PRODUCTION OF ETHANOL FROM CASSAVA BASED INTEGRATED FOOD ENERGY SYSTEM in Côte d’Ivoire

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I. Introduction

Cassava is one of the most important root crops in tropical countries. In Côte d’Ivoire, it is the major food crop after yam with an annual production of 2 200 000 tons. There exists a wide range of potential food and industrial applications for processed cassava, including high quality cassava flour (HQCF), high quality cassava cake (HQCC), starch, ethanol, glucose syrup, and others.

The production of these byproducts requires dewatering cassava producing huge amount of starch. Starch is spilled on food processing, causing unhealthy, bad odors, methane production and degradation of the surrounding environment.
Starch spilling from cassava
In Côte d’Ivoire, traditional biomass and oil are the most widely used energy sources. Biomass supplies 73% of the home energy demand. For cooking activities in urban areas, most people (47%) use charcoal to cook while in the rural areas 95% of the population uses wood.
Risks during charcoal production
III. Our Partners

- COTRAME and SAPHIR HM have signed a collaboration convention with international partners (SE4ALL, PANGEA, PROJET GAIA and GREEN SOCIAL), within which they have shared their intention to collaborate for the development and the deployment of sustainable ethanol production for clean cooking, so as to constructively and responsibly contribute to goals of Sustainable Energy For All Initiative (hereinafter referred to as SE4ALL).

- COTRAME, SAPHIR HM, Green Social and Project Gaia are now collaborating partners of the Sustainable Bioenergy High-Impact Opportunity (HIO).
Logos Partners

Saphir HM
Bureau d'Études et d'Affaires - Entreprise Spécialisée

COTRAME
Compagnie de Travaux
Machinerie et Équipement

Pangea

Green Social Bioethanol

Project Gaia

Sustainable Energy for All
IV. Main IDEAs of the project

- The identified opportunity is an investment in a cassava based Integrated Food Energy System leading to the processing of cassava into cassava food product and the utilization of the waste water for clean cooking ethanol for household cooking.
- Enhancement of cassava starch by ethanol production technology is a sustainable waste management.
- Ethanol thus produced can be used as biofuel for cleancook stoves, green vehicles and pharmacy
SAPHIR HM is a research consultancy and business development company working in the design, management and monitoring of projects. It also works as a promoter of its own projects (PIP) of a social nature. SAPHIR HM works in the areas of mobilization and management of natural resources, environmental management, energy and sustainable development. SAPHIR HM and COTRAME have experience in training of public and private sector employees. COTRAME on the other hand, is a trading company providing services across sectors based in machinery and equipment. Based in Abidjan,

COTRAME join the project as prime contractor for the local development of the sustainable bioenergy project in Côte d’Ivoire. The company COTRAME has already started the cultivation of a 10 ha cassava farm in Anyama as part of the entire business activities as a pilot farm for improved cassava varieties and further engagement in the production of bio-ethanol from cassava processing.
VI. Our Model representation of process outlook

- Cassava
  - High Quality Cassava Product
- Attieke
  - HQCF
  - Gari
- Waste water from fermentation process
- Bioethanol
  - Biofertilizer
- Clean cooking fuel
VII. Description of Technology:

Any material whose sugar content is sufficient or any material that can be converted biologically (fermentation) sugar, such as cellulose or starch, can be used to produce ethanol. The general process of converting biomass into pure ethanol can be divided into four distinct phases:

- **Hydrolysis of polymers sugars.** With hydrolysis, polymers sugars are reduced monomeric sugars. The methods for the hydrolysis include: applying heat, acid, enzymes or a combination thereof.
- **Fermentation.** The conversion of sugars to ethanol is carried out today by using yeast monocultures. Important parameters of the fermentation are a high alcohol content and low energy and a reduction in operation time consumption.
Illustration of the distilling columns.
Distillation. Distillation is a well-known for the separation of mixtures of liquids with different boiling points technology. Distillation provides an ethanol content up to 96% per unit volume.

Dehydration. In this last step the ethanol is separated from the water to obtain a water content of less than 0.3% per unit volume, meaning a more ethanol with 99.7% purity. For this separation, the usual technologies are used as molecular sieves or membranes.
VIII . Advantages:

Impact on Social Development:
- Increased income women who produce food through the sale of starch and
- Intensification of cassava waste collection and improvement of the urban environment, resulting in improved health and quality of life of populations.

Economic Impact:
- Creation of jobs in the collection and processing of starch,
- Improving the balance of trade by importing less ethanol and
- The cassava farmers earn more foreign exchange.

Local environmental impact:
- Improved sanitation and local
- Reduced production of methane and odors in the immediate environment
Experimental Farm
Répartition des ménages selon le type de combustible et le milieu de résidence

Les chiffres 1, 2, et 3 en abscisse indiquent respectivement bois de feu, charbon de bois et gaz butane.
Despite the importance of biomass use, modern bioenergy remains under-exploited in the country with a low level of energy efficiency. Traditional biomass is mainly produced using wood from forests and is one of the leading causes of deforestation in Cote d'Ivoire. The deforestation rate in the country is 250,000 ha/year for a reforestation rate of 5,000 ha/year. The consequences are clear in terms of climate, energy and food insecurity, especially in rural areas where energy access is lower than in urban areas. Thus, the Ivorian rural population is in constant need of sustainable access to energy resources that can also ensure food security and environmental sustainability. For those purpose we are looking for support to our project: PRODUCTION OF ETHANOL FROM CASSAVA BASED INTEGRATED FOOD ENERGY SYSTEM in Côte d’Ivoire
ATTIEKE from Cassava
THANK YOU

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