



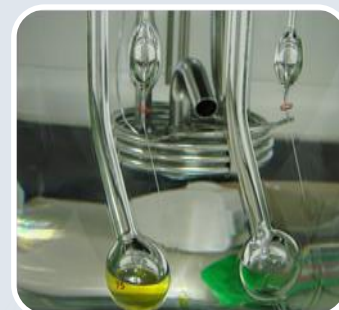
# Bio economy : The Indian context and Praj Bio refinery

Pramod Kumbhar  
CTO

## Praj Industries : Key Highlights

- Established in 1984 by first generation technopreneur, Pramod Chaudhari (Executive Chairman)
- Offering innovative and sustainable solutions for Energy, Environment & Agri-Processing
- Experience and expertise in Process, Integration and Engineering
- Global Presence - marquee customers and key partnerships
- Groundbreaking of South Asia's first 2<sup>nd</sup> Gen Ethanol Demonstration Plant
- Entry into HiPurity segment through acquisition
- Strong belief in *social responsibility*

# What we do



**-Alcohol/  
Ethanol plants**  
**-Brewery  
plants**

**Water and  
Wastewater  
Treatment  
Systems**

**Critical  
Process  
Equipment &  
Systems**

**HiPurity  
Systems**

- Pharma
- Biotech
- F&B
- Cosmetics

**Bio-Products**

- Distillery  
bioconsumables
- Livestock, health  
& nutrition  
products
- Human health &  
nutrition
- Biochemicals

# Praj Matrix – R & D Center



- ❑ US\$ 25+ Million investment
  - 80,000 sq ft of Labs, Pilot Plants, and Offices
- ❑ 94 technologists and growing
  - 20 PhDs, 65 Masters
- ❑ 4 Technology COEs
  - Biology, Chemistry, Engineering
- ❑ 16 Well Equipped Labs
- ❑ ISO-9001-2008 Analytical Labs
- ❑ Pilot Plants
  - 1 tpd Cellulosic Ethanol pilot plant



**Bench and Pilot scale facilities enable validation of scientific assumptions and rapid commercialization**

## Praj Matrix - Focus Areas

### Biofuels

Ethanol  
Advanced Jet Fuels  
Drop in Fuels

### Bio-chemicals

Pentose  
Hexose  
Lignin

Health and Wellness Products  
Oleochemicals

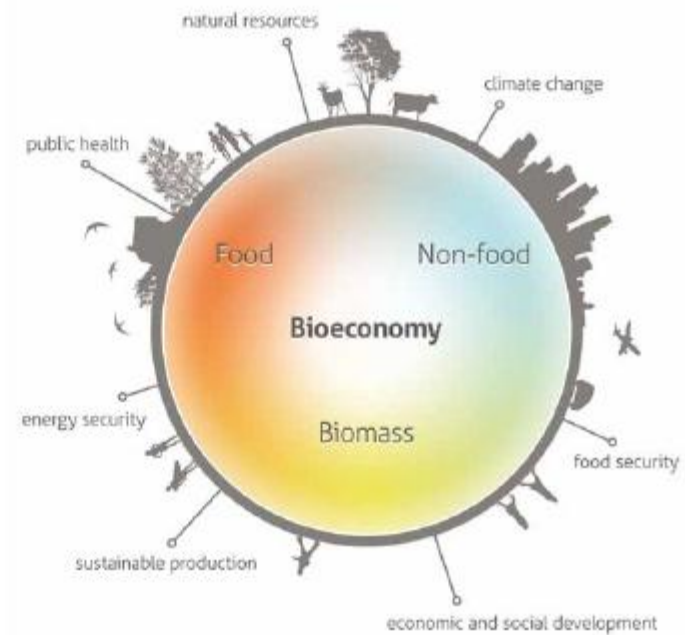
Advanced Strain Development  
COE for yeast engineering



