Summary

It has been the Company mission from the onset to utilize our mineral industry expertise to bring geoscience into the regenerative agriculture debate. Commencing in 1996 the Company has attempted to demonstrate that the sustainable use of ultramafic rocks, in this case Spanish River Carbonatite ("SRC"), with a carbon source, could stimulate soil biota to improve efficiency of plant nutrients, particularly nitrogen, while improving soil health degraded through historical agriculture practices. Validating this would result in a significant change in soil nitrogen management and an overall reduction in fertilizer use. The assessment and criteria of human activities on soil quality has not yet been fully defined. It is general accepted that agriculture has had a negative impact on soil quality through loss of organic matter and soil aggregation resulting in changes to soil microbial communities that ultimately affect nutrient cycling. On a greater scale it is becoming apparent that soil plays a major role in global chemical cycles, particularly carbon, nitrogen and silica.

Major scientific advances across a broad spectrum of disciplines have established that soil/plant/food/nutrition/health webs are infinitely more complex and interrelated than previously believed. Geoscience's major role in this new multi discipline science paradigm has yet to be substantively recognized. The global imperatives for environmental and ecological sustainability, along with maintaining yield will require the advanced capabilities of geoscience; in particular the study of the reactivity of unique naturally occurring minerals in various soil systems made available by complex biological/mineralogical interactions.

From the Company's broad investigation of the growing body of pertinent agronomy, soil and geoscience studies as it relates to plant and soil health, the following key factors were identified and formed the basis of all ongoing independent research.

Soil acidity is one of the key soil fertility constraints affecting crop yield and quality. It is genetically-originated under specific soils like Andosols, Oxisols, Ultisols, etc. but it has become a growing problem due to farming system intensification with low or non-replenishment of cations like Ca or Mg. The soil acidification diagnosis and management require a comprehensive approach. Below are highlighted key aspects to take into account:

- *Soil fertility and health degradation*
  - *Destruction of high energy clays resulting in;*
    - *Limiting the soils ability to store plant available nutrients (CEC).*
    - *The release of toxic levels of aluminum and other metals.*
    - *Depletion of active calcium, organic matter and microbial populations in soils.*

- *Soils rather than maintaining and enhancing ground water quality are contributing to water pollution, particularly eutrophication.*

- *The importance of soil biology in maintaining soil quality, productivity, flow of chemistry and decomposition of organic residues.*
- *Growing awareness of trace elements in plant nutrition and health. The awareness of silica and rare earths are two recent examples.*
- *Mineral reactivity and the role of microorganisms in accelerating mineral dissolution.*
- *Mineral genesis and resulting characteristics, including incorporated trace elements, that significantly hinder or accelerate mineral dissolution.*

The Company's original extended farm evaluation trials were astoundingly effective at addressing plant and soil metal toxicity constraints resulting in improved crop health. These results were experienced in the first year of application at rates of between 1.0 and 1.5 tonnes/hectare. The response to the inevitable question as to 'why does it work' we reduce to careful examination of the key variable "reactivity". SRC works in biological time rather than geological time.

To answer the question 'why does it work' and to establish SRC as an accepted agriculture resource, scientific research was initiated. Using the base application rates achieved through pre-experimentation distribution into Southern Ontario and Northern United States, a Masters and PhD dissertation was undertaken involving Wilfrid Laurier, Algoma, Brock, Western and Algoma Universities. This also resulted in collaborative research in Mexico, Peru, India and China. In all studies the following findings have been repeated:

1. *Reduction of metal toxicity in crops tested, particularly aluminum and cadmium.*
2. *Effective raising of soil pH.*
3. *Soil stabilization of potential metal toxicities.*
4. *Increased plant nutrient uptake.*
5. *Increase in root biomass and yield*
6. *Increased fertilizer use efficiency*
7. *High potassium bioavailability associated with potassium bearing biotite.*
8. *Soil microbial stimulation.*
9. *SRC´s high reactivity*

(see scientific studies and field trials chart at end of report validating all the findings above)

Many of the studies compared the addition of SRC to traditional fertility recommendations. The control plot utilized fertility recommendations whereas the experimental plots added SRC at different quantities with fertilizers. Plant and soil responses were impressive in these tests. Where no fertilizer was used either in control or SRC plots, crop response was much less. It has always been the Company's contention that SRC is an important contributor to designed fertility programs, which results in higher yield, improved crop nutrition and effectively addressing soil fertility features that have been compromised due to historical agriculture practices (e.g. nutrient bioavailable, biological activity, better physical condition, among others).

In 2014 the Company was recognized by the Ontario Centres of Excellence and was given the award for Excellence in Corporate Responsibility for agriculture. These achievements resulted in the Company's ability to sponsor a Masters and PhD dissertation at Wilfred Laurier University with technical expertise from Algoma (microbiology) and Western Ontario (geoscience) Universities. This has culminated in third party research conducted in Mexico, India, Peru and China. Currently the Company has commenced research in Argentina under the direction of Dr. Martin Torres Duggan B.S; M.S; PhD., one of the foremost experts on the utilization of agrominerals in crop production impacting soil quality. Martin has put a team of agronomists and geoscientists together to continue the work outlined in James Jones' PhD thesis. The ultimate goal is to produce SRC biological fertilizers that would be amended with other beneficial mineral components based on specific regional soil conditions.

