

# Renewable Energy Research Case Studies

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**Clixoo**

C3B, Anugraha,  
41 Nungambakkam High Road,  
Chennai – 600034, Tamilnadu, India

# Biofuels

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## Client's Profile

A leading non-oil exporter from Nigeria and a key corporate sector player in the agribusiness sector of Nigeria. It is a part of an international company.

## Objective of Research

The client was keen on venturing into ethanol. They wished to begin their business in Nigeria and their longer term plan is to replicate what they do in Nigeria into West Africa/Rest of Africa. At the same time, the company was uncertain on the feedstock to be used and production route to produce ethanol. To obtain a better understanding, the company sought the assistance of Clixoo's Renewable Energy Research Team. The objective of the research was to:

- Evaluate the suitability of various feedstocks based on various economic parameters for ethanol production in Nigeria.
- Evaluate the most promising bio-fuel production route (including technical/ financial/ time-to-market/ scale) comparisons

## Our Research Approach

Clixoo's biofuels research team did a thorough secondary market research of the ethanol feedstocks being used in Africa, with a focus on Nigeria.

Simultaneously, the industry research team carried out technical feasibility study for each crop in Nigeria. For this, the team collected inputs from the client on climatic, soil and other Nigeria-specific agro-scientific details.

These combined methodologies along with our already existing knowledge of the various ethanol routes and their economics, provided the client with a detailed, comparative cost benefit analysis of current and emerging ethanol crops, for various routes.

With analysis of all above data, Clixoo provided the client with a comprehensive report that will enable them to decide on the most promising ethanol feedstock, and the most optimal route for the same, for their efforts in Nigeria.

## **Benefits to the Client**

Some of the key benefits delivered by Clixoo include:

- A through understanding of the range of feedstocks available for ethanol in Nigeria.
- A detailed knowledge of the process routes for producing ethanol and the optimal route.
- A clear understanding of the costs and benefits for the various process routes and feedstock production.
- An analytical framework that facilitates their decision-making and strategising

# Solar PV

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## Client's Profile

The company, a client of a global consulting group, is an anonymous solar cell manufacturing company in Japan, seeking international business expansion opportunities.

## Objective of Research

The company was seeking expansion opportunities for its PV solar cell product range and had identified India as a potential market.

- The company had no presence in India and wanted to enter the India Solar PV market for the sales of its product range.
- The client had done a preliminary study of the Indian PV market.
- The client wanted to understand the Indian solar PV market more in-depth, in the context of sales and marketing of solar PV cells. They hence wanted a field study to be conducted that focused on acquiring inputs and insights from the relevant players in the solar PV value chain in India

## Our Research Approach

The scope of work comprised collecting inputs on two aspects:

1. PV Sales Market Conditions
2. PV Sales Channel Control Conditions

## PV Sales Market Conditions

In this phase, inputs were required for the following:

- Cell/Module trend, including pricing, quality, and delivery time for the past three years. Specific details were required on delivered price, import taxes, logistics costs, distributor margins, and price trends.
- PV system construction cost trends for the past three years
- PV-based power generation cost trends for the past three years

- Cost breakdown for solar PV-based power generation – break-down into components such as depreciation, maintenance, and monitoring.
- List of major integrators and competitors, and details of their profiles, activities, strengths and unique characteristics

### **PV Sales Channel Control Conditions**

In this phase, interviews were conducted with independent Integrators, competitors and users of solar PV cells in India. These interviews were conducted to get inputs on the following:

- Market sizes and growth
- End user segments and sizes of these end use markets
- Details of typical sales contracts between system integrators and module manufacturers
- Details of the prominent PV cell and module manufacturers in terms of their penetration in the Indian market, their sales strategies and related data.
- Evaluation criteria for choosing the best integrators

Key success factors for cell/module manufacturers and system integrators

The inputs were then merged into a report detailing the Indian photovoltaic scenario and concluded with various strategic scenarios.

