



# BIOGRICULTURE FUND

**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, <sup>(1)</sup> 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. <sup>(2)</sup> 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

Bioculture 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:

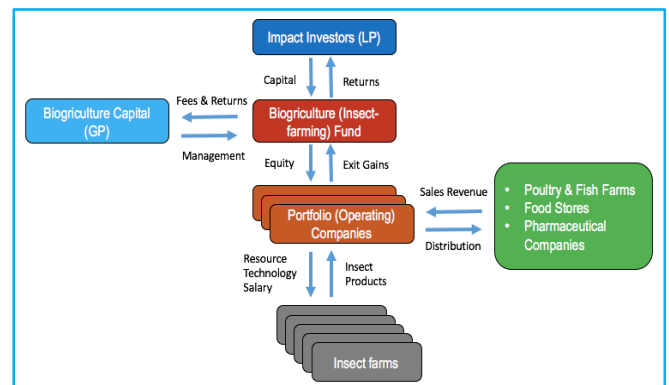
- Invest in cutting-edge technology in insect farming and implement it in large scale through licensing to insect farmers;
- Provide guidance to ensure cost-effective operation and sustainable profitability, which will attract more farmers

- 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.

Bioculture 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 - Bioculture Fund Value Chain



### Rationales

- FAO estimates that food production has to increase by >70% from current level to feed the global population in 2050 <sup>(3)</sup>
- 15% of all wild-caught fish and 95% soybean production are used to feed the farmed fish, pigs and poultry <sup>(4)</sup>
- 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

(1) <http://edition.cnn.com/2013/12/24/business/china-poverty-report>. CNN. December 24, 2013

(2) Facts About Poverty in China Challenge Conventional Wisdom. *The Wall Street Journal*. Retrieved 14 September 2011

(3) Insects: A new sustainable (animal) protein source for feed and food". *Danish Technological Institute*. 23 June 2015

(4) <https://www.technologyreview.com/s/529756/insect-farming-is-taking-shape-as-demand-for-animal-feed-rises>. *MIT Technology Review*. 20 Aug 2014

per hectare of soybean farm per year <sup>(1)</sup>

- 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 <sup>(2)</sup>

The current market price of fishmeal is US\$1,550/ton <sup>(3)</sup>. An insect meal manufacturer in South Africa estimates its products would be 15% cheaper than fishmeal. <sup>(2)</sup> 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 30million tons) are imported every year. <sup>(4)</sup>

Figure 2 – Fund Profile

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

### Risk and Mitigation

Risks	Mitigation Strategies
Stringent regional and local regulations on certain type of insect and insect flee	Enhance technological know-how to ensure rearing room control
Insect farmers fail to meet the production standard	Allocate more specialties to train insect farmers to ensure product quality
Feed demand drop or price fluctuation	Implement long-term fixed price contracts with buyers
People refuse to consume insect products	Enhance marketing campaign or strategic partnership with authorities to clear people's ethical concerns

### Market Expansion Opportunities: Scalability

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

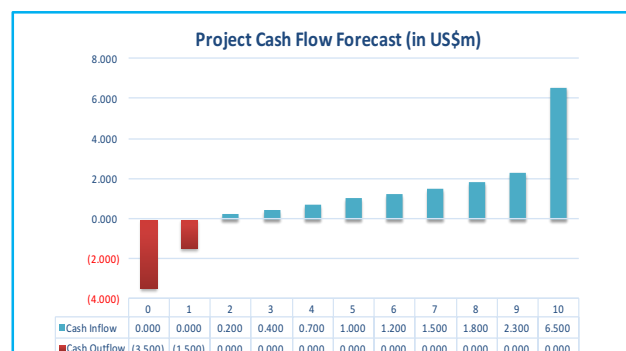
- More batches per year to increase annual protein production
- Expanded product usage (e.g. biogas or fertilizers) to increase demand
- Higher feed demand to increase sales revenue
- Higher protein market price to increase sales revenue
- Cheaper insect feed to make insect products more profitable

### Potential Investment Example (farm in 2<sup>nd</sup> year operation)

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

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

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



## THE IMPACT

Figure 4 – Economic, social and environmental impact of large-scale insect farming in rural areas in China

Type	Positive Impact	Direct Beneficiary	Measurement	Time
Economic	Higher income level	Insect farmers	Local GDP per capita	Short-term
	Higher employment rate in rural areas	Insect farmers	Number of jobs created	Short-term
Social	Lower farmed fish/poultry price	Farmers and food consumers	Market price benchmark	Mid-term
	Increase in protein and food productivity	People suffer from famine	Protein production yield (ton) per hectare of land	Mid-term
	Increase in land usage efficiency	Villagers and rural area residents	Farmland saved; residential living space per capita	Long-term
Environmental	Rural areas development and local community bonding	Villagers and rural area residents	Living standard benchmark; disease/death rate	Long-term
	Reduced natural resources for agriculture and greenhouse gas emission	People suffer from climate change	CO <sub>2</sub> emission/water usage per ton of protein produced	Long-term
	Decrease in overfishing	Endangered fish species	Fish species and population	Long-term
	Recycle of organic waste to biomass	Farmers	Percentage of landfill used for organic waste	Long-term

(1) <http://www.reuters.com/article/us-fly-farm-idUSKBN0F72FU20140702>. Reuters. Jul 2, 2014

(2) Edible insects - future prospects for food and feed security. FAO. 2013

(3) <http://www.indexmundi.com/commodities/?commodity=fish-meal>. Jul 2015 - Jan 2016

(4) Insects: A new sustainable (animal) protein source for feed and food". Danish Technological Institute. 23 June 2015

(5) Annual average income for Chinese farmers are around US\$1,700 in 2015. <http://www.chinanews.com/gn/2016/01-28/7737296.shtml>.