

New Models of Sustainability – Innovative Systems for Biochemicals, Biofuels, and Biomanufacturing

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A man in a red polo shirt is standing in a vast field of golden wheat. He is smiling and holding a large white sign high above his head with both hands. The sign has the words "RETHINK TOMORROW" written on it in bold, black, capital letters. In the background, there are rolling hills and a blue sky with light clouds. The overall scene is bright and optimistic.

Novozymes are experts at bio innovation.

We apply biotechnology to challenge and complement traditional thinking and applications to find sustainable solutions for forward-looking companies.

novozymes® 
Rethink Tomorrow

**RETHINK
TOMORROW**

What is Bioinnovation

Who is Novozymes

The Biobased Society

Biofuels

CleanStar Mozambique

Bioinnovation for a sustainable future

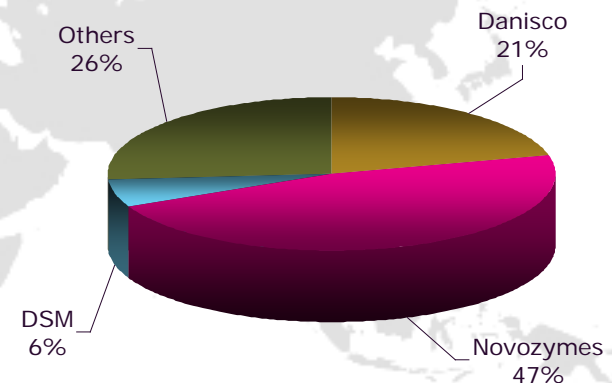


- The supply of energy will not be able to keep up with the demand in the future
- The use of energy continues to harm the environment
- The world is looking for innovation to solve its energy problems while protecting the environment
- Bioinnovation will be one of the solutions for the upcoming energy and environmental crisis
- Bio-based solutions help with the production of biodiesel, biogas, and other biofuels

Novozymes in brief

- World leader in Industrial Enzymes & Microorganisms
- Enzymes account for > 90% of turnover
- Market leader in all main industries
- More than 700 products used in 130 countries in > 30 different industries
- More than 6,500 granted patents and pending patent applications
- Main production in USA, China and Denmark
- Sales DKK 10.51B (FY2011)
- Strong profitability (22.3% in operating profit margin FY 2010)
- More than 5,800 employees

Enzymes for industrial use
- market size approx.* ~DKK 19 billion



Enzyme Business

- Development, production, and distribution of enzymes are a major part of our business
- Enzymes are readily biodegradable proteins that are found in all living organisms and catalyse biochemical reactions
- Enzyme technology can typically replace conventional chemicals, improving resource efficiency and generally reducing environmental impact
- Enzymes Business accounts for more than 90% of sales



Global coverage with strong market presence



PRESENT ALL-OVER NORTH AMERICA



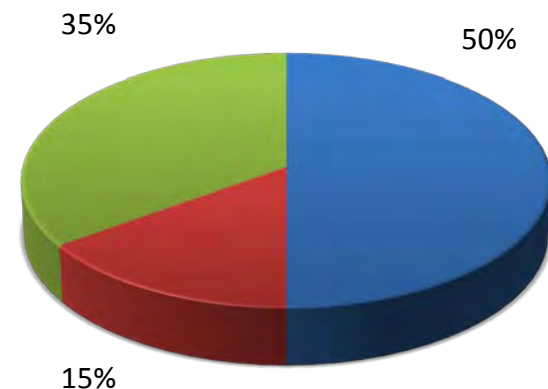
Region North America

No. of employees

- ~483 in Franklinton
- ~164 in Salem
- ~110 in Davis
- ~92 in Saskatoon
- ~55 in Milwaukee
- ~14 in Blair
- ~8 in Boston



Distribution of employees



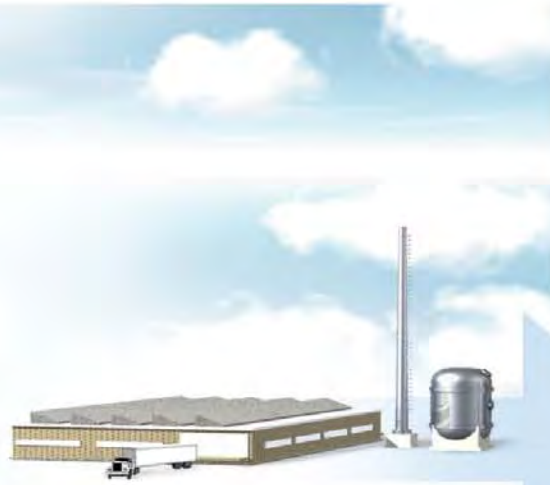
- Production
- R&D
- Sales, Marketing & Staff functions

RETHINK TOMORROW AND HELP CREATE A MORE SECURE, **SUSTAINABLE BIOBASED SOCIETY**



Enzymatic
hydrolysis

The
Biorefinery
Concept



Bio energy
Bio materials

Fine chemicals
Bulk chemicals

Food &
Feed

END PRODUCTS



Producing fuel from organic matter



In the old days...

