The Artemis & Angel Co. Ltd. Bio-fertilizer Credit Fund to Ensure Food Security in Sierra Leone

Artemis & Angel Co. Ltd.
99/296 President Park, Sukhumvit 24, Klongtoey, Bangkok 10110, Thailand
Tel.: (President) +66-86-329-6083; (Sales): +66-99-3377866 Fax: (Sales) +66-2-661-1752
E-mail: (Sales) artemisandangelcoltd@gmail.com Website: www.artemisthai.com

1. Proposal Summary

Summary

- Artemis & Angel Co. Ltd will provide US$25 million (or more) per year of two advanced bio-technology, liquid, 100% organic bio-fertilizers on an interest-free, 12-month L/C, 30% deposit, to enable the government of Sierra Leone to phase out chemical fertilizers and sprays over 3-5 years. In Year 1 they can be reduced by 50%.
- We will guarantee the price of the bio-fertilizers for the duration of the contract, which can be for up to 5 years.
- The Credit Fund will help to ensure the country's food security and to achieve the goals of Pillar 1 in the ***Agenda for Prosperity***.

Summary

- The Credit Fund will ensure an adequate and continuous supply of healthy, 100% organic and chemical-free fertilizer for all farmers.
- All farmers will be able to receive on credit the bio-fertilizers for their crops, and pay back after selling their crops.
- The bio-fertilizers will increase the quality and yield of crops significantly above what chemicals can achieve, and for a lower cost. The nutritional content of food will be higher.
- Farmers not using any fertilizer will be able to restore the soil's fertility and increase the yield and quality of their crops.
- There will be a significant impact on the happiness, stress levels, health, and wellbeing of the population.

Summary

- In order to phase out chemical fertilizer gradually, the farmers can start off with bio-chemical farming whereby they can **halve** the amount of chemical fertilizer they use and still increase their yield.
- After 3 years, farming in the country could be 100% organic with higher yields and lower costs, and no use of pesticides and insecticides.
- The bio-fertilizers will restore the microbial life and fertility of the soil. This will enhance the yields and quality of all crops.
- The money saved on subsidizing chemical fertilizers and sprays can be used to develop rural infrastructure, irrigation, farming community and rural development projects, and strong, prosperous farming communities.

Summary

- The Credit Fund will provide the means to increase the area of arable land used for crops, to diversify crops, to make agriculture sustainable, and to help to ensure the country's food security.
- Agriculture-related industries can be developed:
  - The horticulture industry will benefit tremendously. The bio-fertilizers have a noticeable effect on the scent, quality, size, and freshness of flowers, which also keep longer.
  - Jatropha can be grown for biofuels and animal feed.
  - • 100% organic cocoa and organic latex for exporting.
- The country can become an exporter of 100% organic food.
- Bio-Plant can be used to turn waste into fertilizer as well as to treat waste water.

2. The Credit Terms

The Credit Terms

- We can provide the bio-fertilizers on credit for 12 months for purchases of US$25 million. The amount can be increased as Plan B below shows, or simply doubled.
- A 30% deposit would be paid when the contract starts. The remaining 70% would be paid at the end of each 12-month period.
- As long as a 30% deposit is paid, Plan A and Plan B, or multiple variations are possible.
- A contract can be for 5 years or more. The price will not change for the duration of the first 5-year contract.

The Credit Terms

- 0% interest.
- The bio-fertilizers will be shipped in partial shipments month by month.
- Each container holds 12,240 litres.
- Payment will be by a Standby Letter of Credit guaranteed by one of the following international banks:
  - Citibank (USA); HSBC (Hong Kong); Commerzbank, Deutsche Bank, or Dresdner Bank (Germany); Lloyd's Bank (UK).

Suggested Plans

- **Plan A:** **Bio-chemical Farming.**
- **Purpose:** To change chemical agriculture in Sierra Leone to 100% organic farming by means of bio-chemical farming.
- **Terms:**
  - **Y**ear 1: US$25 million
  - Year 2: US$25 million
  - Year 3: US$25 million
  - Year 4: US$25 million
  - Year 5: US$25 million
  - Total: US$125 million
- *Note: The amount can be up to US$100 million per year.*

Suggested Plans

- **Plan B:** **100% Organic Farming.**
- **Purpose:** To develop 100% organic farming in Sierra Leone once Plan A has been carried out.
- **Terms:**
  - **Y**ear 1: US$25 million
  - Year 2: US$45 million
  - Year 3: US$65 million
  - Year 4: US$85 million
  - Year 5: US$105 million
  - Total: US$325 million
- *Note: The amount can be US$100 million per year.*

3. The Financial Benefits for Sierra Leone of the Bio-fertilizer Credit Fund

With bio-chemical farming used as the strategy to phase out chemical fertilizers.

