A private-equity fund aims to create sustainable income for resource-deprived poor villagers in China by adopting a proven productive insect-farming business model

THE CHALLENGE
One of the most urgent problems faced by China and India today is poverty (living below daily income of US$1.25), given that these two countries account for almost one fourth of the global population. China has done impressively in poverty alleviation, lowering the poverty rate from 26% in 2007 to 7% in 2012, (1) but income inequality has been steadily increasing. Income inequality is illustrated most by the differences in living standards between the urban, coastal areas and the rural, inland regions.

According to a World Bank report published in 2009, 99% of the poor people in China come from rural areas, if migrant workers in cities are included in the rural population figures. (2) Many of them do not even have access to arable land. Our investment will incorporate a business model of insect farming to address poverty by providing these people with the opportunity to make a sustainable living.

THE SOLUTION: Promoting and Commercializing Insect Farming in Rural Areas
Unlike traditional crop farming, insect farming does not need large arable land. It can be done in a concrete building, which allows us to easily scale up the business. Compared to food such as soybeans and fish, certain type of insect is a much more sustainable and environmentally friendly protein source that should be included in animal feed and the human food chain in various forms.

Investment Thesis
Biogriculture Fund will promote insect farming methods in resource-deprived rural areas (e.g. regions without arable land) in Anhui Province, PRC, through investing in technology and advising on daily operations. The fund aims to create a sustainable model involving all parties in the value chain of insect product manufacturing, enhance the market for insect products and create economic benefit to insect farmers. The Fund is based on a private-equity model that will:

- Invest in cutting-edge technology in insect farming and implement it in large scale through licensing to insect farmers;
- Provide guidance to ensure cost-effective operation and sustainable profitability, which will attract more farmers
- Connect insect farmers with consolidated distribution channels to reduce production risk and meet market demand;
- Adopt profit sharing scheme to ensure benefits for fund investors and farmers are aligned.

Biogriculture Fund, therefore, targets to acquire at least 60% equity of three to four operating companies in Anhui Province, with technical know-how and integrate upstream and downstream resources to involve jobless villagers in the insect farming business.

- The Fund sees enormous growth potential in the insect farming industry and huge unmet market demand in protein products and pharmaceutical raw materials. We aim to be a pioneer in the China market by adopting advanced technology and capturing a large market share.
- The Fund will guarantee insect farmers a minimum profit margin for standardized insect products, and split extra profits between investors and farmers with prescribed ratios. This will create a sustainable livelihood for insect farmers by allowing them to upgrade their quality of life.

Figure 1 - Biogriculture Fund Value Chain

Rationales
- FAO estimates that food production has to increase by >70% from current level to feed the global population in 2050 (3)
- 15% of all wild-caught fish and 95% soybean production are used to feed the farmed fish, pigs and poultry (4)
- An experiment run by Elaine Fitches of the U.K. government-run Food & Environment Research Agency showed the possibility of getting an average 150 tons of protein per hectare of insect farm per year, significantly above 0.9 ton of protein

(3) Insects: A new sustainable (animal) protein source for feed and food”. Danish Technological Institute. 23 June 2015
per hectare of soybean farm per year \(^{(1)}\)

- Feeding trials suggested that an insect-based diet will produce bigger, stronger livestock. An FAO report regarding edible insects stated several studies of fish and Japanese quail that consumed diets consisting of 50% ground crickets. The fish outperformed counterparts fed traditional diets on every growth parameter, and the cricket-fed quail laid more eggs than the control group \(^{(2)}\).

The current market price of fishmeal is US$1,550/ton \(^{(3)}\). An insect meal manufacturer in South Africa estimates its products would be 15% cheaper than fishmeal. \(^{(2)}\) With the technology becoming more mature in the near future, insect meal is expected to become an ideal substitute for fishmeal and therefore, insect farming will be economically feasible in the long run. The insect farming market will become even more attractive in China, where half of global animal feed (around 30 million tons) are imported every year. \(^{(4)}\)

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**Potential Investment Example** (farm in 2\(^{nd}\) year operation)

(Assumptions based on an operating insect farm located in Mengcheng, Anhui Province, and sample conducted by Danish Technological Institute)

<table>
<thead>
<tr>
<th>Total Investment</th>
<th>5,000,000</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production area</td>
<td>10,000 sqm</td>
<td></td>
</tr>
<tr>
<td>Annual production (insect meal)</td>
<td>2,000 tons</td>
<td></td>
</tr>
<tr>
<td>Domestic selling price (insect meal)</td>
<td>550 US$/ton</td>
<td></td>
</tr>
<tr>
<td>Sales revenue</td>
<td>1,100,000 US$/year</td>
<td></td>
</tr>
<tr>
<td>Direct expense</td>
<td>110,000 US$/year</td>
<td></td>
</tr>
<tr>
<td>Indirect expense apart from salary</td>
<td>220,000 US$/year</td>
<td></td>
</tr>
<tr>
<td>Insect farmer salary</td>
<td>600,000 US$/year</td>
<td></td>
</tr>
<tr>
<td>Net income</td>
<td>170,000 US$/year</td>
<td></td>
</tr>
<tr>
<td>Net profit margin</td>
<td>15.45%</td>
<td></td>
</tr>
<tr>
<td>Number of Insect farmer supported</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Salary per farmer</td>
<td>1,500 US$/year</td>
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</tbody>
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**Figure 2 – Fund Profile**

- **Total Fund Size**: US$20,000,000
- **Minimum Investment**: US$1,000,000
- **Target Portfolio Size**: 1,600 insect farmers
- **Term**: 10 years
- **Regional Focus**: Rural areas in Anhui Province, PRC
- **Target Investors**: Impact investors looking for innovative and sustainable farming solutions in emerging markets
- **Target Gross Return**: 12-18% IRR p.a.
- **Management Fees**: 2% of revenues
- **Exit Strategy**: Disposal shares of the portfolio companies to third party institutional investors or insect farmers

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**Figure 3 – Projected Cash Flows (IRR: 16.4% p.a. over 10 years)**

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**Risk and Mitigation**

<table>
<thead>
<tr>
<th>Risks</th>
<th>Mitigation Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stringent regional and local regulations on certain type of insect and insect fly</td>
<td>Enhance technological know-how to ensure rearing room control</td>
</tr>
<tr>
<td>Insect farmers fail to meet the production standard</td>
<td>Allocate more specialists to train insect farmers to ensure product quality</td>
</tr>
<tr>
<td>Feed demand drop or price fluctuation</td>
<td>Implement long-term fixed price contracts with buyers</td>
</tr>
<tr>
<td>People refuse to consume insect products</td>
<td>Enhance marketing campaign and strategic partnership with authorities to clear people’s ethical concerns</td>
</tr>
</tbody>
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**Market Expansion Opportunities: Scalability**

The proposed business model could be replicated from Anhui Province to vast rural areas in China by the following mechanisms:

- More batches per year to increase annual protein production
- Expanded product usage (e.g. biogas or fertilizers) to increase demand
- Higher feed demand to increase sales revenue
- Higher protein market price to increase sales revenue
- Cheaper insect feed to make insect products more profitable

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(2) Edible insects - future prospects for food and feed security. FAO. 2013
(4) Insects: A new sustainable (animal) protein source for feed and food”. Danish Technological Institute. 23 June 2015