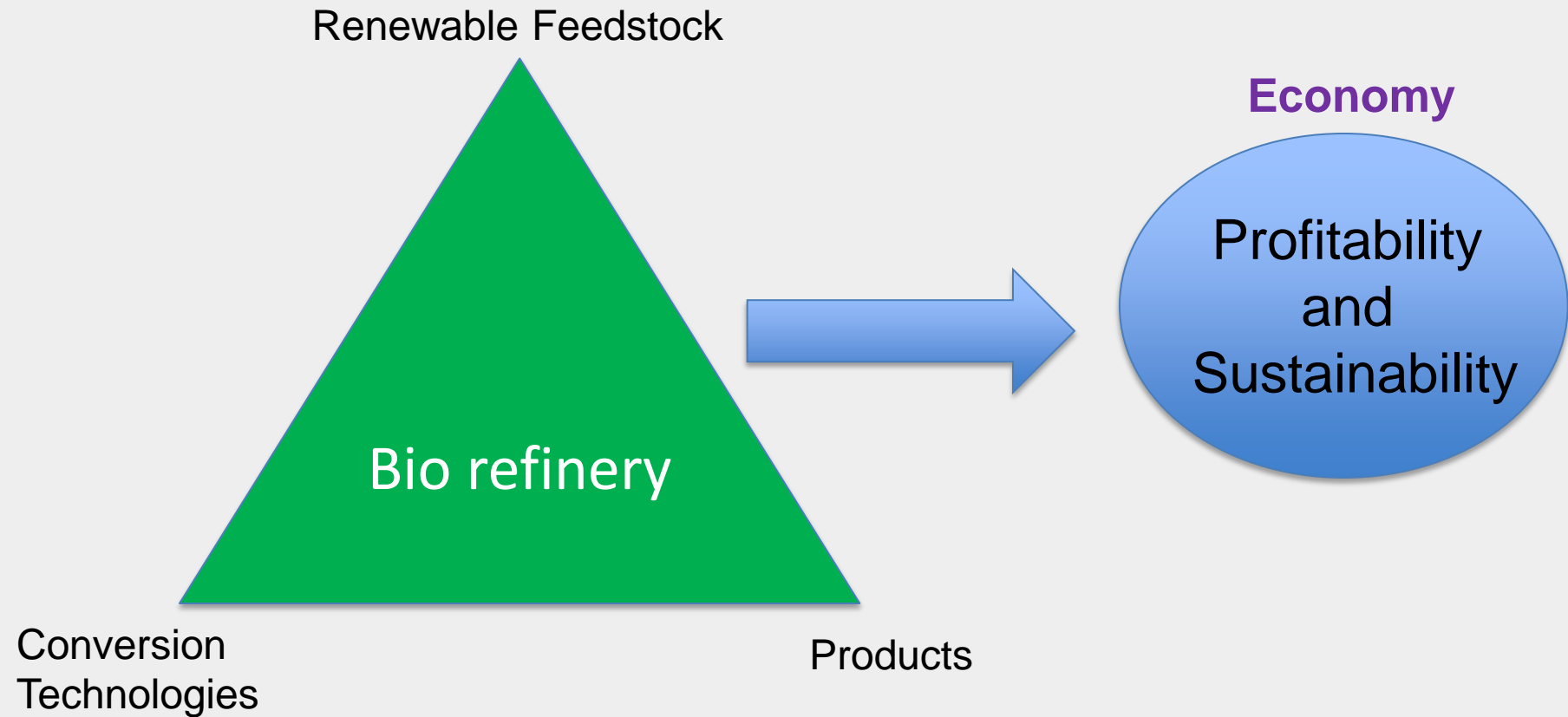
# Biobased economy



Where renewable feedstocks are converted to higher value products including **biofuels** and **renewable chemicals**; or microbial systems are used to produce **chemical intermediates** or in the manufacture of **consumer products**

