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Bioenergy and Food
Security Project

BEFS Module 2 - Techno- economic analysis on the production of biofuels

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Module 2: Key questions

Now that we have seen which areas have potential....

- Can biofuels be produced profitable in Tanzania?**
- Can biofuels be profitable with smallholders participation?**



Module 2 - Steps

No biofuel production in Tanzania today

- **Is the country capable to produce biofuels?**

If yes...

- **At what production cost?**

Based on:

- **feedstock choice**
- **feedstock production set up**
- **Industrial biofuel conversion technology level**
- **Industrial biofuel conversion set up**
- **Co-products income**

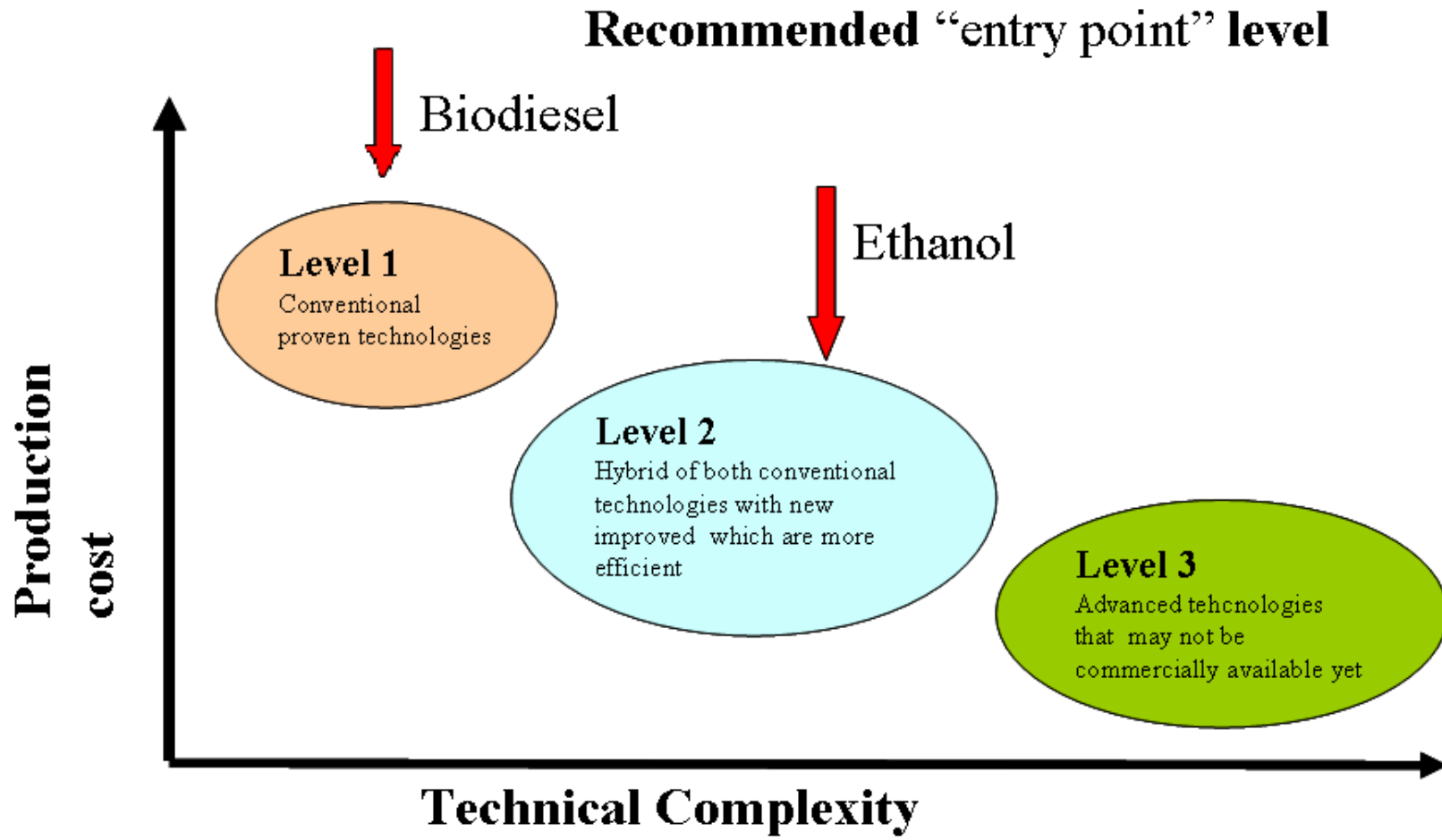
Feedstock



Biofuel	Feedstock	Production options
Ethanol	Sugarcane Molasses Cassava	Outgrower only or Estate only
Biodiesel	Jatropha Oil palm	or Mix outgrower/Estate



Industrial biofuel production technology level





Industrial biofuel conversion set up

Configuration	Production Capacity
Stand alone facilities (i.e. ethanol only)	Million liters per year
Integrated facilities (i.e. sugar and ethanol production at same site)	



Biofuel production cost scenarios

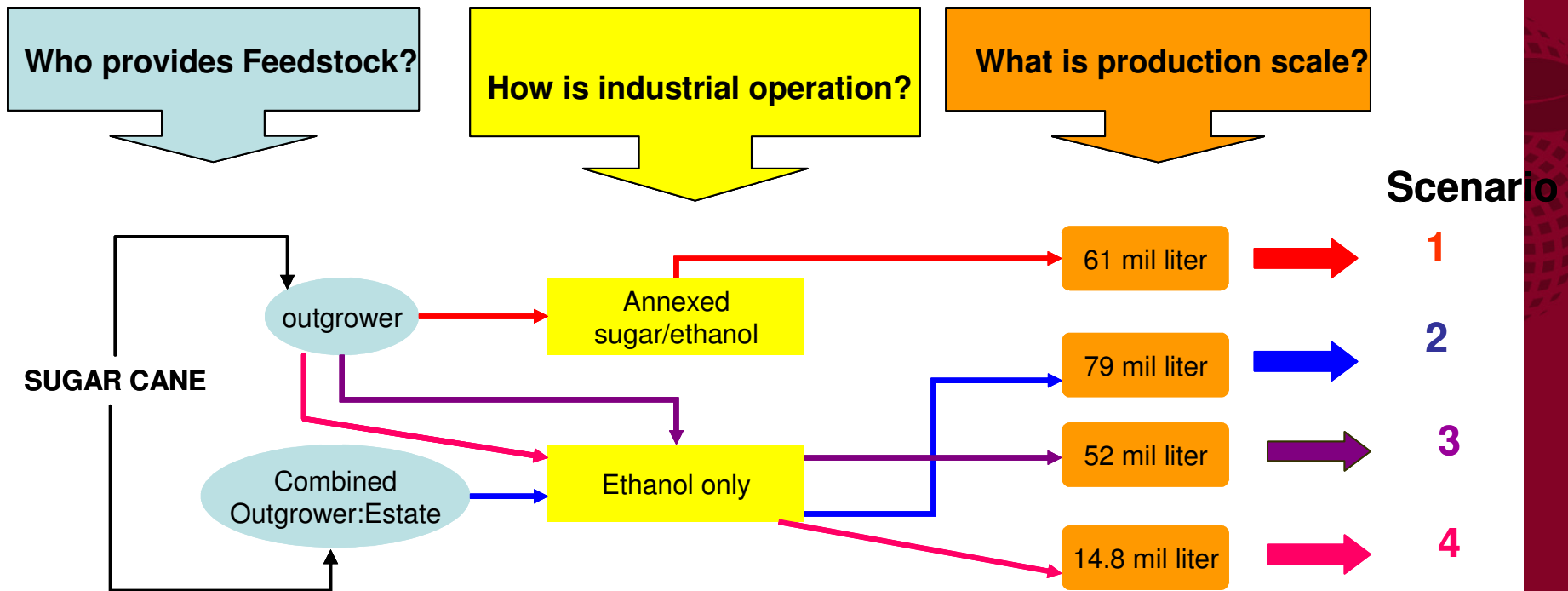
The scenarios considered the following:

