

Feasibility of ESCO model implemented in China agricultural facilities by improving energy efficiency



The amount of land used for covered agriculture in China is expanding rapidly.



Currently, agricultural facilities are often heating by burning coal.

Background

As the prices of both land and labour rise in China, facility-based agriculture is beginning to gain momentum. Rather than growing food in open fields, Chinese farmers are increasingly likely to use greenhouses and other covered facilities for cultivation. In 2010, there were more than 3.5 million acres in use for facility agriculture and this is expected to grow by a further 50 % by 2020. Currently, these facilities have very high energy consumption due to poor design and cheap materials.

In northern China for example, farmers often burn coal to heat their greenhouses and chicken farms. Temperature and humidity are poorly controlled. In southern China, the output of many of these facilities is low due to the large day to night temperature swings. Using renewable energy sources, such as heat pumps, passive solar hot water, and stratified temperature control to improve the cultivating environment are relatively new.

Similar technologies have been demonstrated in Israel, but never tried out in China. Similarly, the ESCO model has been seldom tested as a way of financing EE retrofits in Chinese agricultural facilities. This project combines the two elements.

Project purpose

To test the effectiveness of retrofitting greenhouses with modern clean energy technologies for improved EE and productivity, and to test the feasibility of using an ESCO model to finance the improvements and then replicate widely.



Main activities and outputs

- Design a retrofit for an existing agricultural facility that has high energy costs and low output, located in FengXian District, Shanghai
- Use solar water and ground source heat pumps to heat lower part of the space in winter, using a micro soil heat exchanger – a passive system
- Carry out the building improvements with IDEA Tek, a local ESCO
- Finance the project through loans and government funds

Expected impacts

- Use of conventional energy sources almost completely eliminated in the test facility
- Facility output increased by 30-50 %
- Financial viability of ESCO business model proved, avoiding upfront payment for farmers
- Corresponding new energy policies and code requirements taken up by Shanghai's Bureau of Environment and Sustainable Development
- Replication of project throughout China and world via market forces
- Expected annually potential carbon reduction of approximately 60 million tons in China

Project Information

Location:

China

Duration:

2013–2014

Sector:

Energy efficiency

Thematic focus:

Energy and food

Total project budget:

€ 240,000

REEEP grant:

€ 150,000

REEEP donor:

Norway

Co-funding:

€ 90,000 from Shanghai Home Field for Fruits and Vegetables and IDEA Tek

Implementing partner:

Tongji University