

Feasibility Studies with the Aim of Developing  
Joint Crediting Mechanism FY2014

# **Feasibility Study on Promotion of Bioethanol Production Plant Utilizing the Japanese Fermentation Technology in Ethiopian Sugar Factories**

New Energy and Industrial Technology Development Organization (NEDO)

myclimate Japan Co., Ltd

## Feasibility Study on Promotion of Bioethanol Production Plant Utilizing the Japanese Fermentation Technology in Ethiopian Sugar Factories

Implementing Agency: myclimate Japan Co., Ltd

Promoting the bioethanol production plant in Ethiopia utilizing Japanese fermentation technology that can efficiently convert molasses from sugar factories into ethanol. Since the sugar refining industry is expected to continue to grow steadily, the implementation of efficient bioethanol production technology of Japan can greatly reduce greenhouse gas emission by replacing gasoline.

### Summary

Surveying the potential of the Japanese fermentation technology to implement bioethanol production and business as an alternative to gasoline in order to reduce CO<sub>2</sub> production.

### Survey Items

- 1) Technical survey on the possibility to introduce Japanese fermentation technology into Ethiopian sugar factories
- 2) Determination of the project site and survey on business environment
- 3) Evaluation of the project feasibility and financial analysis
- 4) Development of MRV and calculation of the potential GHG reduction
- 5) Survey on the contribution to sustainable development
- 6) Preparation of the project execution plan
- 7) Organizing workshops

### Partner/Site

- Ethiopian Sugar Corporation
- Ethiopia, Kessem Sugar Factory  
(Planned Site)

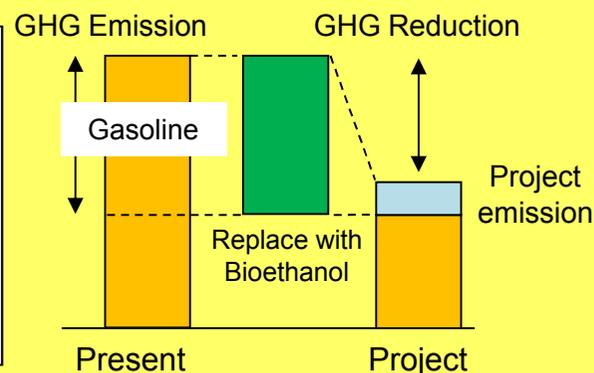


### Estimated Reduction Amount

**27 ktCO<sub>2</sub>/year** (for 153,000 ton-sugar factory)

#### Reference Emission

Reference emission is the emission from heat of vehicles, which is derived from the amount of CO<sub>2</sub> emitted from gasoline instead of bioethanol.  
 <Reference emission>  
 = amount of bioethanol consumption (/year) × net heating value of bioethanol × CO<sub>2</sub> emission factor of gasoline  
 = 27,807 t-CO<sub>2</sub> / year



#### Project Emission

GHG emission is reduced by replacing gasoline with bioethanol produced from wasted molasses from Ethiopian sugar factories. Project emission is derived from the energy needed to operate bioethanol plant and transport molasses and bioethanol.  
 <Project emission>  
 = Transportation of molasses + bioethanol production + Transportation of bioethanol  
 = 768 ton-CO<sub>2</sub> / year