1. Raw material supplied by outgrowers
2. Raw material supplied from estates
3. Raw material supplied both outgrowers & estates
4. Biofuel production capacity & industrial configuration



Biofuel production cost scenarios

- Example – Ethanol from Sugarcane scenarios





Biofuel production cost scenarios

Feedstock	Feedstock Origin	Industrial Configuration	Numbers of Scenarios
Sugar cane	Outgrowers/ Estate/Mix	Stand alone/integrated facility; technology level; capacity; by- products processing	4
Molasses	Existing sugar factories	Stand alone/integrated facility; technology level; capacity; by- products processing	2
Cassava (fresh and dried)	Outgrowers/ Estate//Mix	Stand alone; technology level; capacity; by-products processing	3
Oil palm	Outgrowers	Stand alone; technology level; capacity; by-products processing	1
Jatropha	Outgrowers/ Estate//Mix	Integrated; technology level; capacity; by-products processing	3



Results – Biofuel production costs

Under recommended technology and no co-product credits

Biofuel	Production Cost in Tanzania (USD/litre)	Other Biofuel Production Costs in the World (USD/litre)
Ethanol from sugar cane	0.49-0.68	Brazil / Colombia: 0.27 - 0.30 India: 0.48 - 0.55 EU: 0.76 - 0.78*
Ethanol from molasses	0.62-0.74	Brazil, India Thailand & South Africa < 0.60 USA: 0.60 – 0.70
Ethanol from cassava	0.37-0.47	Thailand and Vietnam: 0.34 - 0.40 Brazil: 0.45 -0.47 China and India: 0.60 - 0.65
Biodiesel from oil palm	0.83	Malaysia: 0.38 – 0.69
Biodiesel from Jatropha	0.74- 0.96	India: 0.60 Zambia: 0.95 Mozambique: 0.78