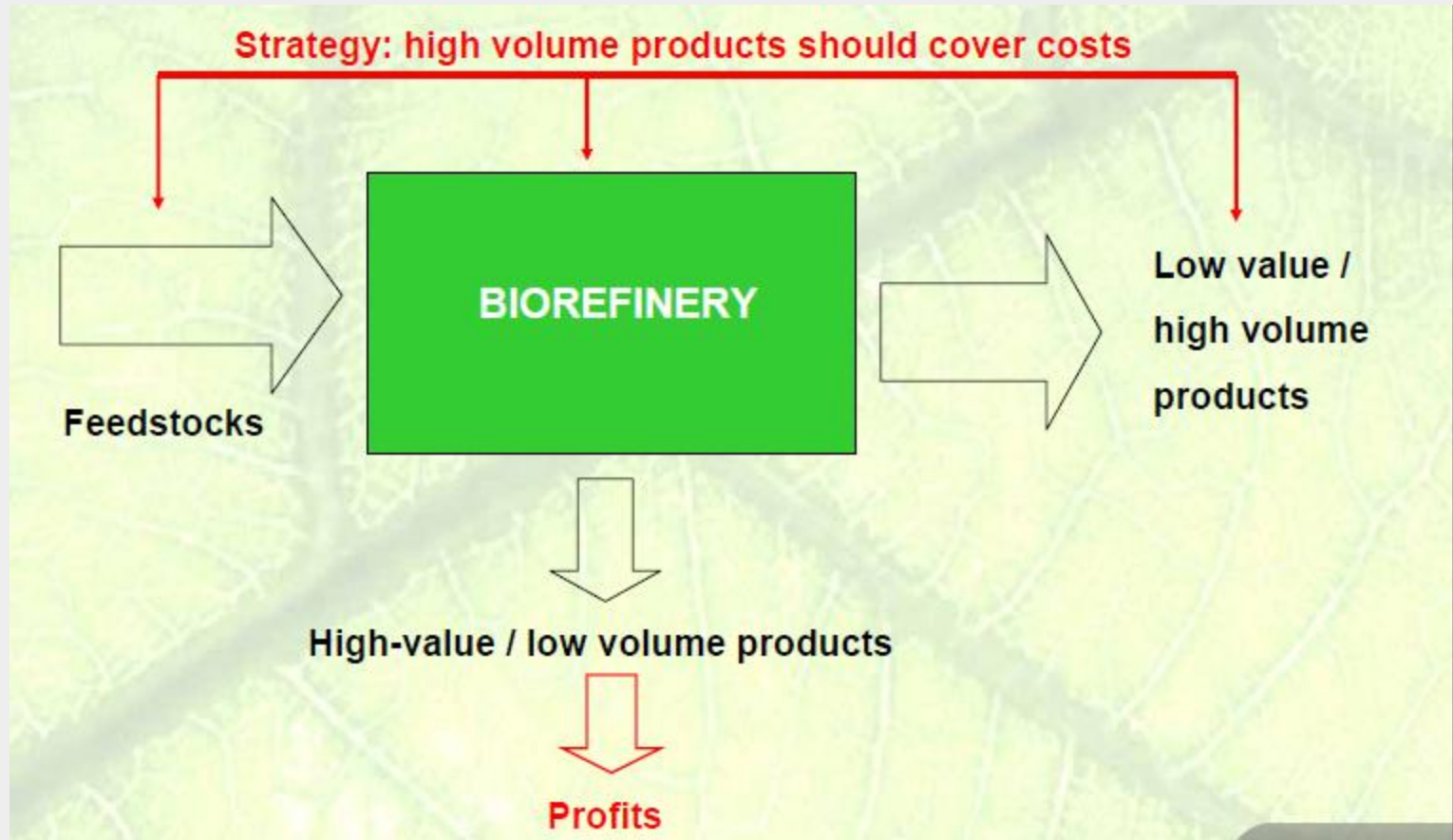


From Becoteps program



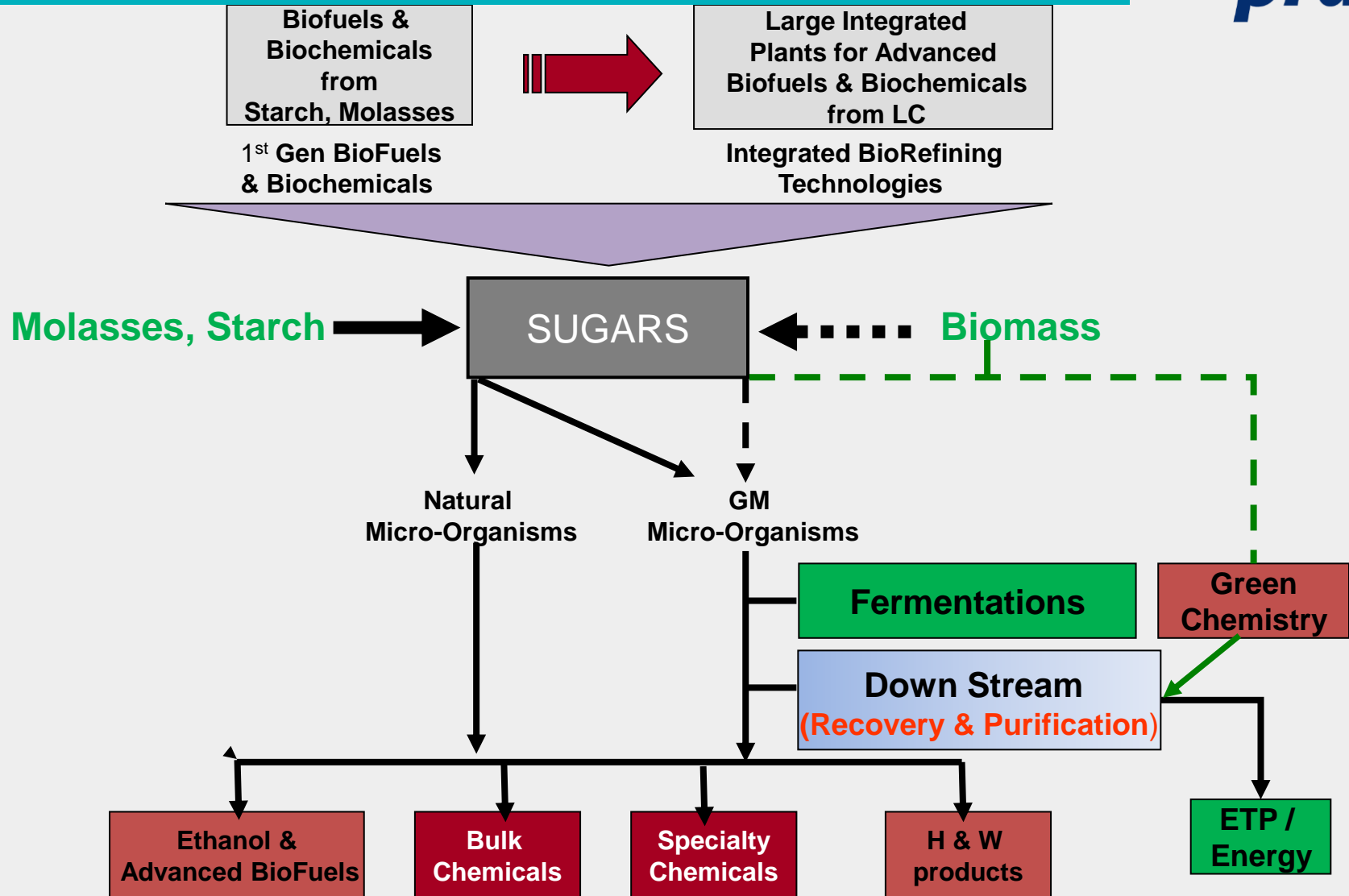
**Development of Bio refinery : integral part of new Bio economy**