SRC has been approved for use on conventional and certified organic crops (OMRI) and is registered as a fertilizer in Canada. The Company is currently registering SRC under new CFIA regulations. SRC has also passed the various Ontario and British Columbia MOE tests which are required to have our product included as a compost amendment at the various major landfill / composting sites and as a soil amendment in those jurisdictions where there are parks, playing fields, lawns, forests, etc. SRC is OMRI listed and re-registering with the Canadian Food Inspection Agency ("CFIA"), to remain compliant under the new rule changes implemented in October 2023.

Ultramafic Rock Characteristics - Carbonatite Complexes

Carbonatite complexes are very rare carbonate rich intrusives belonging to the alkali or ultramafic rock family. No other rocks have provoked such interest as the alkalic group. This fascination is out of proportion to the number of occurrences where less than 1% of igneous rocks are classified as alkalic and yet one third of all rock names are alkaline; a total of more than 250. Explanation of their unique suite of minerals, incredible diversity of chemical compositions and depth of magma sourced exceeds the boundaries of present petrogenic theories.

Mineralogical and chemical characteristics of alkalic rocks which impart distinct changes to mineral reactivity properties are:

- Chemical and mineralogical diversity;
- Disproportionate concentration of hydrolysable bases, (Ca, Na, Mg, K);
- Volatiles (H_2O, CO_2);
- Reactive Ca and Mg silicate minerals cited in the formation of phytoliths, accumulation of secondary clay and protection of soil organic carbon through aggregation;
- Lithophile elements (a strong affinity for oxygen, having a greater free energy of oxidation);
- Anomalous rare earth content.

It is for these reasons that ultramafic rock occurrences are cited for their rapid carbon sequestration capabilities.

Today two of the most important developed carbonatite complexes contributing to agriculture are Jacupiranga in Brazil and Siilinjarvi in Finland. Both carbonatites are mined at annual rates in excess of

10 million tonnes and contain micas, carbonates (calcite and dolomite), apatite (rock phosphate), pyroxenes (magnesium silicates), and accessory minerals.

The demand driving these production rates is the concern of metal contamination found in sedimentary phosphate deposits. Phosphate minerals are a favored host for radioactive ions and heavy metals, particularly cadmium. The phosphate fertilizer refining process removes radioactive ions but cadmium is incorporated into the fertilizer. Recent research is showing plant and animal cadmium uptake exceeding tolerable level intake guidelines established by the World Health Organization. Cadmium containing phosphate fertilizers were confirmed to have increased the Cd status both in soil and plants. In response, New Zealand, Australia, Austria, Sweden and Finland have established guidelines and worked with the fertilizer industry to reduce Cd soil contamination. Austria, Sweden and Finland have enacted legislation to ban high cadmium fertilizers.

The Origin of the Spanish River Carbonatite Complex

The birth of SRC Complex is distinctive amongst unique carbonatites. A comet, 10 kilometres (6 miles) in diameter and travelling at approximately 143,000 kilometres per hour (89,000 mph), impacted the Earth. The resulting catastrophic shock wave resulted in a plume of super-heated rock, from the deepest part of the crust, catapulting into the Earth's early atmosphere; only to return under the pull of gravity in a great splat; extensively turning the crust inside out. After the dust had settled, a hole that was originally 250 kilometres (155 miles) in diameter was created, containing a molten rock lake that was three times the size of the current Yellowstone caldera. Yet, out of this Hades, geoscientists theorize that, similar to what occurred in Yellowstone, the vast network of hydrothermal vents and complexity of mineral constituents created the very conditions necessary for life.

This catastrophe, referred to as the Sudbury Event, is the leading hypothesis for the genesis of the Sudbury nickel basin and fortuitously, the SRC Complex. The modern surface of the deposit consists of the very roots of the original outflow of igneous material. These remnants of the impact site are known as the Sudbury Basin, and this deep magma resulted in the deposition of one of the richest nickel deposits in the world. The SRC deposit is located on the outer perimeter of the Sudbury Basin. Referred to as a pipe, the igneous intrusion is comprised of calcium, magnesium, silica, phosphorous, potassium and iron minerals.