* may include use of sugar from beets

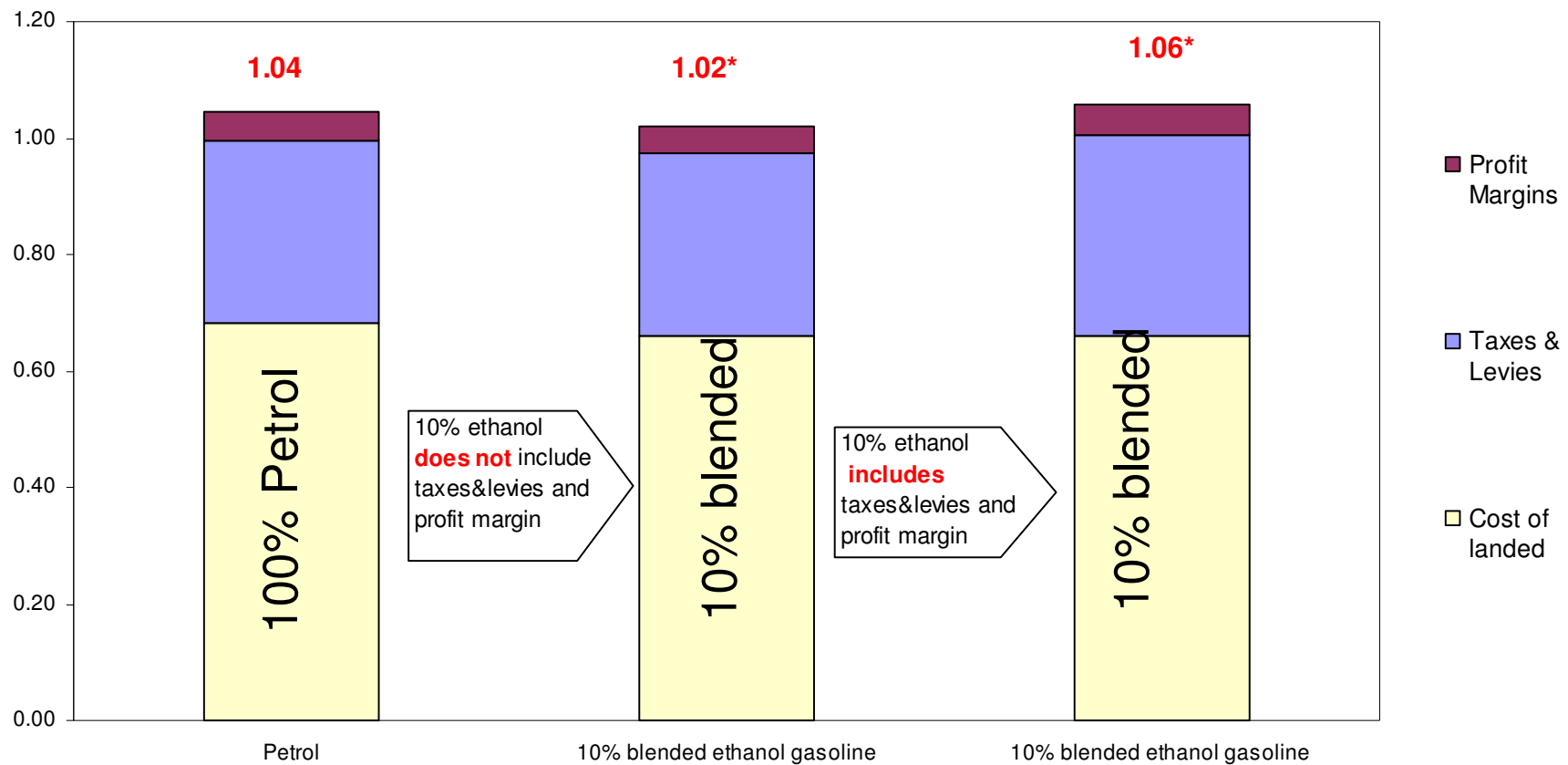


Module 2 - Techno-economic analysis

Information on **biofuel production cost** can help:

- Assess competitiveness of domestic biofuel production with fossil fuels
- Assess competitiveness of domestic biofuel production on international market
- Identify needs for sector support