# Bio-Refinery Concept





# Bio-Refinery Concept (Sugars)



**Opportunity to participate in the emerging Bio-Refinery space**

# PACE Program



Demo Plant -  
Operation

Demo Plant Design and  
Erection

Pilot Plant Trials

Pilot Plant

Bench Scale  
Experiments

Bench Scale  
Facilities



2005

2006

2007

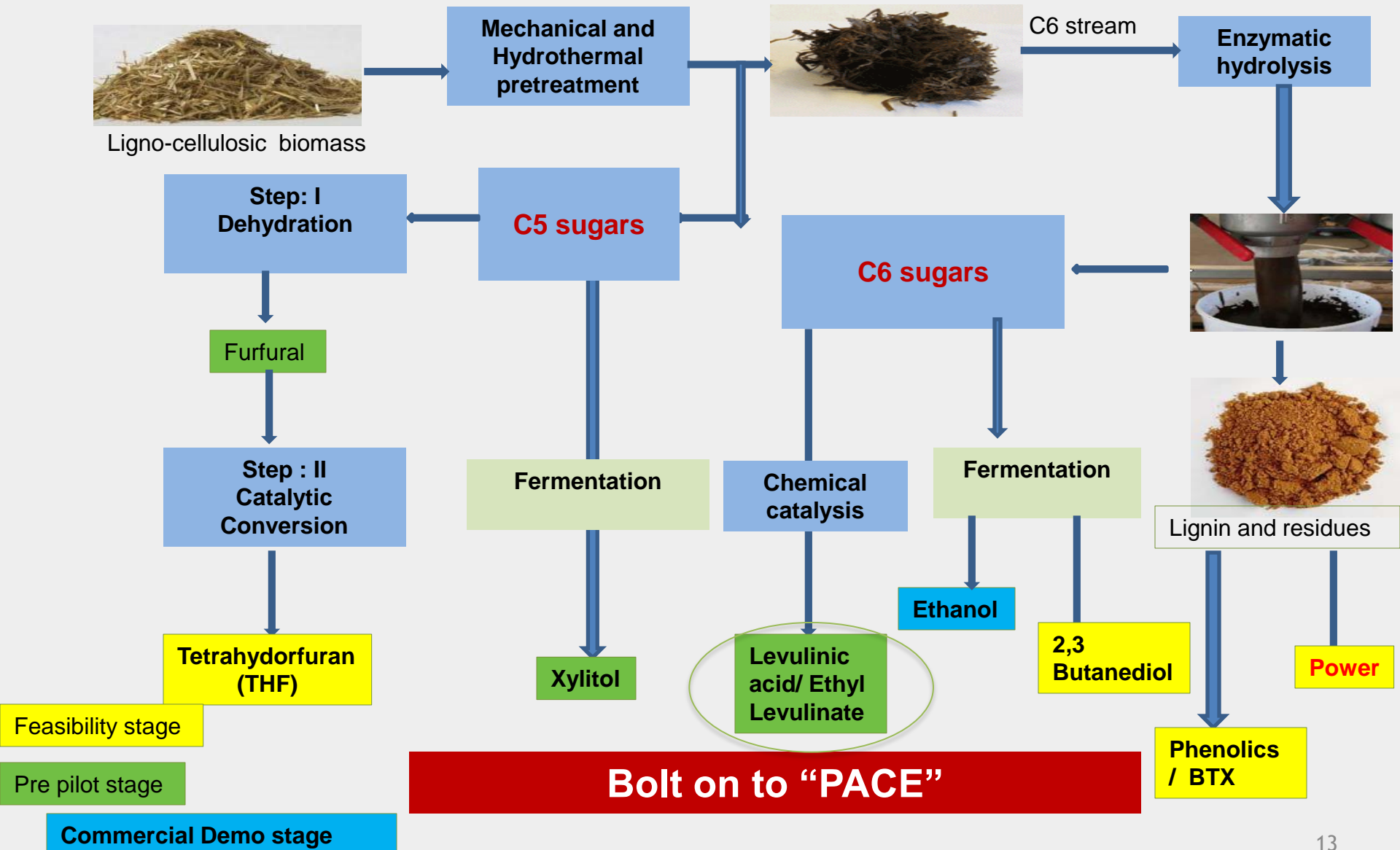
2008

2009

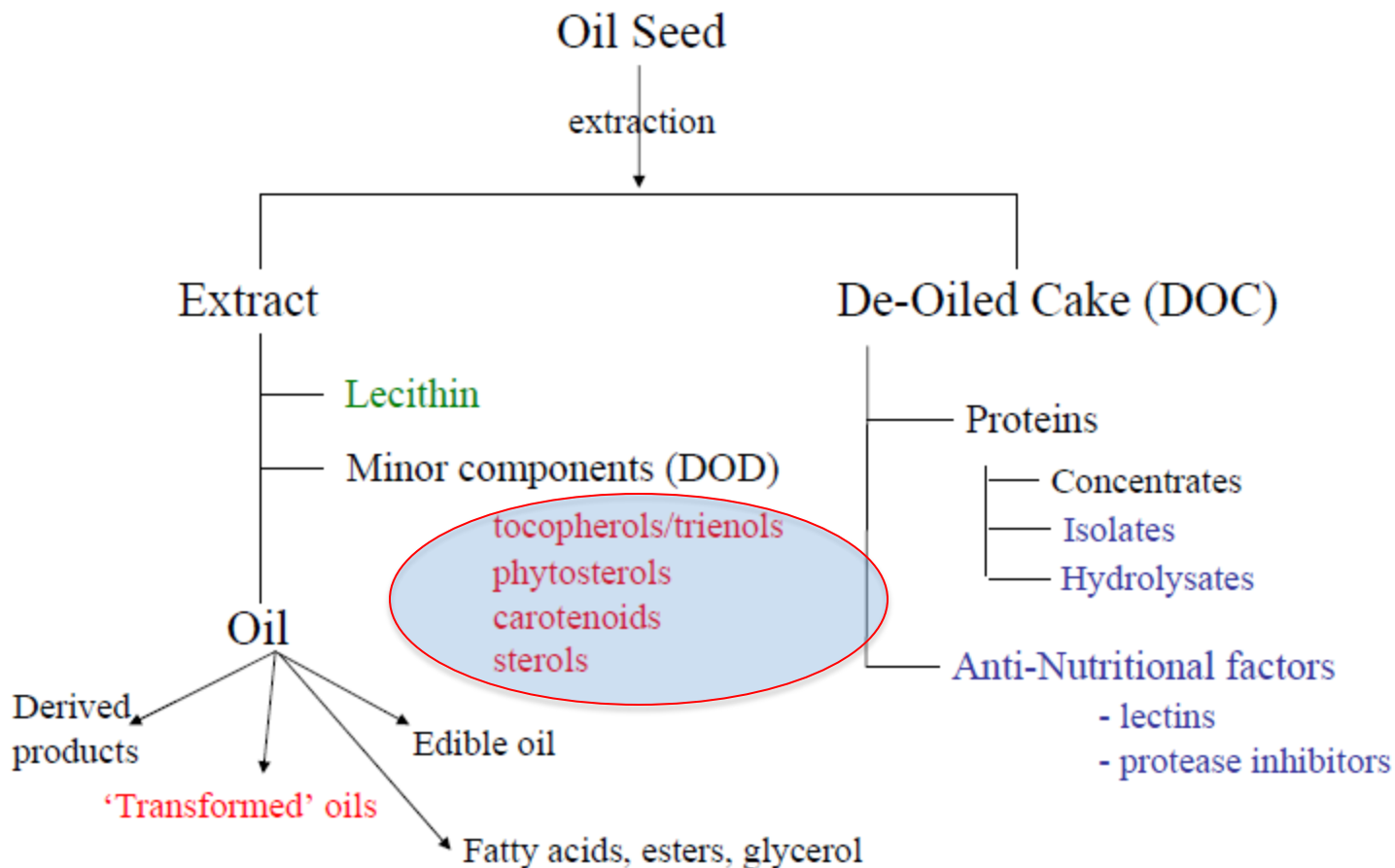
2014

2015

# The Praj “LC” Bio refinery

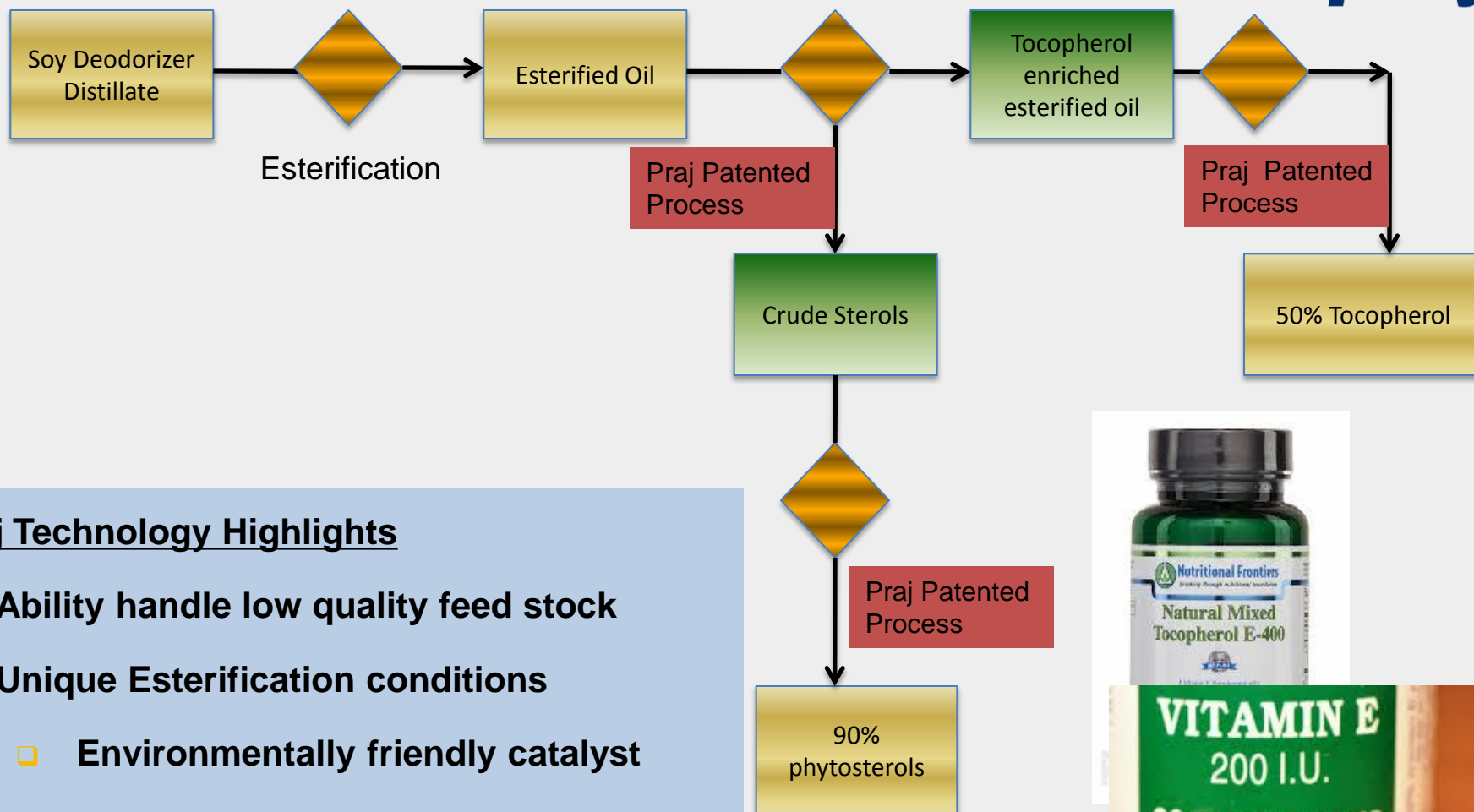


# Bio-Refinery Concept (Vegetable oil)



**Value addition through valorization of DOD**

