

Egypt's Industry Development Strategy - White Biotechnology-

**Assessment of globally important
fermentation products**

Cairo, July 2010



Objectives of Presentation

- Presentation of key characteristics of internationally important fermentation products,
- Appraisal of such products from technical, economic, marketing and know-how requirements angle,
- Ranking of products according to multitude of appraisal parameters,
- Suggestion of products to look at closer for their goodness of fit to Egypt.



The four most attractive fermentation products are.....

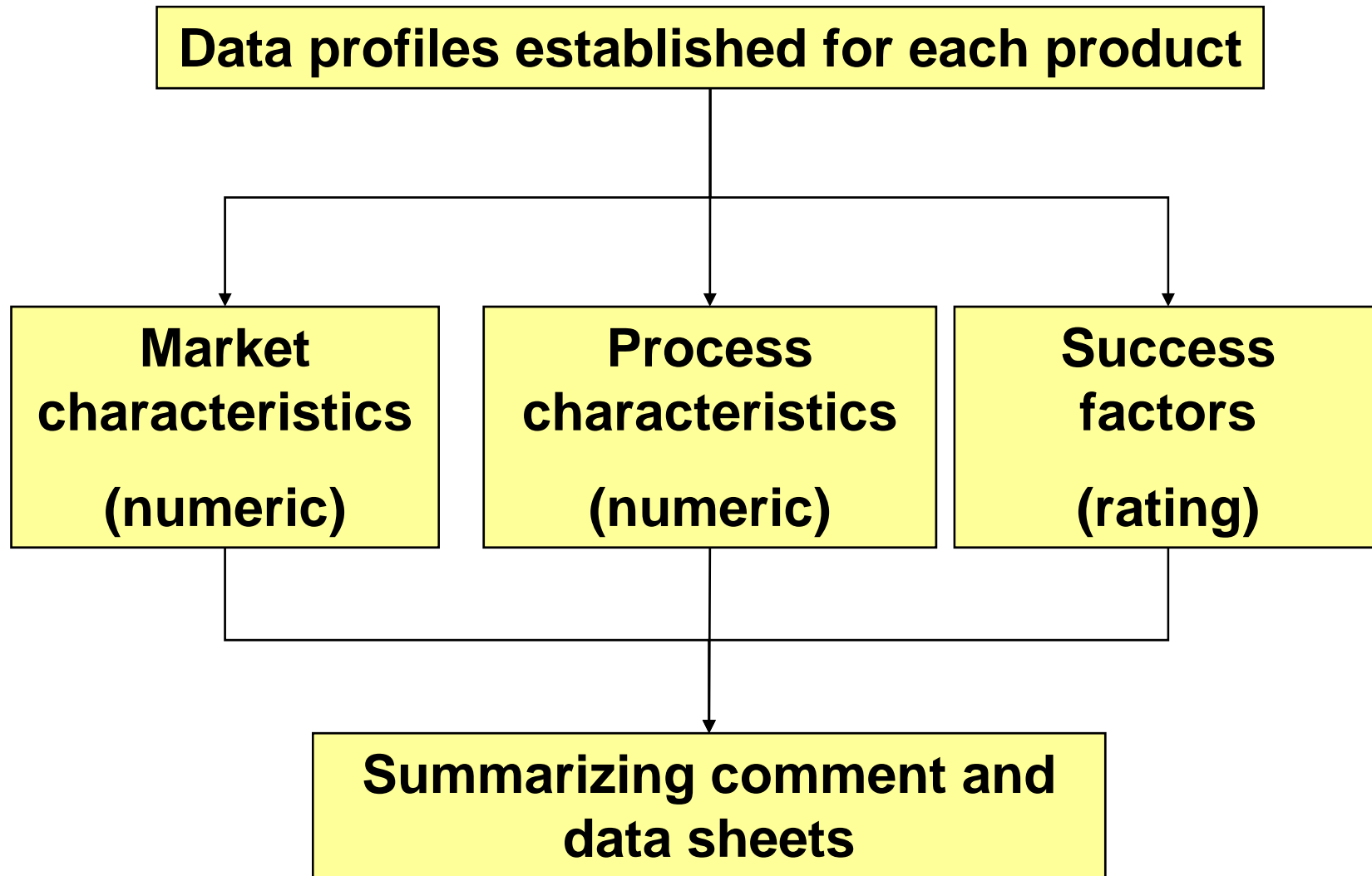
..... let's first look at the procedure and how we came to the conclusion!