### **Benefits to the Client**

The comprehensive report aided in the removal of gaps in the client's knowledge of the Indian solar photovoltaic landscape and facilitated senior managers to rigorously analyze the various scenarios for the company in the Indian market.

# Jatropha Biodiesel

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## Client's Profile

A leading energy crop producing company in American

## Objective of Research

The client was keen to invest in Jatropha cultivation in Africa for biodiesel production. Jatropha being a relatively new energy crop, data relating to yield is often diverse and conflicting. The client required real time yield data of Jatropha across various regions to determine the best possible location for its Jatropha farm.

## Our Research Approach

Clixoo's biofuels research team was involved in both primary and secondary research. Phase I of data collection process involved face to face interaction with participants in India as the country is in itself a prominent Jatropha cultivation. The participants were:

- Famers
- Domain experts from National Agricultural Universities
- Various government departments
- NGOs involved in Jatropha cultivation

The primary research also involved interaction, over phone, with concerned people in various regions of Africa, such as Cambodia, Mali, Mozambique, Madagascar etc.

The team, in addition, performed an extensive analysis of factors that contributes to the yield variation and inferred that under optimal condition, Jatropha can indeed provide excellent yield.

## Benefits to the Client

- The client acquired clear insights on real life yield of Jatropha in Africa. In addition, the client obtained a better knowledge on region-specific yield.
- Our research review enabled the client to decide whether to and where to invest in Jatropha.

# Waste to Energy

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## Client's Profile

A prominent municipal solid waste management company in India.

## Objective of Research

The company wished to generate electricity from waste. To meet its goal, it approached Clixoo to perform a life-cycle economic analysis of using anaerobic digestion vs. incineration for generating energy from waste.

## Our Research Approach

The research was carried out in different stages.

Stage I involved identification of all relevant components of life-cycle for both anaerobic digestion and incineration of municipal solid waste.

In Stage II, the research team performed a thorough cost-benefit analysis involved in these components.

Third stage involved face to face interaction with consultants, companies using both anaerobic digestion and incineration to generate energy, government officials regarding incentives and waste collecting agencies.

## Benefits to the client

- The client was able to clearly identify which of the two options, based on long-term economic benefits, is more suitable for generating electricity from waste.
- The client acquired a clear understanding of the economic benefits for each of these options.

# Renewable Energy Opportunities Strategy

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## Client's Profile

A heavy electrical company based in Europe.

## Objective of Research

The client was keen on diversifying into renewable energy industry in order to become a large player and derive short term government benefits through incentives by producing electricity or fuel. In this context, they required inputs on:

- The entry strategy
- Right product portfolio

## Our Research Approach

Clixoo's industry research team performed an extensive interaction with the client to understand its existing core competencies and its vision of how it wished to add value and derive benefits from renewable energy opportunities.

Clixoo used its unique insights on the current and future potential of renewable energy in Europe, and the specific opportunities available along the entire spectrum of renewable energy. This along with our customized data collection and analysis specific to client's requirement provided a clear understanding to the client on the most optimal strategy for the company's entry into renewable energy.

## Benefits to the Client

- The client acquired a clear mapping of his existing profile and competency to the various opportunities available in renewable energy.
- The client was able to obtain a clear roadmap of the next few steps for its entry into renewable energy industry. The list of business contacts provided by our team helped the client is rapidly implementing its roadmap.

# Wind

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## Clients Profile

The client is a major gearbox manufacturer based out of Europe who wished to expand his sales activities in the wind industry.

## Objective of research

The client was interested in studying the historical, current and future projections of market share of all major turbine manufacturers, in order to re-orient internal strategies to better address market demand.

## Our Research Approach

Phase 1 of the research mostly involved collecting inputs from secondary sources i.e.