Assessing competitiveness of ethanol on the national market USD per litre

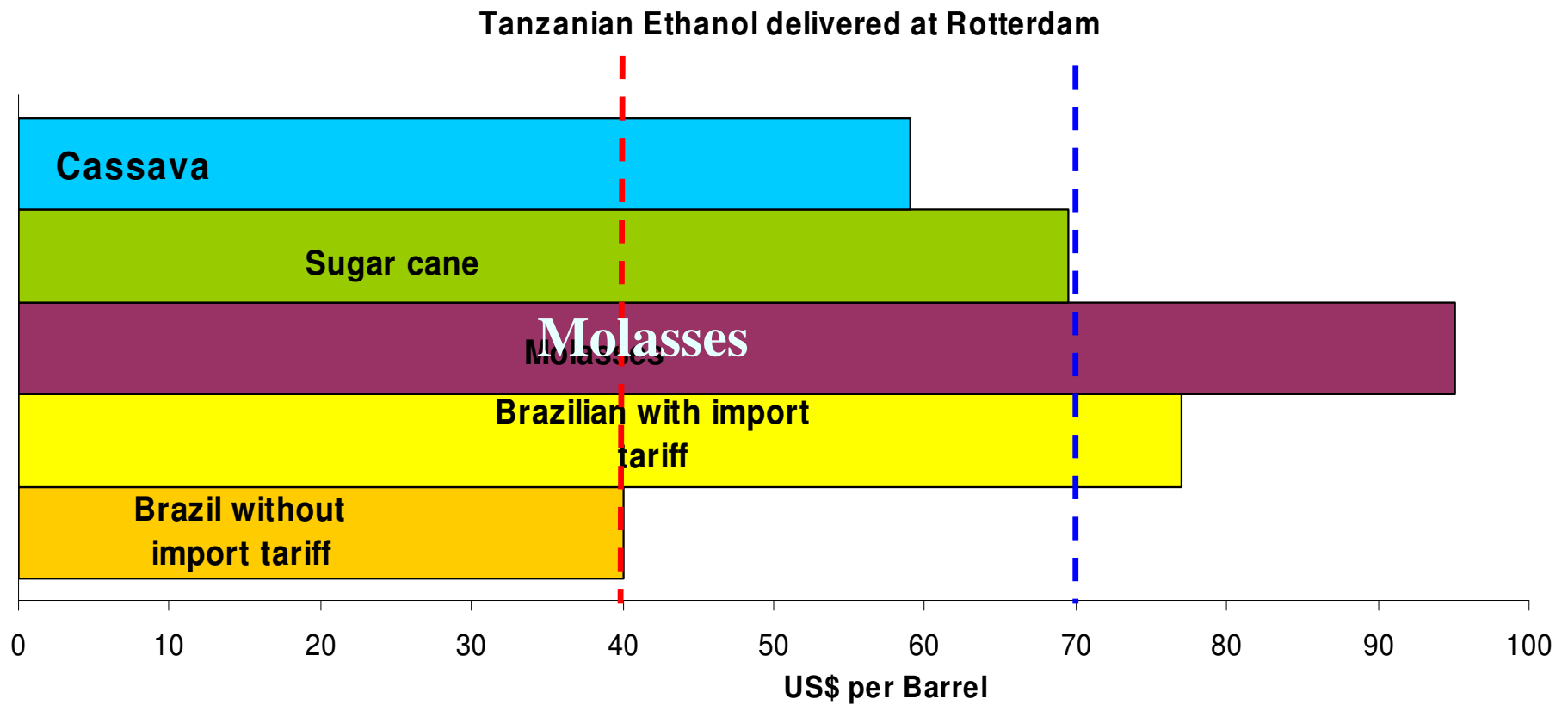


*Based on average ethanol production cost in Tanzania



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Tanzanian ethanol delivered at Rotterdam port USD per barrel



Ethanol Cassava: dried scenario 9. Ethanol Sugar cane: Scenario 2. Ethanol Molasses: Scenario 6b, including co-product credit



Policy implications

Biofuel industry in Tanzania needs to be supported in order to reduce cost and make it competitive. This call for policy and strategies in the following areas:

Co-product market development for byproducts from biofuel industries

- Electricity from co-products
- Organic fertilisers
- **Increase in yield**
- Research into better varieties of crops
- Improved farming technology/services/infrastructure
- Promote block farming and institutional support to smallholder farmers



Policy implications

- Promote block farming and institutional support to smallholder farmers

Human capital

- Development of human capital e.g.
 - Support technology research in universities
 - Initiate and support special training programme in biofuel technology in universities locally and abroad
 - Initiate and support biofuel research and technology development in the country

Policy interventions

- Introduce a blending mandate to stimulate the Biofuels industry
- Fiscal incentives for producers and consumers (i.e. VAT)
- Special incentives/support for integrating outgrowers



Training / capacity building

Why training / capacity building

- The tools that have been developed under the BEFS project can assist the Government in their Biofuel Policy Development
- FAO will not be in a position to continue providing expertise on these tools
- The knowledge on these tools needs to be vested in Tanzania
- The Government can access the knowledge on the BEFS tools through the Universities / Research Institutes and consultants that have been trained under the BEFS project



Training / capacity building

Organisations trained

- University of Dar es Salaam (College of Engineering and Technology)
- Tanzania Investment Center
- Ministry of Agriculture Food Security and Cooperatives
- Ministry of Energy and Minerals

Two levels of training

- BIOTA (Bioenergy Techno-Economic analysis for Africa)
 - Accessible for non technical people
- PENTA (Process engineering for environment and techno-economic analysis)
 - Specifically for chemical engineers



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THANK YOU!

www.fao.org/bioenergy/foodsecurity/befs



BEFS Analysis building blocks

