

Artemis & Angel Co. Ltd.

99/296 President Park, Sukhumvit 24, Klongtoey,
Bangkok 10110, Thailand

Tel.: (President) +66-86-329-6038; (Sales): +66-993377866

E-mail: (Sales) artemisandangelcoltd@gmail.com **Website:** www.artemisthai.com

The Benefits of the Bio-fertiliser Artemis & Angel Co. Ltd. **Credit Fund for Sierra Leone**

1. Summary of the Credit Fund

- 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*.

2. The Main Benefits

2.1 Infrastructure Development

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

- Because the 0% credit period per year is 12 months, 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 is a major impediment on the path towards food security.

b. Infrastructure Is Needed to Increase Rice Production

- Needed:** The rehabilitation and construction of feeder roads in key locations to 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.
- **Needed:** Community service infrastructure including construction of farm market centres, daily 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.

2.2 Eradication of Poverty

a. 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 afford 3 meals a day.
- This alone will have a great impact on their happiness, stress levels, health, and feelings of wellbeing.

b. 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.

c. 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.
 - 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.
- 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).

d. Financial Benefits for the Farmers

- The people will be able to produce enough food for themselves.
- 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.

2.3 The Development of Cash Crops and Export Crops

a. 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.
- The Credit Fund will provide the means to develop more kinds of cash crops and export crops.
 - Also, more cash crop growing areas could be developed.
- New export crops could be grown on restored and cultivated soil.
 - Areas could be set aside for 100% organic export crops.
 - 100% organic fruits could be grown in large quantities for export.
 - 100% organic fruit juices could then be produced for export.

b. 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.
- c. Sierra Leone Could Change Cocoa Production to Being 100% Organic**
- The Credit Fund could be used to change all cocoa production 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.

2.4 The Benefits for Rice Farming

a. 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.
- Money used for fertilizer subsidies could 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

2.5 Benefits for the Agenda for Prosperity

a. 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).

b. 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.
 - 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.

c. 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.

d. 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.

e. 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.

f. 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.

g. 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.

h. 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.

i. 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.

j. 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.

k. 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.

2.6 They Provide the Means to Phase Out Chemical Agriculture

a. 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.
- 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.
- 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.

b. 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.

c. 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.

d. 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.

e. 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.

f. Improved Quality and Increased Rubber Production

- The government of Vietnam buys large quantities of the bio-fertilizers because of the benefits for organic latex production.
- Rubber plantations could 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.

3. Field Tests in Sierra Leone: Tombo Rice and Maize Test Results

a. Rice Test in Tombo, Western District March – July 2015

Crop	Test A 100% Organic	Test B Chemical Rice	Test A and B Comparison
	Amount Harvested (Kgs.)	Amount Harvested (Kgs.)	Percentage Increase
Rice	1,150	850	35%
Maize	120	35	340%



b. Maize Test in Tombo, Western District March – July 2015



Maize Test in Tombo, Western District March – July 2015

Grown With the Bio-fertilizers

Grown With Chemical Fertilizer



Both the intercropped grain-grain crop and the maize grew much better with the bio-fertilisers than with the chemicals.

Maize Test in Tombo, Western District March – July 2015

Grown With Bio-fertilizers

Grown Without Bio-fertilizers



The Bio-fertiliser Maize in Tombo March – July 2015



Because of the Bio-fertilizer application the maize growth was very high; so much so that there was over-crowding of the maize plants beyond the expectations of the farmer, including the growth of the intercropped grain-grain leaves. The grain-grain leaves were harvested twice but only once with the chemical crop.

c. **Rice Test in Tonkolili District: March – July 2015**

- The rice heads contained much more grain. The yield was 53% higher than the chemical rice.
- The rice stems were thicker and stronger, so the rice plants did not lean over like chemical rice.
- The rice plants had noticeably more roots than the chemical rice plants. The roots were stronger and longer.
- The soil was softer and more fertile, and had a lot of worms and insect life.
- The effects on the rice plants and soil were the same in both Bo District and Tonkolili District.
- The rice heads contained much more grain. The yield was 53% higher than the chemical rice.
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- The rice plants had noticeably more roots than the chemical rice plants. The roots were stronger and longer.
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4. **Summary**

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- 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*.
- 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.
- 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.
- 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.