Imported Fertilizer Amount 200,000 MT

(Scale up the figures for the actual volume of imported chemical fertilizer.)

The following picture of condominium buildings are an analogy to show graphically the amount of the savings that Sierra Leone could achieve in bio-chemical farming by using Bio-Plant and Pro-Plant.

Example of Annual Urea and NPK Fertilizer Costs

- Amount of Urea Imported: 100,000 MT
- Amount of NPK Imported: 100,000 MT

- Price of Urea: US$250 MT
- Price of NPK: US$450 MT

- Cost of Imported Urea: US$25,000,000
- Price of Imported NPK: US$45,000,000
- Total Cost: US$70,000,000

Bio-chemical Farming Savings
Project A: Bio-Plant Only

- Amount of Urea Used: 50,000 MT
- Amount of NPK Used: 50,000 MT
- Amount Saved: 100,000 MT

- Cost of Urea Used: US$12,500,000
- Cost of NPK Used: US$22,500,000
- Total Cost: US$35,000,000

- **Savings = – 50%: US$35,000,000**

Amount of Bio-Plant Used

- Mix 1 litre of Bio-Plant with 3 x 50 kgs of Urea. *Or:* Mix 1 litre of Bio-Plant with 150 kgs of Urea.
- Mix 7 litres with 1 MT of Urea and you can use the 1 MT over twice the area. *Or:* Mix 3.5 litres with 0.5 MT. The yield will still increase.
- Total Needed:
  - 50,000 MT of Urea + 50,000 MT of NPK
  - 350,000 litres of Bio-Plant x 2 = 700,000 litres

Costs in Bio-chemical Farming
Project A: Bio-Plant Only

- Amount of Urea Used: 50,000 MT
- Amount of NPK Used: 50,000 MT

- Cost of Urea Used: US$12,500,000
- Cost of NPK Used: US$22,500,000
- Total Cost: **US$35,000.000**

- Cost of the 700,000 litres of Bio-Plant @ US$16 per litre = **US$11,200,000**

- Note: US$16 is shown here as an example for the sake of presenting the possible savings. It is not necessarily the selling price.

Project A: For a 10% Higher Yield
Bio-Plant Only

The yield will increase about 10% in Year 1 with savings of:

US$35,000,000 - US$11,200,000

= US$23,800,000

Project B: For a 30% Higher Yield
Bio-Plant and Pro-Plant

- 50,000 MT of Urea saved
- 50,000 MT of NPK saved
  - Total = 100,000 MT of chemical fertilizer

    = US$35,000,000 saved

- Additional Cost: <u>for a higher yield of about 30%</u>
  - 700,000 litres of Bio-Plant @ US$11.2 million
  - 700,000 litres of Pro-Plant @ US$11.2 million

    = US$22,400,000 extra cost

Project B
Savings With a 30% Higher Yield

1. Urea/NPK/etc. Savings:	US$35,000,000
2. Bio-fertilizer Used:	US$22,400,000
3. Total Savings:	**US$12,600,000**

Project B

Savings With a 30% Higher Yield

The yield will increase about 30% with savings of US$12,600,000.

Three-Year Plan
With Bio-chemical Farming

- Chemical fertilizer could be reduced throughout Sierra Leone by 50% in Year 1, 25% more in Year 2, and the other 25% in Year 3 - total US$70,000,000.
  - Year 1: 50% - Savings US$35,000,000
  - Year 2: 25% - Savings US$17,500,000
  - Year 3: 25% - Savings US$17,500,000

= Total Savings: <u>US$70,000,000</u>

Five-Year Plan
With 100% Organic Farming

- Chemical fertilizer could be reduced throughout Sierra Leone by 20% each year over 5 years - total US$70,000,000.

  - Year 1: 20% - Savings US$ 14,000,000
  - Year 2: 40% - Savings US$ 28,000,000
  - Year 3: 60% - Savings US$ 42,000,000
  - Year 4: 80% - Savings US$ 56,000,000
  - **Year 5: 100% - Savings US$ 70,000,000**

Would these savings benefit Sierra Leone?

4. The Main Benefits

Infrastructure Development

The Fertilizer Subsidy Can Be Used to Build Infrastructure and Create Jobs

- The terms we are proposing are 12 months with 0% interest so that the government does not have to spend money on subsidizing fertilizer for the farmers.
- Instead, the subsidy can be used for farming infrastructure projects, such as irrigation, roads to farming communities, rural electricity, youth training, farming community training and development projects, food processing industries, etc.