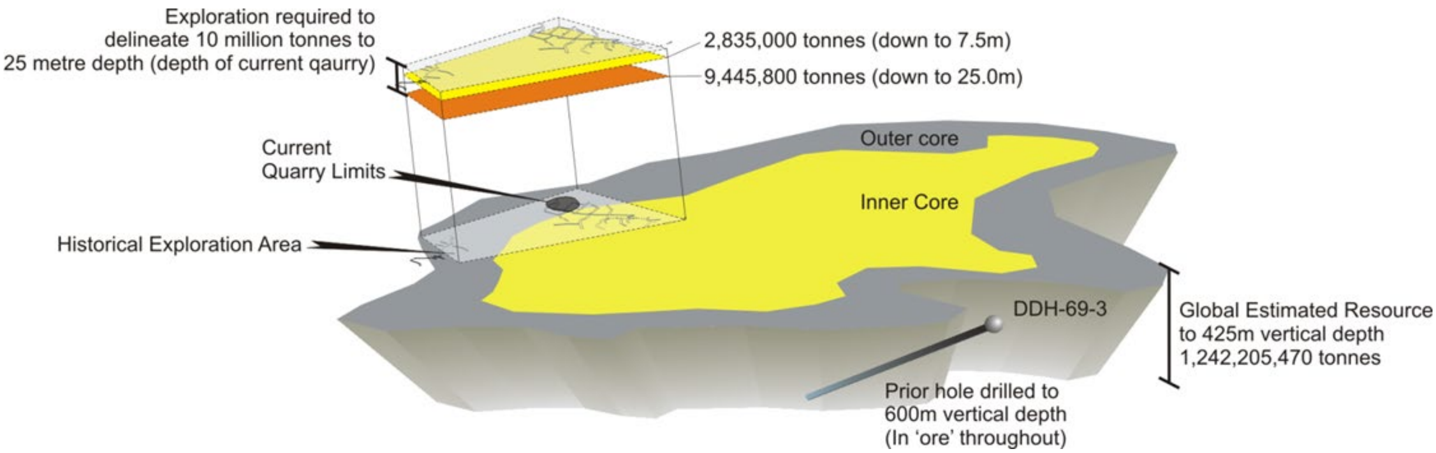
The Geology and Mineralogy of the Spanish River Carbonatite complex

Though all rock occurrences can be grouped into specific classifications based on genesis and mineralogy, each individual rock formation carries unique characteristics unto themselves. The SRC complex is unique amongst rare carbonatite complexes. Beyond the deposits, unique genesis geochemical characteristics may begin to shed light on these differences. The intrusion has very low fluorine content suggested by the absence of the mineral pyrochlore ((Ca,Na)2(Nb,Ta)2O6F), (Hogarth, 1989). Uranium, thorium, cadmium, arsenic and other heavy metal contents are low (Sage 1987a) particularly compared with other carbonatite complexes (Hogarth, 1989, Sage 1987b).

These observations are important, particularly the low fluorine content, which precludes the formation of pyrochlore and the corresponding accumulation of radioactive ions and heavy metals (Hogarth 1989). Low fluorine also results in the substitution of chlorine for fluorine in the apatite mineral. Chlorapatite is considered more soluble than fluorapatite (Veldhuyzen, 2002). The complex is almost entirely comprised of sovite (igneous calcite). This would result in a higher proportion of volatile elements (OH, CO_2). With the lack of fluorine, OH and carbonate substitution is also likely. These geological conditions would result in the formation of very reactive apatite and thus no accumulation of apatite in the residual sands (residuum). The current research being conducted by Dr. Torres Duggan is further evaluating this difference.

The SRC complex is comprised of four major rock units defined by mineral composition. These divisions are rocks with high silicate content within the outer core comprised of silicocarbonatite, ijolite and pyroxenite phases and lower-silicate carbonatite, sovite, occurring towards the core of the complex (Sage 1987). All major rock units are quarried together to produce the current SRC product predominated by biotite sovite, pyroxenite and ijolite where much of the biotite has been weathered to vermiculite. The reason for the biotite to vermiculite transformation is because the Company is quarrying the residual cap overlying the bedrock described above.

Currently this friable mixture of main rock units is estimated at +1,000,000 tonnes before exposing underlying bedrock. Exploration, to date, of the bedrock indicates an increase of phosphorous grade from current, 2.73%, to +5.0% P_2O_5 and potash from 1.16% to +2.5% K_2O. More importantly it will enable the Company to develop unprocessed calcium-phosphorous and potassium-magnesium concentrates.



Spanish River Carbonatite Complex Schematic

Not to Scale

Modal Composition

30 to 100% Calcite ($CaCO_3$) SRC has a loosely bonded crystal structure resulting in increased reactivity.

0 to 80% Vermiculite/Biotite mica is primary, high activity clay, which exchanges potassium cations for OH and becomes vermiculite.

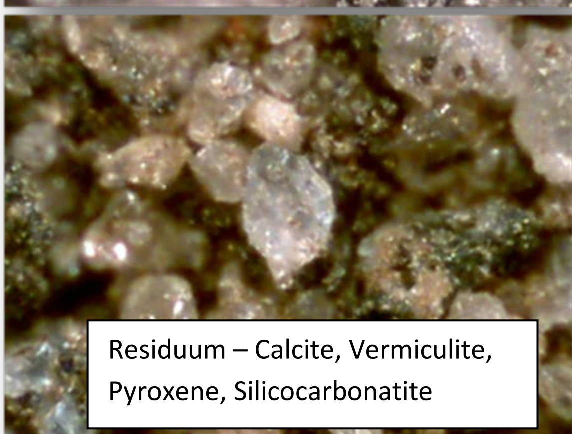
0 to 80% Pyroxene group of minerals rich in silica, magnesium and iron. During the formation of soil clays, magnesium is consumed in large quantities to form high activity clay minerals such as chlorite, smectites and illites.

0 to 15% Apatite is a source of phosphorous. SRC is unique due to low concentrations of cadmium and uranium.