# Praj – Soya oil Bio refinery

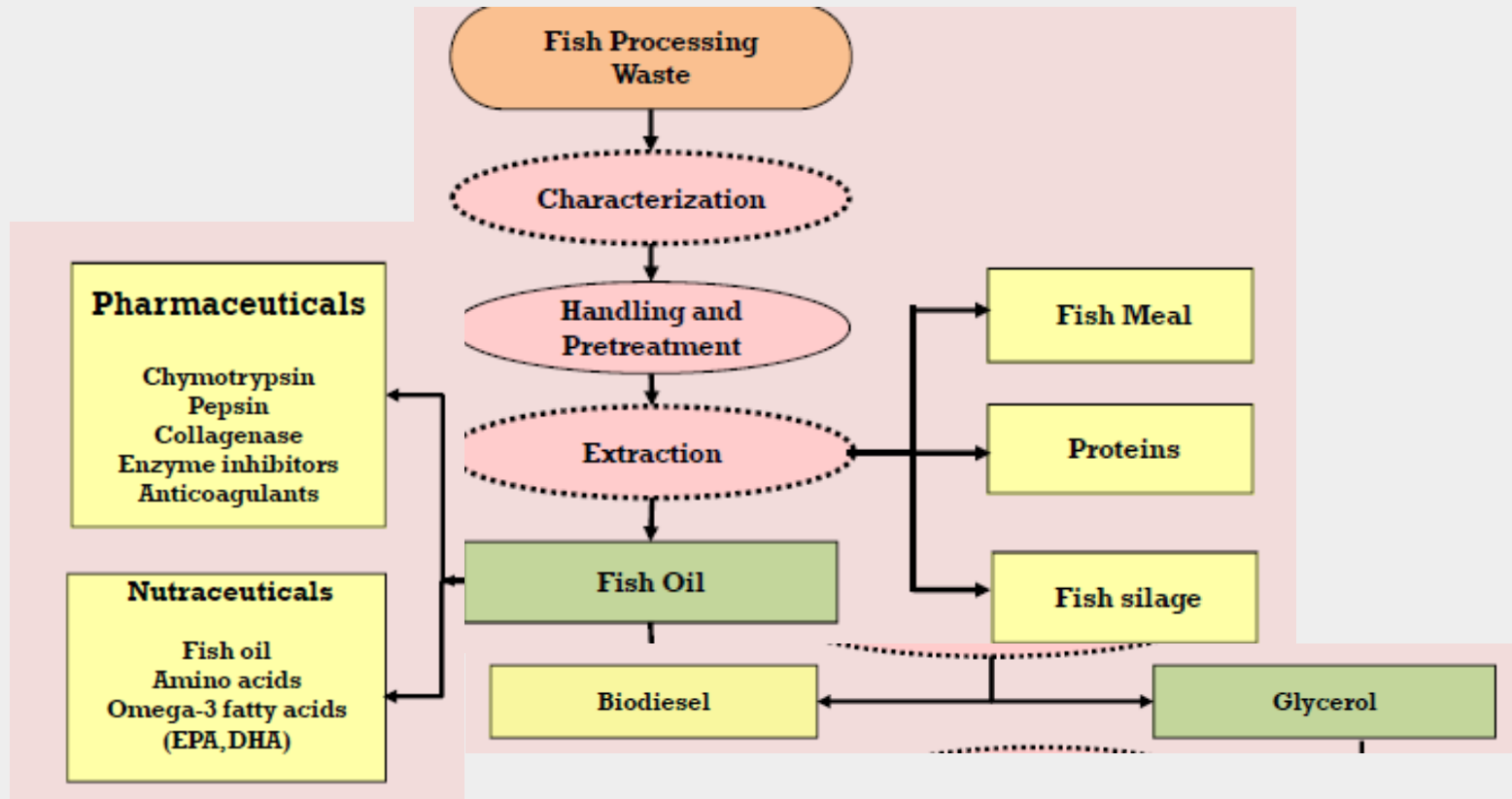


## Praj Technology Highlights

- ❑ Ability handle low quality feed stock
- ❑ Unique Esterification conditions
  - ❑ Environmentally friendly catalyst
- ❑ High recovery of phytosterols and tocopherol
- ❑ IP protected