Inadequate Infrastructure Affects Food Security

- Inadequate infrastructure is a major impediment on the path towards food security.
- Erratic electricity supply and bad roads affect farming, and “Consumers too are negatively affected by poor infrastructure and floods during the rainy season.” (World Food Programme)


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Infrastructure Is Needed to Increase Rice Production

1. Rehabilitation and construction of feeder roads in key locations that will facilitate access to rice growing areas for easy supply of inputs and evacuation of produce; as well as for inland valley development where rice can be grown.

Infrastructure Needed to Increase Rice Production

2. Provision of community service infrastructure including construction of farm market centres, daily retain markets, irrigation schemes; post-harvest processing of produce at on-farm and village level including drying floors and crop store, and rice hulling and milling machines.

Eradication of Poverty

The Farmers Can Receive the Bio-fertilizers on 12 Months Credit

- The government can distribute liquid, 100% organic, bio-fertilizer to the farmers without having to subsidize fertilizer or use its own resources.
  - The poor can be given the bio-fertilizers on credit to restore their soil so that they can produce a good crop yield. They can pay for the bio-fertilizers after selling their harvest.
  - This will help all farmers not only to obtain fertilizer easily, but also to increase their income and be able to be afford 3 meals a day.
  - This alone will have a great impact on their happiness, stress levels, health, and feelings of wellbeing.

Ways the Credit Fund Can Be Used to Deal with Hunger

- Fertilizer subsidies can be used instead:
  - To provide the technology and farming equipment farmers need to farm.
  - To clear, cultivate, and fertilize unused land.
  - To build irrigation systems that will increase yields.
  - To build and repair roads that provide access to markets, which will provide more income.
  - To develop the extension services, which can help farmers to increase their yields.
  - To train the youth so as to encourage them to return to the villages to carry out agriculture.

Some Benefits for Dealing with Hunger and Poverty

- The Credit Fund will provide the country with a large amount of microbial fertilizer, which will restore and fertilize the soil, so that crops can be grown with higher yields.
- Chemical fertilizers ruin the soil's fertility and reduce yields in the long-term while increasing pests and disease.

Some Benefits for Dealing with Hunger and Poverty

- The Credit Fund will provide the country with a large amount of microbial fertilizer, which will:
  - Grow highly nutritious food. The nutrition and energy of organic crops is much higher than chemical crops.
    - UNICEF has reported that about 34% of the population is physically stunted due to malnutrition. The situation is particularly dire in Moyamba, Pujehun and Kenema districts - some of Sierra Leone's bigger regions.

Some Benefits for Dealing with Hunger and Poverty

- The Credit Fund will provide the country with a large amount of microbial fertilizer, which will:
  - Improve people's health, happiness, and well-being.
  - Farmers will have more money to spend on food because they will not have to buy expensive chemical inputs.

Some Benefits for Dealing with Hunger and Poverty

- The World Food Programme (WFP), the UN organ that fights hunger, reported in 2013 that households in Sierra Leone spend “on average 63% of their total expenditure on food” while about 52% of the population borrows money to buy food. Nearly 53% of the population lives on less than $1.25 a day (World Bank).
- The people will be able to produce enough food for themselves.

Financial Benefits for the Farmers

- The farmers will become wealthier and poverty will be reduced.
- They will earn more from higher crop yields and higher quality.
- They will be able to produce surpluses, which they can sell.
- Export crops can be sold for premium prices.

The Development of Cash Crops and Export Crops

Cash Crops and Export Crops Can Be Developed

- The production of the main crops can be increased (maize, rice, millet, nuts, fruit, cassava, cocoa, sugarcane, coffee, rubber, etc.).
- The country will become self-sufficient in food production.
- Food imports can be reduced, especially rice. In 2013 more than 60% of rice consumed in the country was still imported from abroad.

Cash Crops and Export Crops Can Be Developed

- The Credit Fund will provide the means to develop a wider variety of cash crops and export crops.
- More areas of land can be opened up, fertilized, and developed for cash crops and export crops.
- Areas can be set aside for 100% organic crops for export.

Cash Crops and Export Crops Can Be Developed

- New export crops can be grown on the restored soil, such as flowers.
  - Flowers grown with the bio-fertilizers have a stronger scent, they look fresher and brighter, they are larger, and they keep longer.

Agriculture Can Be Diversified and Eating Habits Changed

- As the production of cassava, beans, potatoes, yams, maize, and other foods increases, prices will drop and they will become affordable.
- Also, the quality and taste improve. As a result, the population can be encouraged more easily to change their eating habits and not only eat rice.
- This will mean that rice imports can be reduced.
- However, at the same time the use of the bio-fertilizers will increase rice production.