... petrol, diesel, and gas were produced from crude oil.

Crude oil is a nonrenewable resource that will eventually run out.

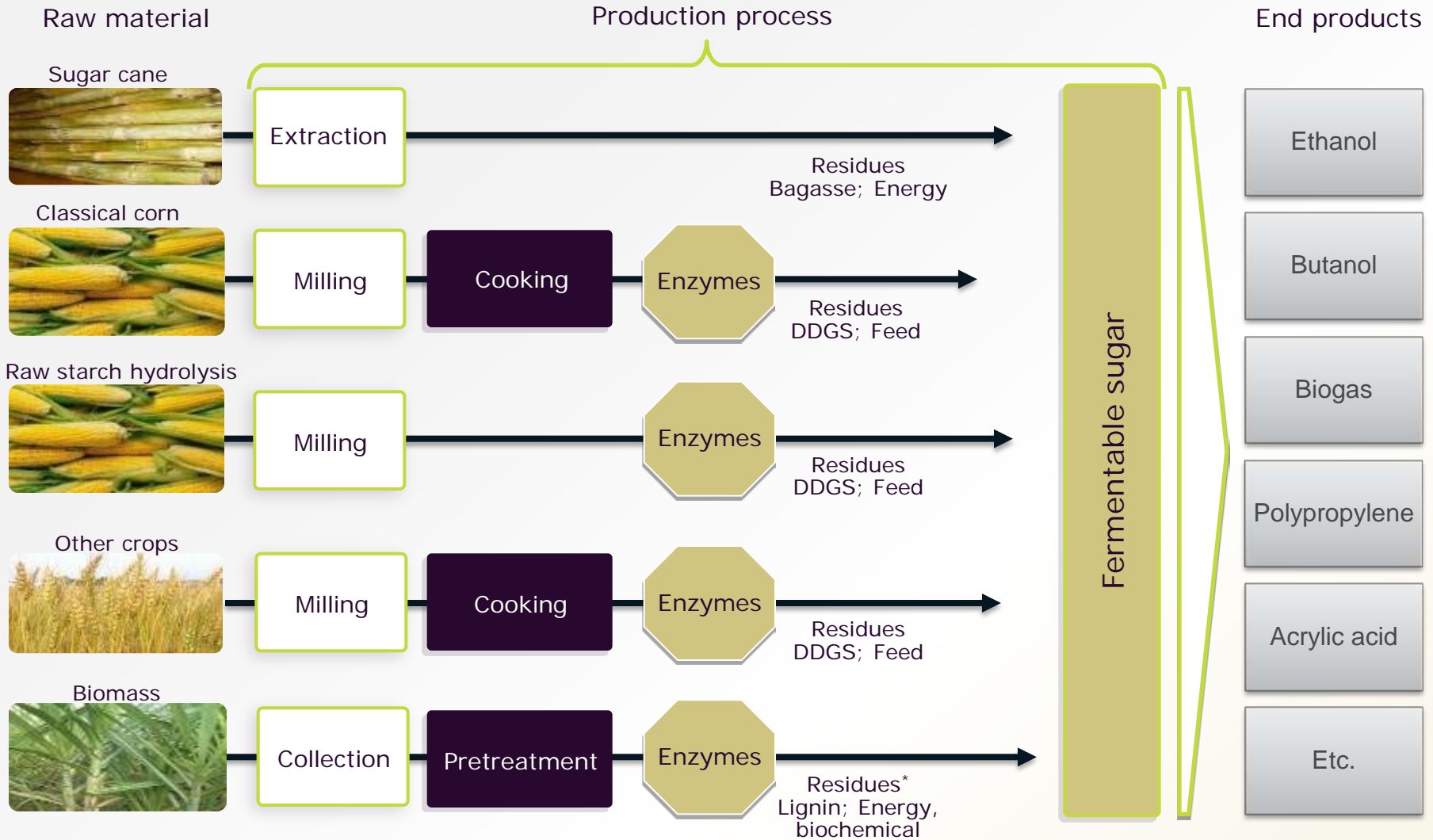
With bioinnovation...

... fuel will be produced from renewable sources.

Organic substances like wheat, corn, corn husk, switch grass, and others are degraded into smaller sugar molecules that serve as substrates for producing ethanol, which can be used as a transportation fuel.