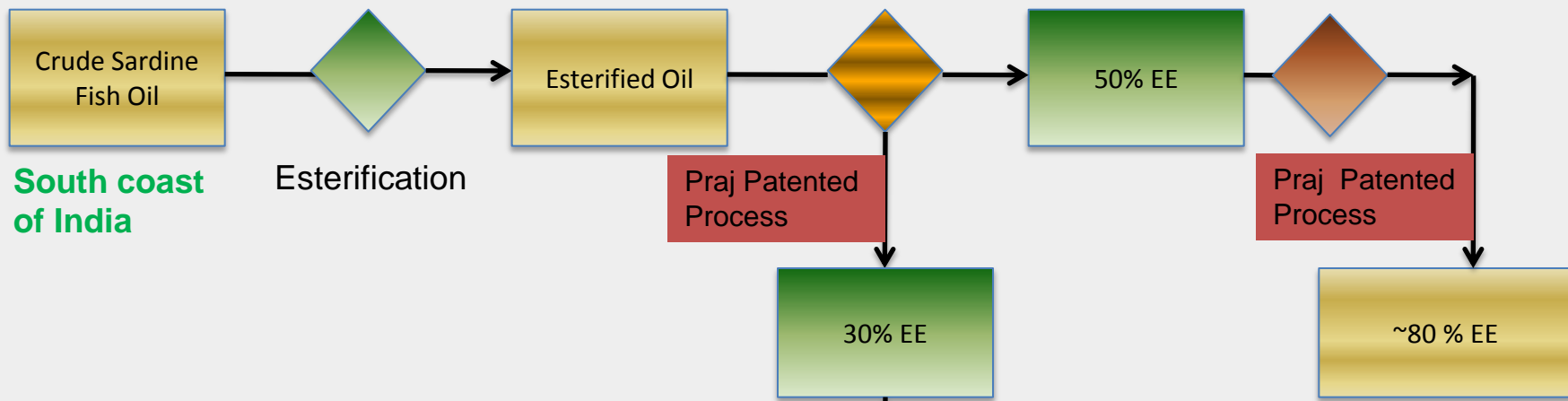
# Bio-Refinery Concept (Fish oil)



**Value addition through valorization of Fish oil**



# Praj – Fish oil Bio refinery

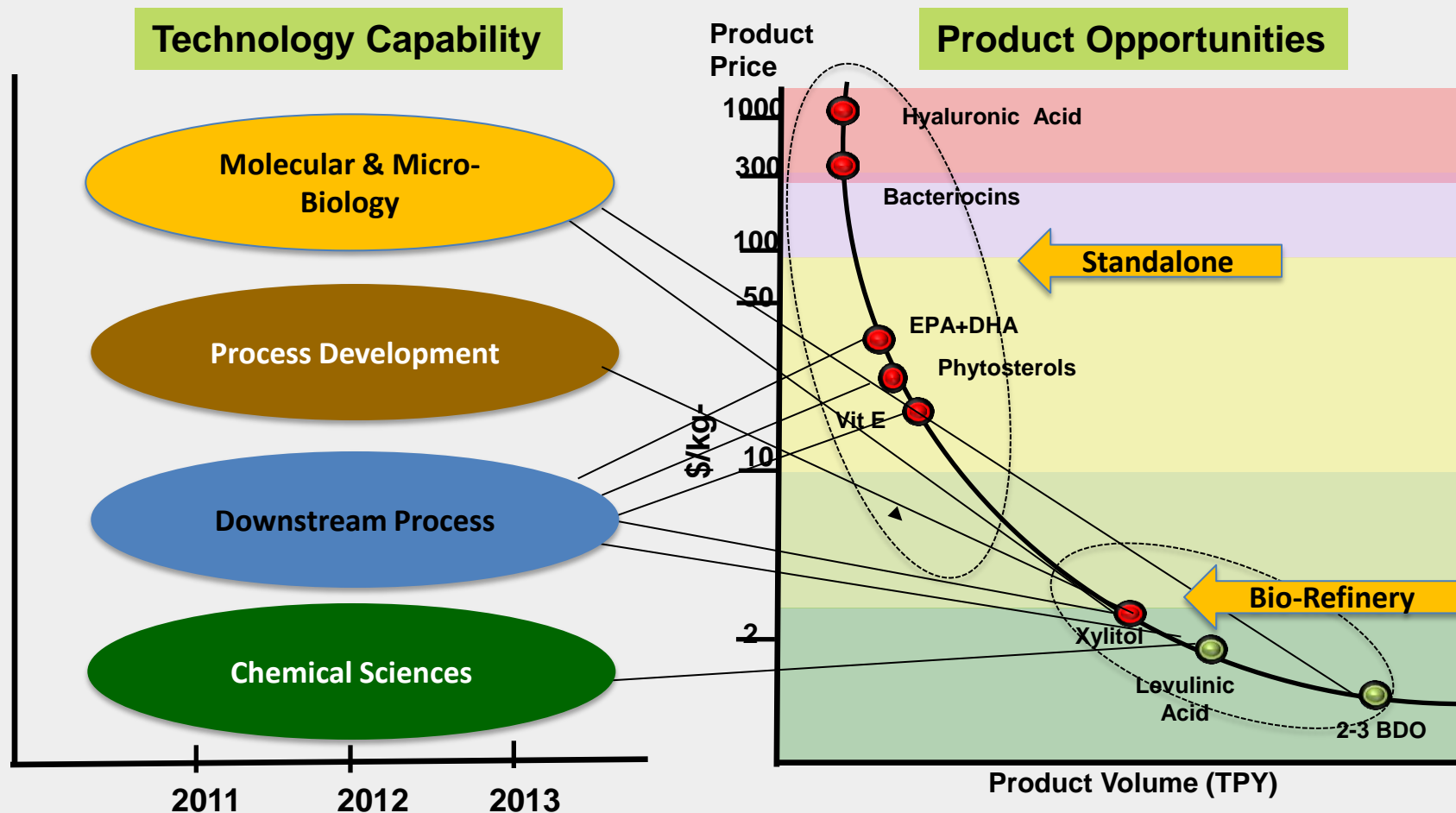


## Praj Technology Highlights

- ❑ Feed stock and product flexibility
- ❑ Unique Esterification conditions
- ❑ Environmentally friendly catalyst
- ❑ High recovery of DHA and EPA
- ❑ IP protected



