR1 : soil	Quantified	STP1 : soil	Quantified

SR : CO₂ source emissions, reference scenario

SP: CO₂ source emissions, project scenario

STR : CO₂ storage (sink) reference scenario

STP : CO₂ storage (sink) project scenario

1.5 GHG monitoring plan

1.5.1 Data Management

Production data was collected daily and saved in a database. Everyday, data from Sherbrooke sorting center and from Sherbrooke and St-Patrice de Beaurivage composting centers was saved and stored on a different site. Therefore, data was permanently available.

1.5.2 Environmental impacts

The environmental impacts generated by the composting operations mainly consist in the leachate stored in a retention basin and later shipped to a processing center. This practice avoids impacts over water resources in the region. Ferti-Val and Agrior were delivered authorization certificates for their sites requested by the Quebec Environment Quality Act, R.S.Q., c. Q-2. These certificates have been delivered by the former Quebec Ministry of Environment, currently named Ministry of Sustainable Development, Environment and Parks.

Chapter 2: GHG Emissions Quantification

2.1 Methodology selection and discussion

The selection of a methodology was based on the consultation of various scientific sources as IPCC 2006 guidelines, EPA *Solid Waste Management and Greenhouse Gases, A life-Cycle Assessment of Emissions and Sinks* report (2006) and other scientific studies as ICF Consulting Report (2005)⁴.

Methodologies proposed by IPCC in their 2006 guidelines for composting and landfilling are difficult to compare since one is using time series and long term impacts and the other one is using a static model and a one-time quantification. On the other hand, EPA presenting an interesting alternative, the project data was analysed to confirm the compatibility of their methodology with the available data. Based on information received from Recyc-Quebec and data presented in the Canadian GHG Inventory (2007), no reason was found to conclude that the local data was significantly different from the US data quantified with the EPA methodology. In fact, according to EPA data, 59 percent of all landfill CH₄ was generated at landfills with recovery systems⁵ while in 2005, in Canada, the quantity of CH₄ captured at MSW landfills for flaring, or combusted for energy recovery purposes amounted to 22% of the total generated emissions from this source.⁶

Therefore, American emission factors should be conservative in the context of a reference scenario, underestimating the emissions quantification. Thus the EPA methodology and emission factors, as described in 'Solid Waste Management and Greenhouse Gases : A Life-Cycle Assessment of Emissions and Sinks' (2006). were selected. ICF Consulting final report entitled 'Determination of the Impact of Waste Management Activities on Greenhouse Gas Emissions:2005 Update' was also consulted.⁷

⁴ ICF Consulting. (2005). *Analyse des effets des activités de gestion des matières résiduelles sur les émissions de gaz à effet de serre*, mise à jour 2005,

⁵ EPA. (2006). *Solid Waste Management and Greenhouse Gases, A life-Cycle Assessment of Emissions and Sinks*, p.8.

adresse [URL:http://www.epa.gov/climatechange/wycd/waste/SWMGHGreport.html](http://www.epa.gov/climatechange/wycd/waste/SWMGHGreport.html)

⁶ Environment Canada (2007), National Inventory Report, Greenhouse gas Sources and Sinks in Canada, 1990-2005. p.59.

⁷ ICF Consulting. (2005). *Analyse des effets des activités de gestion des matières résiduelles sur les émissions de gaz à effet de serre*, mise à jour 2005,

adresse URL : <http://www.recycle.nrcan.gc.ca/ICF%20Report%20FR.pdf>

2.2 Methodology and emission factors description

EPA methodology

EPA methodology is based on the product life cycle concept. It compares the GHG emissions for the two waste management options (landfilling as reference scenario and composting as project scenario) through their life cycle.⁸ In this report, the Waste Management approach was selected.

Emission Factors :

Exhibit 8-8 from EPA (2006) report was used.⁹ This table provides the emission factors for the comparison in between two composting activities (food discards, yard trimmings project scenario) and landfilling reference scenario.

Food Discards

EPA (2006), exhibit 8-8, proposed factor for food discards is -0,25 MTCE (*metric tons carbon equivalent*) / Ton (short ton) of materials which is the equivalent of -1,01 t CO₂e / tons of materials.