Cash Crops and Export Crops Can Be Developed

- The Credit Fund will provide the means to develop a wider variety of cash crops and export crops.
- More cash crop growing areas can be developed.
- New export crops could be grown on the restored and cultivated soil and in greenhouses.
- 100% organic fruits could be grown in large quantities for export. 100% organic fruit juices could then be produced for export.

Sierra Leone Could Change Cocoa Production to Being 100% Organic

- The Credit Fund could be used to change from producing chemical cocoa to 100% organic cocoa.
- The cocoa will be of a higher quality.
- There is a huge global demand for 100% organic cocoa liquor and 100% organic chocolate.

The Benefits for Rice Farming

Some Benefits for Rice Farming

- Yields can be increased so that the country stops importing rice and can export 100% organic rice.
- We will teach the farmers how to use the bio-fertilizers so that Sierra Leone can become a major producer of high quality, chemical-free and 100% organic rice with higher yields and lower production costs.
- We will teach rice-growing techniques to increase the yields and lower production costs.

Some Benefits for Rice Farming

- Money used for fertilizer subsidies can be used instead to:
  - create rice demonstration farms;
  - buy farming equipment;
  - build rice storage facilities and rice mills;
  - build road access to rice farming areas

The Benefits For Rice Production Effect on Seeds

- Rice farmers in Thailand and Vietnam commonly soak their seeds in Bio-Plant and Pro-Plant (20 cc of each in 20 litres of water) for 24 hours before planting in order to increase their crop yield by about 5%.
  - The seeds absorb the micro-organisms and nutrients. The micro-organisms strengthen the immune system and the plants are not affected by disease.
- The seeds are fuller and are sold as mother seeds for a higher price in Thailand and Vietnam.

The Benefits For Rice Production Effects on Rice

- Unlike chemical rice, which is tall and has many green leaves, rice grown with the bio-fertilizers is yellowish-green, shorter, and has fewer leaves.
- The stems are stronger, so the rice plants do not lean over like chemical rice.
- If you pull up a rice plant, you will see about 20% more roots than on a chemical rice plant.
- The roots are stronger and longer.
- The rice heads contain much more grain.
- The rice seeds do not tend to fall off during harvesting.
- The soil is softer and more fertile, and has a lot of worms and insect life.

Benefits for the Agenda for Prosperity

The Credit Fund Will Support the Goals of the Agenda for Prosperity

- Sierra Leone's agricultural sector is growing at 5.3% - shy of the 6% target set by the African Union in 2003 when it adopted the Comprehensive African Agricultural Development Programme (CAADP).

Benefits for Special Projects and Goals

- The Credit Fund will provide funding:
  - To ensure food self-sufficiency, e.g. rice.
  - To make agriculture profitable by using bio-fertilizers.
  - To provide loans and skills training for youth so they can start agriculture ventures.
  - To build agribusiness towns to encourage people to return to farming.
  - To develop a floriculture industry. Flowers grow very well with the bio-fertilizers.

Benefits for Special Projects and Goals

- The Credit Fund will provide funding:
  - To build food, rubber, cocoa, cassava, and fruit processing factories, including building and restoring rice mills.
  - To produce fresh food for a lower cost, and which is chemical-free and healthier.
  - To reduce sharply chemical pollution of the waterways.

Improving the Value Chain

- In short, the Credit Fund can be used to support and improve the value chain, which includes training, farming-related infrastructure, irrigation, improving food quality and production, developing food processing technology, and improving packaging and marketing so that small farmers can obtain better prices for their crops in local and international markets.

Developing Commercial Agriculture

- The Credit Fund will provide the bio-fertilizers, which can fertilize large areas of land for commercial agriculture.
- But not just commercial agriculture: value-added, higher quality and more nutritious, chemical-free, and 100% organic commercial agriculture at a lower cost than current chemical agriculture, and with higher, healthier, disease-free yields.

Beneficial for Reforestation Projects

- The bio-fertilizers can be used to reforest the country and restore eco-systems.
- They will increase the speed of reforestation because usually they make trees grow about 20% faster than when grown with chemicals.

Funding Bio-Fuel Development

- The Credit Fund will provide the means to develop jatropha for bio-fuel as well as other bio-fuel crops.
- Jatropha plantations can be planted on poor soil. The bio-fertilizers would be put in and around the tree holes and sprayed on the trees.
- The Credit Fund would make money available to build a jatropha seed processing and bio-fuel factory.