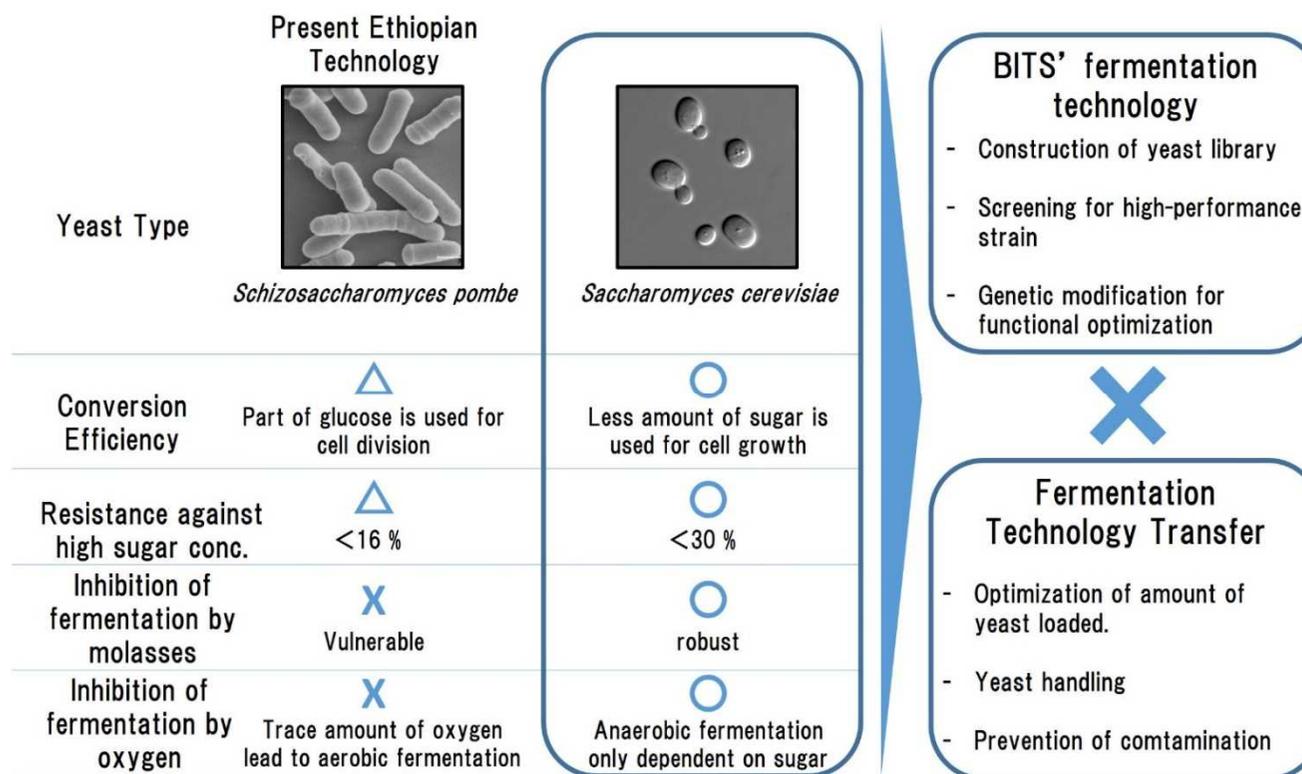
Technology Outline

Bioethanol fermentation by *Saccharomyces cerevisiae*

The wasted molasses that contain high amounts of glucose is used and conditionally fermented in order to produce ethanol. If the Japanese fermentation technology, which has also been used for Sake making, could be utilized to produce bioethanol in Ethiopia, there is a high probability of an increased efficiency and robustness in bioethanol production. On the other hand, the water and the soils of Ethiopia, which affect the fermentation efficiency, might contain substances unique to the country. Therefore, technology transfer would not be as simple as adding just the yeast into molasses.

In this study, the yeast library will be constructed by BITS\* and the screening will be conducted to select high-performance yeast strain, which is the most suitable for use in Ethiopia.

\*BITS, Biomaterial in Tokyo, Co.,Ltd, is a Japanese Biotechnology company, which especially excels at sugar processing technology.



## Technology Outline

## Repeated Batch Fermentation

“Repeated Batch Fermentation”, which is a Japanese unique technology that taps into yeast’s aggregability, will be introduced into a bioethanol plant. In this method, after fermentation process, the tank is left to rest, and supernatant is transferred for distillation process. The remaining residues are mixed with new molasses solution, and the next step of fermentation is conducted in the same tank.

This repeated batch fermentation method enables the omission of the centrifugation and acid-treatment of yeast, resulting to the reduction of operation costs and time. In addition, risk of contamination is significantly reduced because each tank functions independently.