Current Average Geochemical Analysis for 1 Tonne of Spanish River Carbonatite Residuum

Sovite

Biotite Sovite



Residuum – Calcite, Vermiculite, Pyroxene, Silicocarbonatite

Mineral Composition

- 500 kg Magmatic Calcite (Calcium Carbonate) - the only magmatic calcite sold in North America.
- 150 kg Vermiculite- Biotite (Potassium Mica)/ Vermiculite; Biotite is a potassium bearing mineral; Vermiculite is a high activity clay.
- 80 kg Ijolite (silicocarbonatite) – pyroxene, nepheline, - silicate minerals
- 90 kg Pyroxene - a magnesium silicate
- 120 kg Apatite (Rock Phosphate)
- 60 kg Trace Minerals – Manganese, Sodium, Sulfur, Cobalt, Copper, Iron, Zinc, Rare Earths

Spanish River Analysis – January 2024 Accredited Laboratory - ALS Geochemistry

SiO2	24.10%
Fe2O3	10.10%
CaO	30.20%
MgO	3.29%
Na2O	2.13%
K2O	1.16%
MnO	0.18%
P2O5	2.73%
S	0.05%
Co	18.25 ppm
Cu	40.50 ppm
Zn	78.30 ppm

Deleterious Metals:

Cr (Chromium)	8 ppm
Cs (Cesium)	0.71 ppm
Sn (Tin)	2.5 ppm
U (Uranium)	1.63 ppm
As (Arsenic)	<0.10 ppm
Hg (Mercury)	0.008 ppm
Sb (Antimony)	<0.05 ppm
Cd (Cadmium)	0.197 ppm
Pb (Lead)	5 ppm

Currently quarried mineral composition is 50% calcite, 15% biotite/vermiculite, 8% ijolite (silicocarbonatite), 12% apatite, 9% pyroxene and 6% accessory minerals

Application Advantages over Ag Lime

Table 3.—Lime requirement test (SMP) interpretation.

Lime requirement test value (SMP)	Desired soil pH: pH 5.6	pH 6.0	pH 6.4
	Lime to apply to attain desired soil pH[a] (t/a)		
6.7	0	0	0
6.6	0	0	1.0
6.5	0	1.0	1.7
6.4	0	1.1	2.2
6.3	0	1.5	2.7
6.2	1.0	2.0	3.2
6.1	1.4	2.4	3.7
6.0	1.7	2.9	4.2
5.9	2.1	3.3	4.7
5.8	2.5	3.7	5.3
5.7	2.8	4.2	5.8
5.6	3.2	4.6	6.3
5.5	3.6	5.1	6.8
5.4	3.9	5.5	7.3
5.3	4.3	6.0	7.8
5.2	4.7	6.4	8.3
5.1	5.0	6.9	8.9
5.0	5.4	7.3	9.4
4.9	5.8	7.7	9.9
4.8	6.2	8.3	10.4

[a]"Lime to apply" values are based on application of 100-score lime and 6-inch soil sampling depth. For example, lime to apply = 1.7 t/a when desired soil pH is 5.6 and the lime requirement test (SMP) value is 6.0.

All too often SRC is compared to lime because of calcite ($CaCO_3$) content, hence the Company's scientific validation of inherent reactivity properties and other critical minerals found. As stated, average applications of SRC historically were 1.0 to 1.5 tonnes/hectare on acidic soils compared to typical liming recommendation of 2.0 to 4.0 tonnes/hectare for limestone or dolomite.

Ongoing research stipulated that SRC was to be tested against typical liming agents to evaluate effectiveness at the recommended application rates for both. Other important considerations that must be considered in this evaluation are ease of spreading and credit given for macro-micro nutrients found in SRC. Liming materials are very difficult to store and spread whereas SRC has no restrictions and can be stored indefinitely without cover. Given credit for P, K, Si, Mg, high activity clays and trace elements at reduced application rates verses aglime, SRC is more economical.

Additionally, unlike Lime, SRC does not wash away and does not have to be applied annually for the same outcomes.

Agromineral Comparison

When compared to accepted and well recognized agromineral amendments, SRC contains minerals, chemistry and attributes that these individual mineral resources specifically claim. The table below shows the concentrations of SRC compared to available products on the market. SRC is unique as it has a wide range of properties that make it difficult to compare to the other market products due to all the other benefits it brings. Further to this, the composition supports and enhances microbial action. Taking into consideration the cost of individual products, transportation, blending and applying a balanced fertility program, substituting with SRC will be more cost effective. The Table below displays the contribution of different nutrients and/or minerals (e.g. clay minerals) for featured total application rates.