Benefits for Achieving Food Security

- The new, large areas of crops will not only make food security a reality over coming years, but also increase exports and make Sierra Leone a model agricultural country in West Africa.
- Sierra Leone covers 72,300 sq. km, of which 5.4 million hectares (74%) could potentially be cultivated (with chemical-free, 100% organic crops).
- The uplands represent 80% of arable land suitable for different food and cash crops. Even the lowlands, with higher fertility, can have high crop yields.

Increased Food Production & Quality

- The bio-fertilizers will assist the government to increase food production and quality beyond what chemical fertilizers can achieve.
  - We have shown the ability of the bio-fertilizers to do this with any crop over the years.
  - Fruit and vegetables become sweeter, crispier, and keep longer; flowers are larger, fresher-looking, and have a stronger scent; grain crops produce more; sugarcane is sweeter; tea has a less tannic taste; etc.

Production Costs Will Fall Significantly

- The bio-fertilizers will reduce significantly food production costs in the country.
  - In bio-chemical farming, the amount of chemical fertilizer used can be halved in the first season.
  - 100% organic farming costs are much lower than chemical farming costs.
  - Chemical sprays can be reduced by half straight away, and then phased out completely as the immune system of plants and trees improves.

Financial Benefits for the Farmers

- The farmers will become wealthier and poverty will be reduced.
- They will earn more from higher crop yields and higher quality.
- Export crops can be sold for premium prices.

No Problems With Exports

- As concern about chemicals in food increases in the world, especially in the big markets of the EU, the USA, and CIS countries, the government of Sierra Leone will not have to worry about crop-produce shipments being turned back on arrival at the destination port as sometimes happens in countries that use harmful chemical fertilizers and pesticides.

Phasing Out Chemical Agriculture

Chemical Agriculture Can Be Phased Out

- The government will be able to phase out the importation of chemical fertilizers and sprays.
  - The fertilizer subsidies could be phased out over 3 years as the bio-fertilizers are used to change chemical farming to bio-chemical and 100% organic farming.
- This will save Sierra Leone a lot of money.

Chemical Agriculture Can Be Phased Out

- In the first year, by mixing Bio-Plant with chemical fertilizer the farmers can reduce the amount of chemical fertilizer by 50%.
- In each succeeding year they will be able to reduce the amount of chemical fertilizer by another 25%. This is a rate that chemical farmers can accept.
- After 3 years chemical inputs can be stopped.

Chemical Agriculture Can Be Phased Out

- The current agreements with chemical suppliers can be kept. It will be the farmers who reduce the amount of Urea and NPK they buy. The phasing out of chemicals will be a natural process.
- The chemical fertilizer suppliers will gradually start to market the bio-fertilizers also as the market shifts towards bio-chemical and 100% organic farming.

Produce Will Become Chemical-Free

- The crop produce of Sierra Leone will be in demand because the produce will be grown each year with less and less chemicals and pesticides until the country is 100% organic after 3-5 years, depending on the plan.
- This will mean that the farmers can be guaranteed a market and good prices for their produce in the country.

100% Organic Farming in 3-5 Years

- The 0% interest, the credit period, and the fixed price will enable the country to move from food production based on chemical fertilizers to bio-chemical farming and then to 100% organic farming over a period of 3-5 years.

Reduced Expenditure on Chemical Inputs

- The country will spend less and less money as the country changes over to cheaper 100% organic bio-fertilizers and reduces the imports of and subsidies on expensive chemical fertilizer.

Soil Fertility Can Be Restored

- The bio-fertilizers can be used as part of a strategy to restore soil fertility throughout the country.
  - The soil will be cleaned of chemical fertilizer deposits within 3 years and changed to a crumbly state that is rich in micro-organisms and beneficial insect life.
  - This will reduce poverty because crop yields will increase.

Improved Quality and Increased Rubber Production

- The government of Vietnam buys large quantities of the bio-fertilizers because of the benefits for latex production.
- Rubber plantations can stop using chemicals and change to 100% organic rubber production.
- The great majority of rubber plantations in Vietnam now use these bio-fertilizers for 100% organic latex production. Chemicals have become too expensive.

Other Benefits for the Country

Improvement to the DNA of Plants

The introduction and use of Pro-Plant improves the genes of plants naturally so that the yield increases each season.

Crop Seed DNA Can Be Improved

Artemis & Angel Co. Ltd. can improve the local seeds for different purposes, such as to increase tolerance to drought, to increase the yield, to improve the flavour, etc.

Benefits for Waste Water and Waste Treatment

- Bio-Plant can also be used for the treatment of waste water and rubbish.

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The End