



Tongwei Group's Green Strategy

■ By CEIBS Professor of Finance and Accounting Oliver Rui & Case Researcher Xie Chun

The Fish Farm + Solar Parks Combination refers to a production method that has been emerging in China in recent years. It combines aquaculture and the solar energy industry: while engaged in aquaculture inside ponds, photovoltaic modules are set up to harness the potential of solar power generation, so as to reach the goal of farming fish underwater while generating power above. This is being done by Tongwei Group, one of the biggest aquatic feed manufacturers in China – maybe even one of the largest in the world. Guided by the principle of creating more value for fish farmers, the company stumbled upon the possibility of the Fish Farm + Solar Parks Combination. Funds were raised on the capital market in order to successfully implement the project. While fulfilling its social responsibility, the company successfully transformed from a feed manufacturer to a supplier of green agricultural products and a source of green energy.

Growth of photovoltaic power

With the rapid development of the world economy, the immense amount of greenhouse gases emitted from the burning of fossil fuel has become the main reason for global climate change. As a countermeasure, it has become increasingly important to establish a sustainable energy system that mainly features renewable energy. Among the various types of new energy, solar is globally recognised as the one that will be most competitive in the future because of its great supply, attainability, accessibility, and relatively low negative environmental impact.

For China, striving to develop photovoltaic power stations is equally significant. There are two kinds: centralised and distributed. The former refers to large photovoltaic power stations constructed by using resources found in desert areas, with power generation being directly connected to the public supply network; the latter is mainly found on building surfaces and provides

electricity to residents. In Eastern China where land is scarce, building distributed photovoltaic power stations is an inevitable choice.

Since 2012, relevant organisations – including the National Energy Administration of China – have been vigorously promoting demonstration zones for distributed photovoltaic power stations and successively formulated a series of relevant supporting policies. Government policies got the attention of Tongwei Group's Board Chairman Liu Hanyuan and his team. The Group has a listed subsidiary, Tongwei Co Ltd. It specialises in feed production as well as fishery research, fish farming, meat processing, animal healthcare, new energy, etc. It is among China's leading companies in industrialisation of agriculture, as well as one of the biggest aquatic feed producers in the world and a major manufacturer of feed for livestock and poultry.

How does a feed producer come into contact with a photovoltaic power



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plant and then work together to both their advantages? It all started when Liu noticed two state policies: first, the state came out in favour of all kinds of applications of distributed photovoltaic power generation and encouraged the setting up of photovoltaic power stations through the use of local resources – abandoned lands, deserted hills and slopes, fish ponds and lakes. Second, the state announced plans to spend six years carrying out a poverty alleviation project by developing the photovoltaic power-generation industry. By then Tongwei had already – during its various stages of development – formed benevolent cooperative relationships with more than 300,000 fish farmers throughout the country. It is estimated that the size of these fish farmers' ponds total 10 million mu (667,000 hectares). If all these ponds were used for photovoltaic power generation, the impact would be considerable.

Creating more value for fish farmers

Even before Tongwei Co Ltd went public in 2003, Liu stressed that the company's operational principle was 'let farmers do what they are good at; let us do the rest'. He often uses this catchy phrase to keep employees focused. Shortly after it went public, Tongwei witnessed the first boom in the feed industry (2000-2008). During that period the company greatly promoted the application of industrial feed, which improved

farming efficiency. After 2008, Tongwei started to introduce diversity into its operations, and aquatic feed saw a decline. After 2013, the aquatic feed industry enjoyed a second fast-growth stage. Due to surging costs, fish farmers can only make a profit if they improve the amount they reap from every mu. Therefore the demand for fishery services has become more urgent and the entire industry is going through a restructuring.

Liu is convinced that only when fish farmers gain more benefits can the company constantly see an increase in product sales. In recent years, based on a solid R&D system, Tongwei has taken the lead in the 1.0 reform of the fishery industry, which uses a products + services approach. Tongwei helped farmers scientifically farm fish and improved their efficiency thanks to its excellent production skills and multifaceted service.

Since 2008, Tongwei has built up a complete R&D system. It has also recruited more than 80 renowned experts. Tongwei's product range is not limited to feed but also includes animal vaccine, diversion agents (which are poured into ponds to make the water suitable for fish farming), etc. It provides a comprehensive package of product for farmers. At the same time, the company's marketing system focuses on segmentation and selling their products at the grass-roots level, such as in villages. Through interviews by its marketing team and by organising technology

forums targeted at agencies and farmers, Tongwei is actively involved in serving end-use farmers.

In 2013, Tongwei began to promote a brand new fish farming model and made a concerted effort to have a win-win relationship with farmers. The most important step in this approach was to have close and benevolent interaction between fish farmers and the company. The company needs to ensure product quality and scientific rationality in feeding, meanwhile farmers need to strictly follow the regulations and provide feedback, which leads to a 1+1>2 effect.

During the promotion of the new fish farming model, the Tongwei research team once carried out a simulation at Tongwei Aquatic Science Park. The goal: to figure out how to increase aquafarms' profits. They used planks to keep out the sunshine and began to farm underwater. The result was surprising – fish grew even better without light! After several experiments, the conclusive result was that fish farming in the shade is a very good idea.