Agromineral Comparison With Spanish River Carbonatite

Agromineral	Brand Name	Formula	%	CaCO3 (kg/ha)	P2O5 (kg/ha)	K2O (kg/ha)	MgO (kg/ha)	SiO2 (kg/ha)	Trace Elements (kg/ha)	REE's (kg/ha)	Clays (kg/ha)	Typical Application (kg/ha)
Calcium												
Carbonatite	SRC	CaCO3	50%	750								1500
Limestone		CaCO3	>85%	2550								3000
Dolomite		CaMg(CO3)2	55%	1650								3000
Marl		CaCO3	85%									
Gypsum		CaSO4	29%									
Burnt Lime		CaO	100%									
Wollanstonite	Canadian Wollanstonite	CaSiO3	26.50%	398								1500
Phosphorous												
Apatite	SRC		12%		40.95							1500
	Volcano Phos		100%		59.25							250
	Tennessee Brown		100%									
Francolite												
Potassium												
Carbonatite	SRC	K2O	1.16%			17.4						1500
Langbeinite	Kmag, SolPoMag		22.7%			56.75						250
Glauconite	Greensand		7.5%			18.75						250
Magnesium												
Carbonatite	SRC - Pyroxenite	MgO	3.3%				49.5					1500
Dolomite		MgO	22.0%				660					3000
Langbenite	Kmag, SolPoMag		11.7%				29.25					250
Wollanstonite	Canadian Wollanstonite	MgO	6.6%				99					1500
Silicates												
Pyroxenites & Ijolite	SRC	SiO2	24.1%					361.5				1500
Wollanstonite	Canadian Wollanstonite	SiO2	55.2%					828.0				1500
Trace Elements												
Carbonatite	SRC	traces	6%						90			1500
Volcanic Ash	Azomite	traces	100%						250			250
REE's												
Carbonatite	SRC											
	Volcano Phos											
High Activity Clays (CEC)												
Vermiculite/Biotite	SRC		15%								225	1500
Zeolites			100%								250	250
Glauconite	Greensand		90%								225	250
Vocanic Ash	Azomite		90%								225	250
	SRC			750	40.95	17.4	49.5	361.5	90		225	

SRC Benefits for Animal Nutrition and Health

There have been a large number of traditional customers that have fed SRC to small chicken flocks and mixed it in with mineral supplement for ruminant animals. Anecdotal feedback from these individual farmers, particularly small chicken flocks, was increased shell thickness in eggs, better feed conversion for hens and an overall improvement in flock health.

One of our distributors, Francis Cornish, was an egg producer in Ontario and we convinced him to run trials with SRC. The test results were significant enough that the distributor, L.H. Gray & Sons, sent agronomists to investigate.

Francis documented, "*For more calcium I was adding Spanish River Carbonatite (supplied by Russ Anderson of Andersan Lime Service and Haulage Ltd.) 65% calcium and other trace nutrients, which I add 10 to 15 lbs. /1.0 ton of feed. I feel it was this product that lowered my crack, because when I ran out of the Spanish River my cracks increased in number. So this new flock I store up several tons of Spanish River Carbonatite to be used for the full flock, to see if I get a lower reading of cracks near the end of the flock. (Another observation I noticed about Spanish River is that while I was using it Mites started to disappear and started to reappear in small numbers three or four weeks after I ran out.)*"

All parameters changed with the introduction of SRC: egg breakage, flock health and feed conversion.
In Boreal's lead up to field applications of SRC, all potential deleterious components of SRC were evaluated. Where we were well aware of potential hazardous metals and radioactive minerals Carbonatites are a favored host of anomalous levels of rare earth elements ("REEs"). A review of rare earth effects on plants, animals and soil have indicated positive benefits of rare elements in agriculture. With the ban on antibiotic use in farm animals, veterinaries have been looking at alternative feed additives to enhance performance. REEs have been introduced as new feed additives to improve animal health and production. Based on the previous literature, REEs reportedly enhance milk, egg, and meat production.

The use of rare earth elements as trace nutrients in agriculture including plants and animals is widely practiced in China starting with extensive studies commencing in 1972. Common responses of plants to rare earth application are to be in the order of 5 to 15 % and sometimes even higher (Xiong, 1995). In addition to plant yield increases, improvements in product quality, comprising increased sugar content in sugar cane, increased vitamin C content in grapes and apples and increased fat and protein content in soybean (Brown et al., 1990) (Wan et al., 1998), have also been reported for a wide range of crops. Furthermore, rare earth supplementation was reported to decrease the content of chemical residues in several crops such as rice, orange, watermelon, grape and pepper. Many of the observable changes in plant physiology documented by the Chinese were witnessed in early SRC farm trails and subsequent third-party scientific research.

With the current trend of eliminating cages in the poultry industry an unintended consequence has been losses due to black bone syndrome in fast growing chickens. The unique inherent reactivity characteristics of SRC's igneous calcite, pyroxene, vermiculite and REE's, as well as improve laying hen performance, could effectively address this problem. We will be commencing scientific research to substantiate our early findings.

Conclusions

The leading hypothesis on the origin of the SRC Complex has led to speculation on why the deposit is void of the mineral pyrochlore and low concentration of detritus elements. This fortuitously has resulted in SRC ideal for direct application to agriculture soils. Unique amongst rare carbonatite occurrences, the deposit is comprised of four major rock units defined by mineral composition, which are sovite, pyroxentite, silicocarbonatite and ijolite.

The main conclusions were that SRC buffered soils against acidic conditions as evidenced by soil pH. Increased root development caused by SRC indirectly made carbon more available boosting soil microbiological activity. On this point, geomicrobiology research also indicates that mineral components such as silicates and high activity clays have a pronounced effect on soil microorganisms, which SRC is well supplied with both. Lastly SRC made the soil conditions such that increased nodulation and plant growth occurred as demonstrated when plants were given both rhizobial inoculant and SRC. All main findings occurred in initial applications, which is a testament to reactive nature of SRC.

