

Institute of Applied Science and Technology



University of Guyana campus,
Turkeyen, Greater Georgetown, Guyana
Telephone (592)222-4212-5.4218,5864
Fax: (592) 222-4229 Email: iast@networksgy.com

Introduction

- The Institute of Applied Science and Technology, IAST, was established in March 1980 as an implementation arm of the National Science and Research Council. The institute is expected to serve as the focal point for Research and Development and Technology transfer in Guyana.
- IAST is governed by the National Science Research Council Act No. 26 of 1974 (dated 19th August, 1974) and has as its mandate “the development and/or adaption of appropriate technology for the utilization of Guyana’s natural resources, so that these resources can be gainfully developed and exploited, for the benefit of the people of Guyana.”

Theme

- The theme for this presentation is :
“The development/Utilization of low valued by-products and waste generated from the agro-processing sector to produce value-added commodities.”
- Our initiative at the institute is, “From waste to wealth”.

Projects at IAST which utilizes by-products and waste from agro-processing are:

- Extrusion of food products
- Extrusion of animal feeds (Fish feed)
- Chemical processing of coconut oil into higher value components.
- Using agricultural waste in roofing tiles and other related building products.
- Processing of vegetable oil and their waste into biodiesel.

Extrusion of Food Products

- Guyana has the potential to grow much more food than it currently does – and the Government of Guyana is investing heavily in agriculture. However, the profit to be made in the food industry relates to the value-added processing of food and feed, as opposed to the sale of commodities.
- Therefore, there is significant value to the country to also invest in value-added processing of its agricultural commodities. One very versatile method of processing starch, protein and fat is through co-extrusion into a wide variety of food products.
- In addition, with the institute acquiring a state of the art Food Grade Extruder and the availability of significant amount of unused by-products from the rice industry, the Institute has found it very useful to produce value-added commodities such as rice noodles, cereals and resotto etc.

Food Grade Extruder at IAST



Products from the by-product of rice

Noodles



Risotto Rice



Breakfast Cereals



Extrusion of Feed

- With the development and expansion of the aquaculture industry, especially in the area of fish rearing. There is a growing demand for the right type and quality of feed.
- As such, the IAST is at the stage of testing various formulations to produce an appropriate quality feed from locally available agri-products such as using cassava leaf extract for protein together with more traditional sources such as soy.

Aim of project:

- Extrusion processing of local commodities, in particular rice, cassava and plantains into value-added products or ingredients for export – assessment of quality, reproducibility, economic competitiveness, and showcase to markets and investors.
- Extrusion processing of local materials, in particular rice bran, cassava roots, stems and leaves, plantain and banana peels, duck weed, fish meal, oil-expelled coconut flesh, etc. into feed pellets – assessment of quality, toxicity, nutritional balance and bio-availability, microbial stability, reproducibility, and economic competitiveness, and showcase to local investors and farmers.

Chemical processing of Coconut Oil into Higher Value Components.

- **Guyana exports coconuts as copra, raw nuts and oil.**
- **The IAST performs lab-scale reactions with coconut oil**
- **Significant value can be added to coconuts by local processing to create high value chemicals and commercial products while retaining an economic value to the coconut industry by producing chemicals that have potential industrial applications.**
- **IAST has been very successful with this project – already, the institute has produced very impressive liquid and solid soaps, high purity ethyl laurate, lauric acid, glycerol and glycerol monolaurate at the laboratory scale.**
- **Pilot scale equipment purchased specifically for this project has been installed and is now ready to use.**