Yard trimmings

EPA (2006), exhibit 8-8, proposed factor for yard trimmings is 0,01 MTCE (*metric tons carbon equivalent*) / Ton (short ton) of materials which is the equivalent of 0,04 t CO₂e / tons of materials.

Project Period

Emissions and reductions were quantified from 2002 to 2007. The first year of the temporal range was selected based on the availability of production and energy consumption data for both composting sites. The year 2007 includes three months only based on the fact that the project ended in March with the shutdown of the operations.

⁸ EPA. (2006). *Solid Waste Management and Greenhouse Gases, A life-Cycle Assessment of Emissions and Sinks*, chapter 4, p.49 à 63 and table 8.8.

⁹ Idem, p. 122.

2.3 Project GHG emission reductions quantification

The project consists in quantifying the greenhouse gas emission reductions attributable to the composting of food discards and yard trimmings. In order to prove the additionality of this reduction project, GHG emissions associated with the composting scenario will be subtracted from the landfilling reference scenario for the same waste quantity (tons).

The next table presents the GHG emission reductions for the food discards composting (project scenario) compared to the landfilling reference scenario,

Table 2 : Project scenario (food discards) vs landfilling scenario

Year	Food Discards (tons)	Emission Factor (Food Discards vs landfilling) (t CO ₂ e / tons of material)	Emission Reductions (Food Discards) (t CO ₂ e)
2002	11 880	-1,01	-12 004
2003	30 618	-1,01	-30 938
2004	28 551	-1,01	-28 849
2005	21 001	-1,01	-21 220
2006	19 617	-1,01	-19 822
2007	7 000	-1,01	- 7073
Total	118 666		-119 906

In the following table, GHG emission reductions are based on the yard trimmings composting compared to the landfilling reference scenario.

Table 3 : Project scenario (yard trimmings)

Year	Yard trimmings (tons)	Emission Factor (yard trimming vs landfilling) (t CO ₂ e / tons of material)	NET Emission (yard trimmings) (t CO ₂ e)
2002	0	0,04	0
2003	162	0,04	7
2004	406	0,04	16
2005	509	0,04	21
2006	9 488	0,04	383
Total	10 564		427

Finally, the last table presents the total GHG emission reductions for the total reductions for all feedstock (yard trimmings and food discards).

Table 4: Total GHG Emission Reductions (food discards and yard trimmings)

Année	Food discards (reductions) (t CO₂e)	Yard Trimming (net emissions) (t CO₂e)	Total Reductions (t CO₂e)
2002	-12 004	0	-12 004
2003	-30 938	7	-30 931
2004	-28 849	16	-28 833
2005	-21 220	21	-21 199
2006	-19 822	383	-19 438
2007	-7 073		-7 073
Total	-119 906	427	-119 478

2.4 Uncertainty & limitations

Emission factors for the composting activities were obtained from the EPA report: *Solid Waste Management and Greenhouse Gases, A life-Cycle Assessment of Emissions and Sinks (2006)*, based on scientific studies. EPA methodologies are among the most serious scientific contributions to the study of the climate changes.

Uncertainty is lowered by the fact that United States presents a similar industrial structure to Canada and fuel sources have similar emission factors. Electricity emission factors in US are a little higher and probably influenced the methane recovery lowering the level of emissions for the reference scenario since the EPA factors are more conservative than the Canadian ones.

The project verifier, as a temporary constraint, asked us to qualify the project with high level uncertainty since the activity data provided by the chief engineer was not verified in details as of today.

Conclusion

Based on the data collected from the composting center, data describing feedstock types and volume, energy consumption, production process and outputs as well as the methodology based on EPA Solid Waste Management report (2006), we conclude that the quantification of GHG emission reductions in this project were based on sufficient data and a valid scientific methodology.

This GHG emission reductions report is also based on ISO standards 14064 part 2 in order to facilitate the use of the CO₂ e reductions (Verified Emission Reductions) to be negotiated on the voluntary market.