The agronomic effectiveness of SRC compared to limestone arises from the combined effects and interaction of calcite, other mineral components like Ca/Mg silicates, as well as by the nutrient supply (e.g. P, K, etc.). In other words, the capacity of SRC to ameliorate soil acidity is not just associated with sovite (calcite), content but also contribution from Ca/Mg silcates and direct nutrient supply improving the base saturation and increased soil pH. Hence, there is a combined effect where SRC functions as a rock fertilizer and also as a "soil acidity ameliorator" (i.e. as a soil conditioner and/or soil amendment).

The most telling result that occurred in tomato greenhouse trials in Mexico was productivity in soils that has nutrient sufficiency. This was confirmed in Chinese research where SRC was part of a fertility program. The main findings that have suggested itself from the attached compilation is effectiveness of increasing nutrient efficiency with the utilization of 1000 kg/hectare to 1500 kg/hectare SRC in a balanced fertility program. Many of the studies compared the addition of SRC to traditional fertility recommendations. The control plot utilized fertility recommendations specific to the crop being tested whereas the experimental plots added SRC at different quantities with fertilizers. Plant and soil responses were dramatic and very significant in these tests. Where no fertilizer was used, either in control or SRC plots, results were less evident. It has always been our contention that SRC is an important contributor to designed fertility programs, which results in higher yield, higher crop nutritional status and effectively improving soil fertility features that have been compromised due to historical agriculture practices (e.g. physical and biological degradation, soil nutrient depletion, acidification, among others) The Mexican research was the only jurisdiction that looked at cost benefit to growers. Detailed business case histories are recommended to demonstrate the economic benefit of SRC applications.

In all cases SRC effectively addressed plant metal toxicities and stabilized these metals in the soil. Addressing this very critical issue alone will result in a significant increase in plant nutrition and yield. Singularly addressing soil and plant metal toxicity, which is becoming a global problem, will result in increased plant nutrient uptake and yield.

Not discussed at length in this document but of growing awareness is the role of silica in agriculture. It is now recognized that silica is not only important in plant health, but soil carbon sequestration and stabilization. As stated by Song (2012), “It is well documented that terrestrial cycles of silicon and carbon driven by plants and soil organisms play a vital role in the regulation of atmospheric CO2. The processes recognized are: (i) mineral weathering facilitated by life, (ii) the formation of phytoliths, (iii) accumulation of secondary clay and (iv) protection of soil organic carbon through aggregation"

SRC pyroxentite, silicocarbonatite and ijolite mineral phases are essentially comprised of calcium and magnesium silicates, which are cited in numerous scientific studies contributing to the four critical plant and soil attributes cited by Song.

Current Situation

The company has 100K tonnes of SRC mined, stockpiled and ready for shipping.

The Company is permitted for 300K tonnes annually and will start the permitting for a million plus annually when required.

As seen in the SRC schematic diagram above the upside of the deposit is unlimited. The original deep hole went 600m and the entire hole was in SRC. In 2020 five more shallow holes were drilled and the entire holes were SRC. All holes are open at depth.

We have the ability to move the product in multiple ways:

1. Via rail
2. Shipping via the Great Lakes
3. One Tonne bags in shipping containers or trucked.
4. 20kg bags
5. Truck transport

We are also experimenting with pelletizing the product and have a customer trial in Ontario this spring. We have also micronized the product successfully.

We are willing to enter into multiple-year contracts and/or one time sales. Our preference is to sell to customers who will share the results of the product applications. Our preference is in bulk sales for our initial stockpile.

Once the initial 100K stockpile has been sold we will be initiating more drilling and studying the property to come up with a long term mine plan and look closer at specialty product possibilities. We have a unique product that is valuable and versatile and those in early will see price benefits.

Supporting Research – *(supplied on request)*

<u>Farm Trials</u>

Aluminum Toxicity

Marlette, Michigan, Chatham & Sudbury Ontario Field Trials
Kerr Farms, Chatham, Ontario

Fruit Applications

Juicy Fruit Orchards & Farm Market – 5 Year Orchard Trials
Chatham Orchards – Increased Brix and Yield
Herman Eggers – West Virginia

Dan Haist, Niagara Ontario
Pelee Island Winery – SRC Manure Free Compost

Vegetable Production
Norfolk Soil and Crop Improvement Association – 3 Year Asparagus Trial
Northern Ontario Organic Research (NORDC) – Organic Potato Trial

Compost Trials
Golden Innisfree Farms Compost Trials, Erin Ontario
Day Construction – Vessel Composting Experimentation, Sudbury Ontario

Field Trials

Turf Grass & Ornamental

Growing Mediums

<u>Wilfrid Laurier & Algoma Universities</u>

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<u>Western University</u>

Pratricia L. Corcoran, Laurisha Bynoe & Carolyn M. Hill, (February 2020), Geochemistry of the Spanish River Carbonatite Complex – An Engage Project done in partnership with Boreal Agrominerals, Western University.