# Biochemicals - Value Curve



**Effective Linkage of technology development to Business opportunities**

# Challenges for bio economy



- Continuing biotech R&D in parallel with commercialization of products
- Flow of capital to finance construction of first-of-a-kind commercial biorefineries
- Establishing next generation feedstock supply chains
- Training a new workforce for the bioeconomy
- Ensuring pro industry regulatory atmosphere (use of GMO in industrial biotechnology)
- Increasing public awareness and support for industrial biotech processes and products

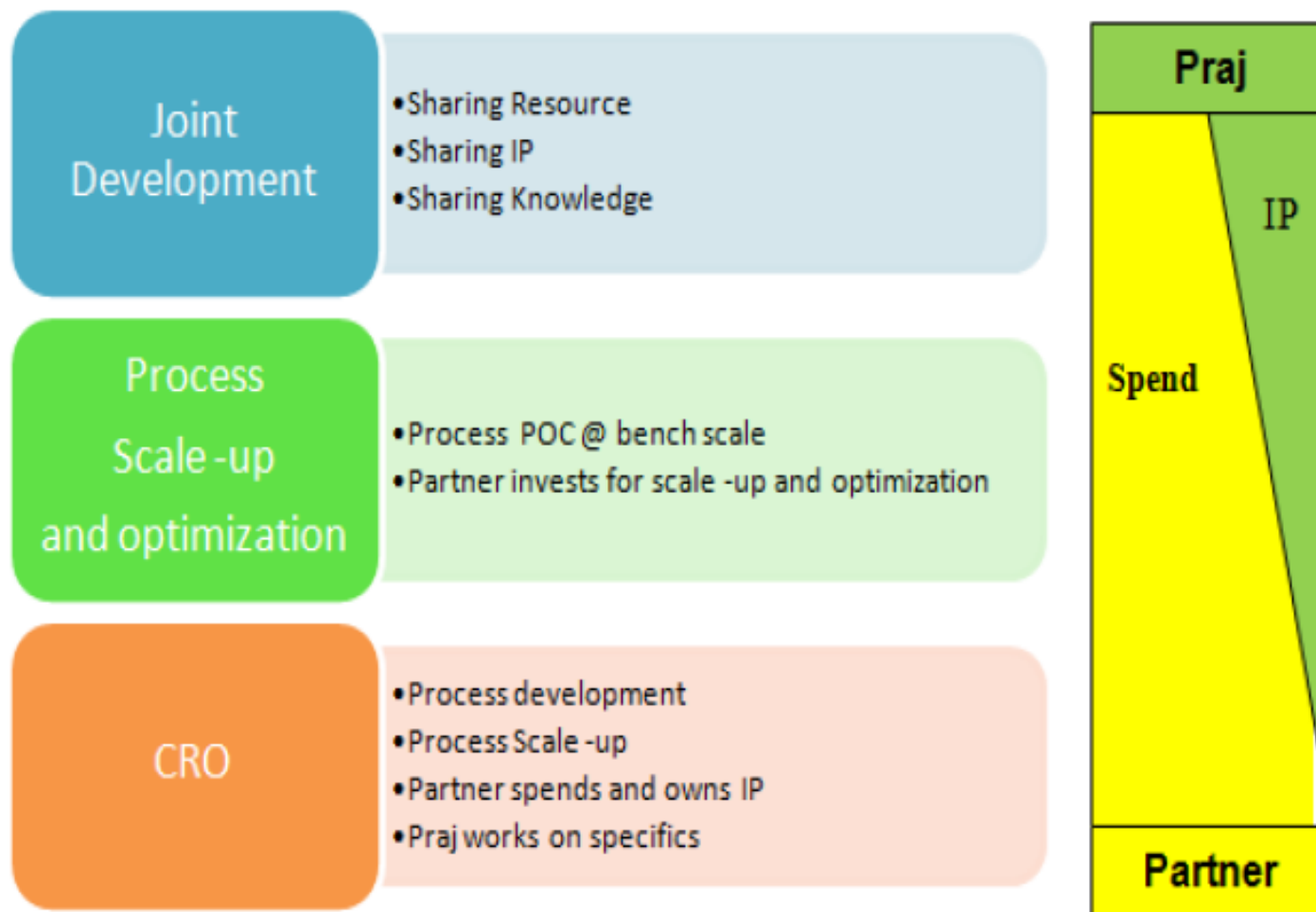
# Proposed support mechanisms



- Advancing the field of synthetic biology with a R&D Grants Program
- Establishing an R&D program to fund projects in industrial biotechnology for renewable chemicals, biobased products, and renewable specialty chemicals
- Providing grants for collaboration between academia (European) and industry (IFCPAR type)
- Providing grants for conducting environmental assessments for renewable chemicals and industrial products produced with industrial biotechnology
- Financing construction of bio refineries

**A growing biobased economy can strengthen the nation's economic security and enhance energy security**

# Collaboration Models



**Partnerships for sustainable future**

**Thank you**

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