Liquozyme®, Viscozyme®,
Spirizyme®, Cellic®

VAST PROCESS EXPERTISE TO ENSURE PARTNER SUCCESSES

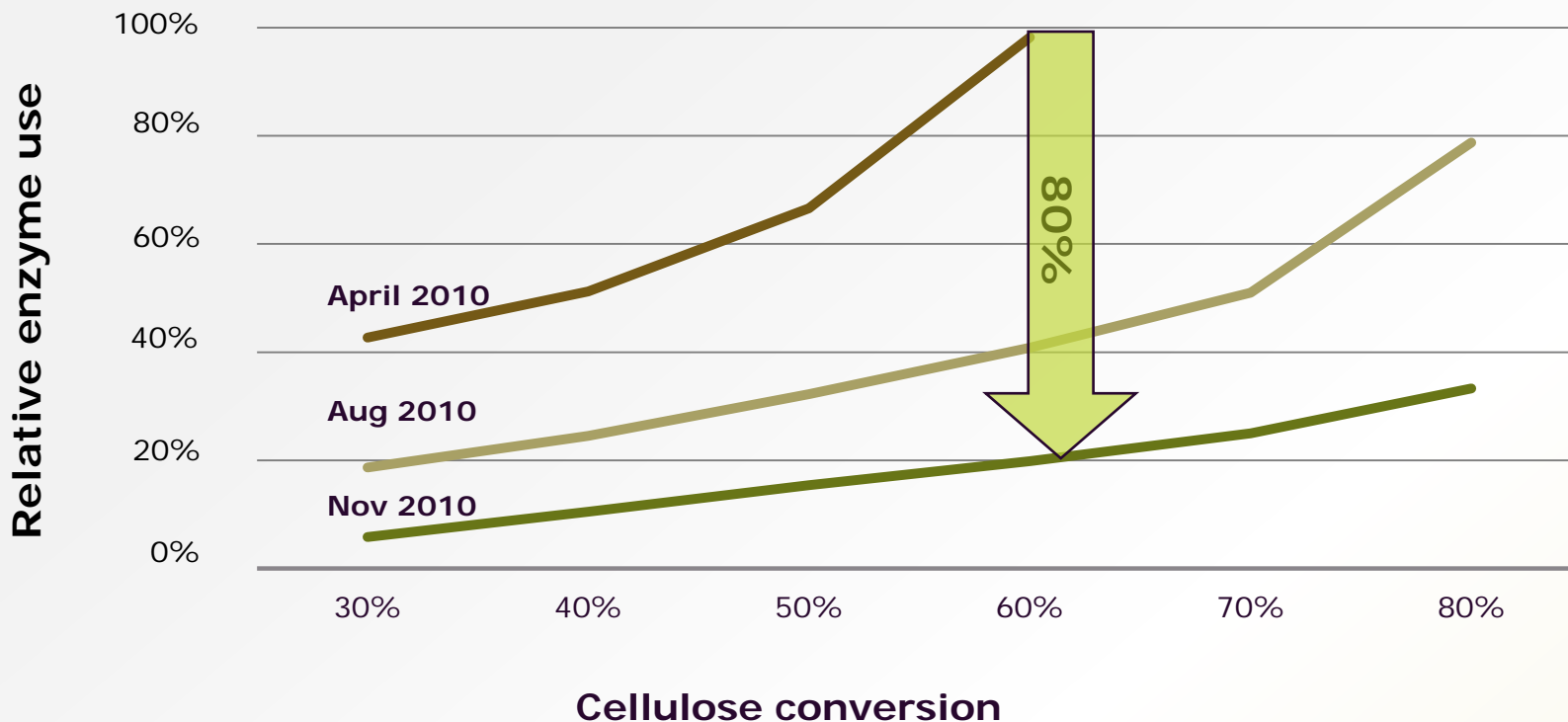


*In the US Department of Energy Biomass-model the lignin residue is burned to power the production plant

OUR COMMITMENT TO OUR PARTNERS & INDUSTRY BEGINS WITH OUR **GLOBAL EFFORTS AND FOCUS**



PRETREATMENT OPTIMIZATION SUCCESSSES RESULT IN EFFICIENCIES & COST REDUCTIONS



Key takeaway

Optimization focus and results within pretreatment. Huge opportunities for improvements, cost reductions, and efficiencies outside of pretreatment.