<u>Brock University</u>

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<u>Mexico</u>

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Scientific Studies and Field Trials Compilation of SRC

The following two pages summarize the reference papers and trials that support all the claims of this paper.

Spanish River Carbonatite - Studies Compilation

Country	Affiliation	Study	1	2	3	4	5	6	7	8	Remarks
Canada	Wilfrid Laurier University	Jones James, (2014), Master Thesis		◊		◊	◊	◊	◊		It was found that a mix of 1:10 SRC:Soil was optimal
	Wilfrid Laurier & Algoma Universities	James Jones, (2016), Spanish River Carbonatite: Its benefits and potential use as a soil supplement in agriculture, Thesis and Dissertations		◊		◊	◊	◊	◊		Indicated that SRC may contain unique microbiology that warranted further investigation
		J.M.C. Jones, F.C. Guinela, P.M. Antunes, (2020), Carbonatites as rock fertilizers: A review, Rhizosphere 13, 2020, 100188.						◊		◊	Carbonatites are igneous rocks made mostly of carbonate minerals with a relatively high weathering rate and often containing nutrient-bearing accessory minerals, (e.g., apatite and biotite).
	Brock University	Heather VanVolkenburg, BSc (Hons), (2019), Exploring Diversified Vineyard Ecological Soil Management Strategies: Impacts of cover cropping, Spanish River Carbonatite, and smooth pigweed , (Amaranthus hybridus) interactions on an agroecosystem						◊			
	Boreal Agrominerals	Juicy Fruit Orchards & Farm Market				◊		◊			5 year study applying 500kg/hectare yearly resulting in achieving brix increases to 13-14. In Russets achieved brix levels of 17-18, the highest in the Lampton Shores orchard growers.
		Chatham Orchards				◊	◊	◊			4 year study applying 430kg/hectare yearly resulting in increased reproductive growth, (more buds); 1999 average brix - 12, 2004 average brix - 17; 1999 yield 48 bins, 2004 yield 56 bins per acre.
		Norfolk Soil and Crop Improvement Association - Three Tear Asparagus Trial				◊	◊	◊			SRC plot had double the root mass and spear numbers, Control plot brix average 7 to 8%, SRC plots 12 to 13%; yield control plots 5242 lbs, SRC plots 5832 lbs per acre, a 10% gain, which could be significantly higher if harvest continued.
United States		Arise Research & Discovery Inc.	◊			◊	◊	◊			R&D suggested SRC can play a significant role in boosting mineral availability in mineral deficient, low CEC soils present in southern Illinois; increased chlorophyll production; decreased aluminum and cadmium; dramatic yield increases, control 22.9 bu/acre, 56.1 bu/ac with 1500 lb/acre SRC application.
Canada & United States		Aluminum Toxicity - Acid Soil Environments - Marlette Michigan, Chatham & Sudbury Ontario	◊								Average application of 1000 lbs/acre SRC reduced aluminum in every location
Canada		Kerr Farms - Chatham Ontario	◊			◊					Analysis of clover cover crop, control Ca 0.81%, Al 1181 ppm, 500 kg/hectare SRC Ca 2.45%, Al 263 ppm; increased brix and density of tomatoes contracted to Heinz.
		Day Construction - Vessel Composting Experimentation			◊					◊	Control compost contained 143.7 ug/g Cu, 114.15 ug/g Ni, SRC at 1:10 SRC: Organic Inputs resulted in 6.06 ug/g Cu, 2.54 ug/g Ni in finished compost; produced certified compost in half the time with a muturity index of 8 without any limitations to usage.
Mexico	Dr. Nadia I. Torres Flores; Dr. Juan C. Pichardo Riego; Dr. Hector E. Felt Herrera; Dr. Fernando C. Gómez-Merino	Effect of the Product "Spanish River Carbonatite" on Onion (Allium cepa) in Greenhouse Conditions				◊	◊				Results indicate that the variables evaluated during vegetative development were better with the dose of 2.0 tonnes/ha-1, while in the production stage the dose of 0.5 t ha-1 favored plant height by 6%, the bulb diameter by 35%, 0.5 tonnes/ha-1 under greenhouse conditions.
		Effect of the product " Spanish River Carbonatite" on Tomato (Solanum lycopersicum) in Conditions of Nutrient Calcium Deficiency in Greenhouse				◊	◊				During the reproductive stage, the dose of 0.5 t ha-1 increased the weight of fruits by 10% and therefore favored sizes; the yield and economic analysis increased with the dose of 2.0 t ha-1 by 4 and 5%, respectively, compared to the control.
		Effect of the Foliar Application of "Spanish River Carbonatite in Tomatoes (Solanum lycopersicum) in Conditions of Nutrient Calcium Deficiency in Greenhouse				◊	◊				The number of total fruits and the equatorial and polar diameters are improved using a dose of 10 kg/ha-1, by 40% and 31%, respectively; performance and economic analysis were higher with 10% and 14% with the dose of 30 kg/ha-1.