Multi-beneficial strategy

In 2012, the first Fish Farms + Solar Park Combination project was launched in Jianhu County, Jiangsu Province and realised grid-connected power generation. Then a number of these power plants were successively established and connected in Eastern China. It became a popular choice

for the region to set up photovoltaic power stations. However, through on-site investigation of projects implemented in several parts of China, Liu and his team found that sufficient attention had not been paid to one of the major components of the projects – fish farming. This is because the cement columns, which are used to install photovoltaic panels, have a negative impact on fish farming. In addition, the enterprises engaged in the project were mainly from the

new energy industry, and they lacked expertise in aquaculture. Plus, the combination of fish farming and power generation was also exerting a certain unfavourable influence on aquatic and hydrated conditions. Therefore, to succeed in fish farming, it was of great importance to select a suitable feeding pattern.

From April to November 2014, the simulation of raising yellow head catfish under the Fish Farms + Solar Park

Combination model was conducted at the Nanjing Tongwei Aquatic Technology Park. Initiated and carried out by the Tongwei Facility Fisheries Engineering Research Institute, the test set five treatment groups to simulate photovoltaic power stations with the size of 0%, 25%, 50%, 75% and 100% of the aquafarms. The test evaluated the influence the photovoltaic power stations of difference sizes might have on various indicators of aquafarms: light intensity, floating vegetation,



floating zooplankton, as well as aquatic and hydrated conditions. The test showed that statistics were the best, overall, when the photovoltaic power station covered 75% of the farm. On this basis, Tongwei prepared a project feasibility report and decided to invest RMB11 million in Nanjing Tongwei Fisheries Science and Technology Company to implement the 1MWp project of Fish Farms + Solar Park Combination.

Given the light conditions in Pukou District, Nanjing, if calculated according to the optimum tilt angle, the average power generation reaches about 950kwh/kw every year over 20 years, then the system can generate 950000kwh every year. Given the policies of subsidising the photovoltaic industry at the state and provincial levels, if the on-grid power tariff is RMB1.15/degree, the annual revenue from power generation totals RMB1,092.5 thousand. For 20 years, the net cash flow would be RMB12.35 million (cost deducted); the annual net profit would be RMB617.5 thousand and the profit per mu would reach RMB13.2 thousand.

Tongwei has the edge of years of experience in aquaculture and feed production as well as their deep and benevolent partnerships with farmers. Thus, its innovative production mode of Fish Farms + Solar Park Combination – Clean Energy Above Water, Safe Fish Underwater – led to the organic combination of photovoltaic power generation and aquaculture, and

laid the foundation for a double harvest in fishery and power generation.

Help from the capital market

Tongwei New Energy was set up on December 31, 2014. This was a new company focused on photovoltaic power generation projects including Fish Farms + Solar Park Combination, Synergies between Fish Farming and Power Generation, as well as Farmers' Roof Power Plants. Registered capital of RMB50 million was fully in place by March 2015.

On the evening of May 10, 2015, Tongwei Co Ltd (600438) announced that the company planned to buy 100% of the shares of Tongwei New Energy from Tongwei Group. At the same time as the major capital restructuring, Tongwei planned to privately issue shares to less than 10 specific qualified individuals as a way to raise supporting funds of RMB2 billion, which did not exceed 100% of the purchase price. The funds would be used on the underlying assets – all the photovoltaic power generation projects belonging to Tongwei New Energy, providing a supplement to the company's cash flow and payment to the agencies involved in the transition.

According to Tongwei Co Ltd's Plan on Connected Transactions: Issuing Shares, Purchasing Assets and Raising Supporting Fund, before the transaction closed, the listed company's primary business is to research, develop, produce and sell aquatic feed

as well as feed for livestock and poultry. After over 20 years of development, Tongwei Co Ltd had grown into a comprehensive service provider of aquaculture that specialises in R&D of cultivation techniques as well as feed production and sales.

After the transaction closed, the agricultural and photovoltaic sections of Tongwei Co Ltd achieved a significant level of synergy. Originally specialising in aquatic feed and feed for livestock and poultry, Tongwei Co Ltd has accumulated considerable water, land and farmers' resources throughout 20 years of strong business development and its operations in agriculture. For example, its subsidiary Tongwei Energy has accumulated rich experience in fish farming and gained an advantage in the industry. All of these factors will be part of a driving force in the implementation of Tongwei's new strategy – combining agriculture and photovoltaic and creating a new and multi-beneficial profit model.

Advantage of horizontal industries

The water, land and farmers' resources accumulated since Tongwei Co Ltd's establishment have formed a benevolent, horizontal industrial synergistic advantage in developing businesses of photovoltaic stations, including Fish Farms + Solar Parks Combination, Synergies between Agriculture and Light, as well as Power Plants on Farmers' Roofs. These businesses have the advantage



of being environmentally friendly, energy saving, as well as having high performance cost ratio, etc. At the same time, the company shoulders its social responsibility, it has gained financial and policy support from the government, and has relatively good economic and social benefits.

To be more specific, the market potential for Fish Farms + Solar Parks Combination is immense: due to the wide distribution of its feed business, Tongwei has established strong partnerships with more than 300,000

farmers all around China. And the total size of the farms is estimated to be 10 million mu (sufficient to run a photovoltaic station of 300-500G with an annual revenue of RMB300-500 billion). There is the potential for a huge market in the future. At the same time, for fish farmers, the profit of a traditional farm is RMB2,000-5,000/mu, and the implementation of Fish Farms + Solar Parks Combination can bring about an additional output value of RMB30,000-40,000 per mu.

After the transaction in the capital

market closed, Tongwei grew from a pure feed manufacturer to a competitive supplier of green agricultural products and an operator of green energy, and the synergies created by the common growth of farming and photovoltaic will further improve Tongwei's constant earning ability and capacity for sustainable development.

This article is based on the CEIBS case # CI-715-067 "Tongwei Group's Green Strategy".