- Government databases
- Paid databases (for ex New Energy Finance)
- Press releases and websites of major turbine manufacturers
- High quality renewable energy magazines

Phase 2 of the research involved interactions with primary players through email and telephonic conversations with

- European wind energy association
- American wind energy association
- Wind turbine manufacturers
- Wind turbine suppliers
- Government agencies

The inputs were thoroughly analyzed, resulting in detailed historical, current and future projections of market share of all major turbine manufacturers.

## Benefits to Client

The report provided market intelligence on crucial trends in the wind turbine manufacturing industry which aided in better positioning of the client for enhanced sales.

# Solar Thermal

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## Client's Profile

The client is a leading energy developer in the United States looking for development opportunities in solar thermal.

## Objective of Research

A Japanese company was seeking opportunities to establish a solar thermal plant and had indentified the US as a potential location.

- The client wanted us to prepare a report on the feasibility of a solar thermal plant in US and the economics of running such a plant. The data requirements included detailed inputs on costs – capital costs, operational costs and levelized costs of the venture. Cost comparisons with solar photovoltaic plants were also sought.

## Our Research Approach

Phase 1 of the research assignment composed primarily in tapping established information sources such as

- Research papers compiled by:
  - NREL
  - DOE
  - EERE
- Existing Clixoo database
- Paid databases such as New Energy Finance
- Government Databases

Phase 2 of the research involved

- Review of the Mojave desert solar thermal power plant installation
- Primary data collections through email and telephonic conversations with
  - Solar energy consultants based in the United States
  - Solar associations in the United States

These inputs were compiled into a comprehensive report comparing currents costs and future projections of photovoltaic and thermal.

## **Benefits to the Client**

The consolidated knowledge inputs on costs were incorporated into the planning for entry strategy of the company and various cost based scenarios were rigorously analyzed by the leadership of the corporation.

# Sustainable Agriculture

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## Client's Profile

The client is a global conglomerate with interests in food, pharmaceuticals and engineering plastics.

## Objective of Research

The client, a Europe-based sustainability conscious organization wished to assess the sustainability (social, environmental and economic sustainability) of large-scale castor cultivation in India.

## Our Research Approach

The research assignment consisted of comprehensive interviews with numerous players along the entire castor cultivation and castor oil production value chain, such as:

- Castor crushers and refineries, in order to assess scalability of castor derivatives in which the client might be interested in the long term and to assess safety protocols in such installations.
- Farmers to determine the social sustainability levels such as access to basic necessities, labour conditions, wages etc., and assess environmental practices in cultivation, such as use of pesticides, intercropping, use of water etc.
- Castor industry experts and consultants regarding best practices in castor cultivation and economics of various practices.

These inputs were compiled into a report that exhaustively detailed the sustainability of large-scale castor cultivation in India.

## Benefits to the Client

The client was able to obtain clear insights on the current sustainability practices in castor cultivation in India and the long term business prospects for such a venture.

# Cellulosic Ethanol

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## Client's Profile

An FMCG major based out of the United States, with interests in agriculture, food, cosmetics and personal hygiene.

## Objective of Research

The client wished to determine the optimal process for cellulosic ethanol production.

## Our Research Approach

Research for the project analyzed the economics of various stages of the cellulosic ethanol production processes, viz.

- Pretreatment phase
- Cellulose hydrolysis (cellulolysis)
- Separation of the sugar solution from the residual materials, notably lignin
- Fermentation
- Distillation
- Dehydration

In the first stage, inputs on the economics of the stages were gathered through extensive primary interactions through email and telephonic conversations with

- Research universities
- Biofuel companies
- Enzyme developers

The second phase of the research involved secondary research that tapped sources such as:

- DOE research
- Research papers

These inputs were analysed and the inferences were compiled into an exhaustive report detailing cost structures for all cellulosic ethanol production processes.

## **Benefits to the Client**

The corporation was able obtain precise insights on the economics on cellulosic ethanol production and the optimal process route/s for the same. These enabled informed decision making and aided the company in taking the next steps in its quest to enter cellulosic ethanol production.