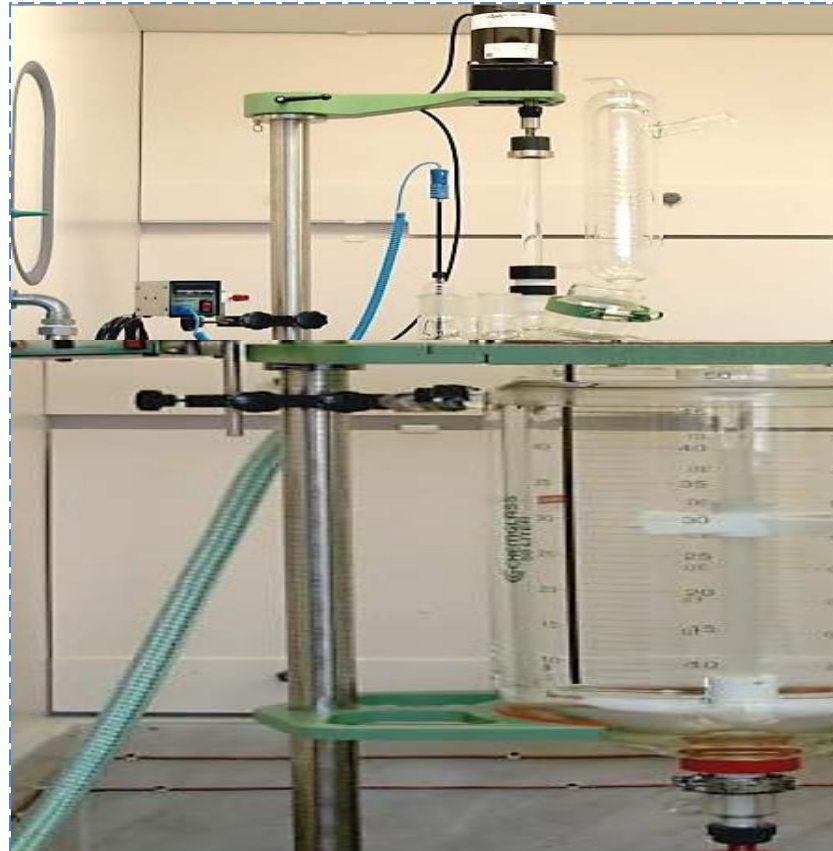
Chemicals produced are:

- **Glycerol:** preservative, sweetener, solvent personal care products and capsules
- **Ethyl laurate:** flavorant
- **Glycerol monolaurate:** emulsifier
- **Hydrogenated Oil:** margarine, confections
- **Lauric Acid-** cosmetics

Natural soaps produced



Pilot Scale Reactor



Using agricultural waste in roofing tiles and other related building material.

- The IAST has been able to produce high quality roofing shingles from plastics such as high density polyethylene, low density polyethylene and polypropylene, combined with milled and dried wood waste (sawdust), milled and dried rice hulls (paddy shells) and milled and dried bagasse
- IAST produces plastic composite materials by thoroughly mixing natural, pulverized agricultural fibers with a thermoplastic resin (waste water bottles, HDPE, etc.) and additives (dyes, chemicals for UV and fire protection).
- The mixture is extruded with a parallel twin screw extruder to form a homogenous melt strand that is converted to pellets.
- The pelletized material is heated until it is sufficiently fluid to allow for pressure injection into the shingle mold where it solidifies quickly.

Display of roof tiles made with agricultural waste and plastics



Processing of vegetable oil and waste into Biodiesel

- Waste vegetable cooking oil can be recycled to negate the environmental impact of pouring it into drains or adding it to landfills.
- IAST produces biodiesel from waste vegetable oil for use in vehicles, generators, and the in-house plastics and rubber recycling plants. Approx. 90% of the institute's fuel requirements is supplied by Biodiesel.
- Biodiesel is typically produced by a trans-esterification reaction of oils with methanol and a catalyst.
- Glycerin is formed as a by-product; it can be purified then used to make soaps, added as a nutritional supplement to cattle feed, or used in personal care items and cosmetics as a humectant.

Collection of Waste Vegetable Oil and usage of IAST's Biodiesel



Briquetting Agricultural Waste

- Guyana's rice, cane and sawmilling industries all produce significant amounts of waste in the form of rice husks/hulls, bagasse and sawdust.
- This waste material generally cannot be easily consumed as fuel due to the large surface area to volume ratio which results in high combustion rates but no significant concentration of energy.
- IAST has solved the challenge of utilizing this type of waste. A hydraulic briquetting machine reduces the surface area to volume ratio by compacting the biomass to produce briquettes. These briquettes can then be consumed as fuel in households and industries.
- The briquettes were commercially tested at Guysuco (Enmore factory). The results were excellent when compared with firewood.

Briquetting Machine and Briquettes made from Agri-waste.



End of Presentation