1 - Plant Metal Toxicity
2 - Raising Soil pH
3 - Soil Stabilization of Heavy Metals
4 - Increased Plant Nutrient Uptake
5 - Increase Root Mass & Fruiting Production
6 - Increased Efficiency of Fertilizer Inputs
7 - Soil Microbial Increases & Stimulation
8 - Mineral Reactivity

Spanish River Carbonatite - Studies Compilation

Country	Affiliation	Study	1	2	3	4	5	6	7	8	Remarks
Mexico	Ziana Gomez Soto University of Chapingo Department of Soils	Effect of Product " Spanish River Carbonatite" on Tomatoes (Solanum lycopersicum) in Conditions of Nutrient Sufficiency Under Glass				◊	◊	◊			0.5 t ha-1 SRC, with the increase of the caliber of the fruits up to a 40% in large and extra large, in the number of fruits there is 58% more in the third cut, the weight of fruits and the equatorial diameter are increased by 28%, the yield is increased by 14% and in the economic analysis it was obtained that profits are obtained of 20%.
		Effect of Product " Spanish River Carbonatite" on Tomatoes (Solanum lycopersicum) in Conditions of Nutrient Deficiency in Greenhouse				◊	◊				Increased plant height by 2%, bunch number by 2%, clusters with flowers in 6% and length of leaves in 2%. In the parameters of production, performance and economic analysis the results are greater with the dose of 1.5 t ha-1 in 39% in the number of total fruits, 18% in the weight of fruits, 11% for the estimated yield per hectare and 12% for the analysis economical according to its calibers.
		Biological Effectiveness of Spanish River Carbonatite as a Toxic Metal Immobilizer in Soil	◊	◊	◊						The Spanish River Carbonatite (SRC) fertilizer had a different effect on each metal. For cadmium SRC had a positive effect on water-soluble fraction in soil after harvesting, both in relationship in the root, soil and plant. A postive effect was noted in the interchangeable form. With lead after harvesting a positive effect was observed in fractions linked to organic matter, carbonate and residuals. A positive effect was obeserved in all plant fractions.
Peru	L. De Los Santos Valladares, J. H. Jhoncon Kooyip, L. E. Borja Castro	Characterization of Spanish River Carbonatite (SRC) for Agricultural Fertilizer				◊	◊				Detailed mineralogical interpretation, Postive application on sweet cucumber, expressing itself in high foliar biomass.
	Alejandro Aguilar	Results of the Application of Carbonatita in Culture of Native Potatoes				◊	◊	◊			Yields of the plants without carbonatite were 1 to 1.5 kg/plant with SRC 3 to 4 kg/plant; little storage deterioration was observed.
	Jose Anaya Yabar	Spanish river Carbonatite & Superfoods of Peru - Inca Inchi					◊	◊			Seed production per hectare 2-3 tonnes. SRC at 1 tonnes/hectare produced 7 tonnes seed per hectare.
India		India Trials - Bottle Gourds - SRC verses Rock Phosphate, (Supplemental Notes Incl.)				◊	◊	◊			SRC recorded better performance in terms of vegetative growth, number of fruits and crop harvest; standard fertility practice - # of fruit 6842, total weight: 2180 kg, SRC, (250kg) plot - # of fruit 10,711, total weight 2825 kg.; 50% & 30% increase repectively.
China	Zhiyi Zhang, Li Yang Luping Ding	Spanish River Carbonatite (Calcium Carbonate Igneous Limestone) Reduced Bio-availability in Paddy Soil of China: Case Studies of Field and Pot Experiments	◊		◊			◊			Reduced Cd bioavaiability similar to aglime; reduced Cd toxicity in plants; reduced Cd in rice roots; replaced phosphorous fertilizer.
	Zhang Zhiyi, Xin-xing Nie Li Yang, Xian-peng Fan Yan-feng Yu, Lu-ping Ding	Effects of natural igneous rocks on bioavailability of cadmium in soils with different pollution levels	◊		◊						Content of acidic Cd decreased by 6%~14%; iron-manganese oxidized Cd and organic Cd increased by 8%~9% respectively, SRC significantly inhibited Cd uptake by rice roots, straws and grains, with decreases of 53.7%, 69.8% and 54.6% respectively.
	Institute of Soil Research, Chinese Academy of Sciences	Report on the field effect test of Spanish River Carbonatite soil conditioner in Yujiang Jiangxi Province in 2018	◊	◊	◊						Application of 1.1 t/ha in red soil dry land can increase pH vaule by 0.16 units & soil potential acidity; Exchangeable acid and aluminum in soil was reduced by 0.59 cmol/kg and 0.11-0.37 cmol/kg; peanut yield increased by 59.40 kg/ha
	Wuhan Bolai Ecological Agriculture Science and Technology Co.	Natural agricultural minerals SRC, in the grape "Sunshine Rose" applied trial report				◊	◊	◊			SRC application has a great impact on the quality of grape "sunshine rose". ear weight and grain weight of SRC-100 (SRC 100 kg / mu) increased by 19.85% and 27.57%o, respectively; total acidity SRC-40 and SRC-100 grapes decreased 7.52% and 20.26%; dry matter increased by 4.13% and 13.66%; leaf chlorophyll content is one of the most important indicators used to monitor growth status, leaves of SRC-40 and SRC-100 increased 22.64% and 26.10%

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