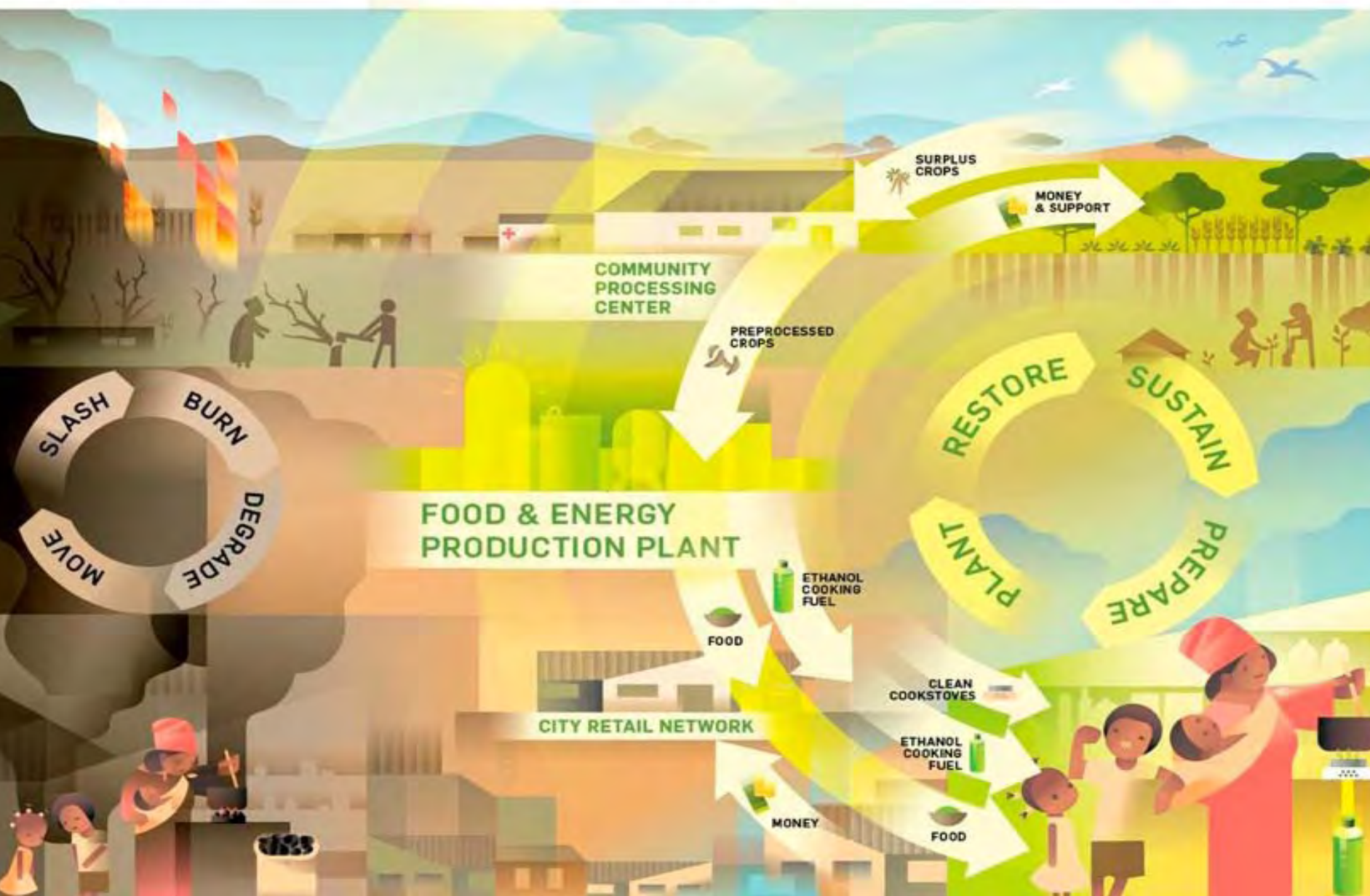
CLEANSTAR MOZAMBIQUE

ENERGIZING AFRICAN AGRICULTURE

A BLEAK REALITY

THE CHANGE WE BRING

A BRIGHTER FUTURE



Profitable in 2014 and then expand - in Mozambique and beyond

By end of 2012

- >500 farmers engaged
- 2 community-level pre-processing centres
- 2m litre ethanol cooking fuel plant commissioned
- Stove manufacturing & assembly started in Maputo
- >5000 cook stove and fuel customers in a Maputo neighborhood
- >\$5m invested total

By end of 2014

- 3,000 farmers engaged
- 7 community-level pre-processing centres
- 20m litres of clean cooking fuel sold per annum
- Farmer household income increased 4x from baseline
- 80,000 urban households using clean cookstoves
- 320,000 t-CER per annum
- 4,000 ha of avoided forest destruction per annum
- 2.4 million trees planted in forest belts (3,000 ha total)
- ~\$15m invested total

2014+ (not modeled)

- 15,000 farmers engaged in current area of central Mozambique
- Agroforestry system replicated in Inhambane & Nampula provinces
- Stove market share expanded to 40% (160,000 households)
- Ethanol cooking fuel production capacity matched to demand
- Cooking solution launched in other sub-Saharan African cities
- Potential for several hundred million dollars of investment/exports

OUR VISION HAS NEVER BEEN MORE RELEVANT

Our vision Where we are heading

A future where our biological solutions create the necessary balance between better business, cleaner environment, and better lives

Join the dialogue...

bioenergy.novozymes.com
insight.novozymes.com



Thank you!

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