Products Reviewed

Category	Product
Amino Acids	MSG, Lysine, Threonine, Tryptophan, Aspartic Acid
Bio Fuel	Ethanol
Carotenoids	Astaxanthin, Beta-Carotene, Lycopene
Enzymes	Amylases, Proteases, Cellulases
Organic Acids	Citric, Lactic, Gluconic, Isoascorbic, Acetic
Polysaccharides	Xanthan, Curdlan, Gellan, Welan
Biomaterials	Polyhydroxybutyrate, Poly-Lactic-Acid
Vitamins	C, B2, B12





Example for a Data Profile: Marketing Characteristics of Lysine

Historic and current market parameters

• Market size (tons)	850.000
• Annual growth of market size (%)	10,1
• Main usage (%)	
Food	1
Feed	96
Supplements/Pharmaceuticals	1
Chemical/Intermediate	1
• Share of base product converted to derivatives (%)	1
• Main product forms	powder & liquid
• Price of base product (€/kg)	1,5
• Price of main derivatives (€/kg)	5
• Annual price trend (Ø 1990-206) of base products (%)	-5
• Annual price trend (Ø 1990-206) of main derivatives (%)	0
• Market value (2006), (Mio €)	1.150
• Regulation (EU/NAFTA), (free/regulated)	free
• Image of product (high/low)	high
• Number of producer (No)	> 25
• Market share of three main producers (%)	51
• Market share of Chinese/Indian producer (%)	32
• Distribution system	trader
• Steps in value chain	3
• Requirements for formulation (yes/no)	no
Future Developments	
• Volume Trend (%)	+8
• Price trend (%/a)	0
• Expected market value in 2015 (Mio €)	2.300



Example for a Data Profile: Production Characteristics MSG (Mono-Sodium-Glutamate)

Process Characteristics	
• Type of organism used	Corynebacterium
• Type of process	fermentation, addition of NaOH, crystallisation, purification
• Main carbohydrate	molasses/starch
• Carbohydrate conversion rate (%)	85
• Valuable by-product (yes/no)	no
Size and cost structure of plant	
• Typical size (tons/a)	50.000
• Global capacity utilisation (%)	> 90
• Typical investment (€/ta)	1.150
• Total costs of production (€/kg)	0,9
• Importance of cost items:	
Depreciation (%)	24
Carbohydrate (%)	28
Labour (%)	10
Utility (%)	28
Overhead/others (%)	10
• Margin fc (sales price – costs), (%)	20
Patent protection of main process steps (yes/no)	no
Flexibility of process	
• Flexibility in using carbohydrates (high/low)	high
• Degree of sophistication (high/medium/low)	medium
• Dedication of plant (dedicated/ not dedicated)	dedicated



Example for a data Profile: Success Factors Iso-Ascorbic-Acid

Parameter	Degree of Importance (1=lowest, 3= highest)		
	1	2	3
• Economy of scale			X
• Quality			X
• Low selling price			X
• Specialisation on specific derivatives		X	
• Availability of specific know-how (base process)	X		
• Availability of specific know-how (formulation)	X		
• Availability of spec. carbohydrates			X
• Low priced carbohydrates			X
• Low prices labour	X		
• Low priced utilities			X
• Availability of specific reaction chemicals	X		
• Availability of special sales force/network		X	
• Need for customer training		X	
• Need for specialised distribution network			X
• Patent protection	X		
• Elaborate product/derivative portfolio		X	
• Requirement of flexibility vis-à-vis market/ consumer developments		X	
• Specific permissions/regulations	X		

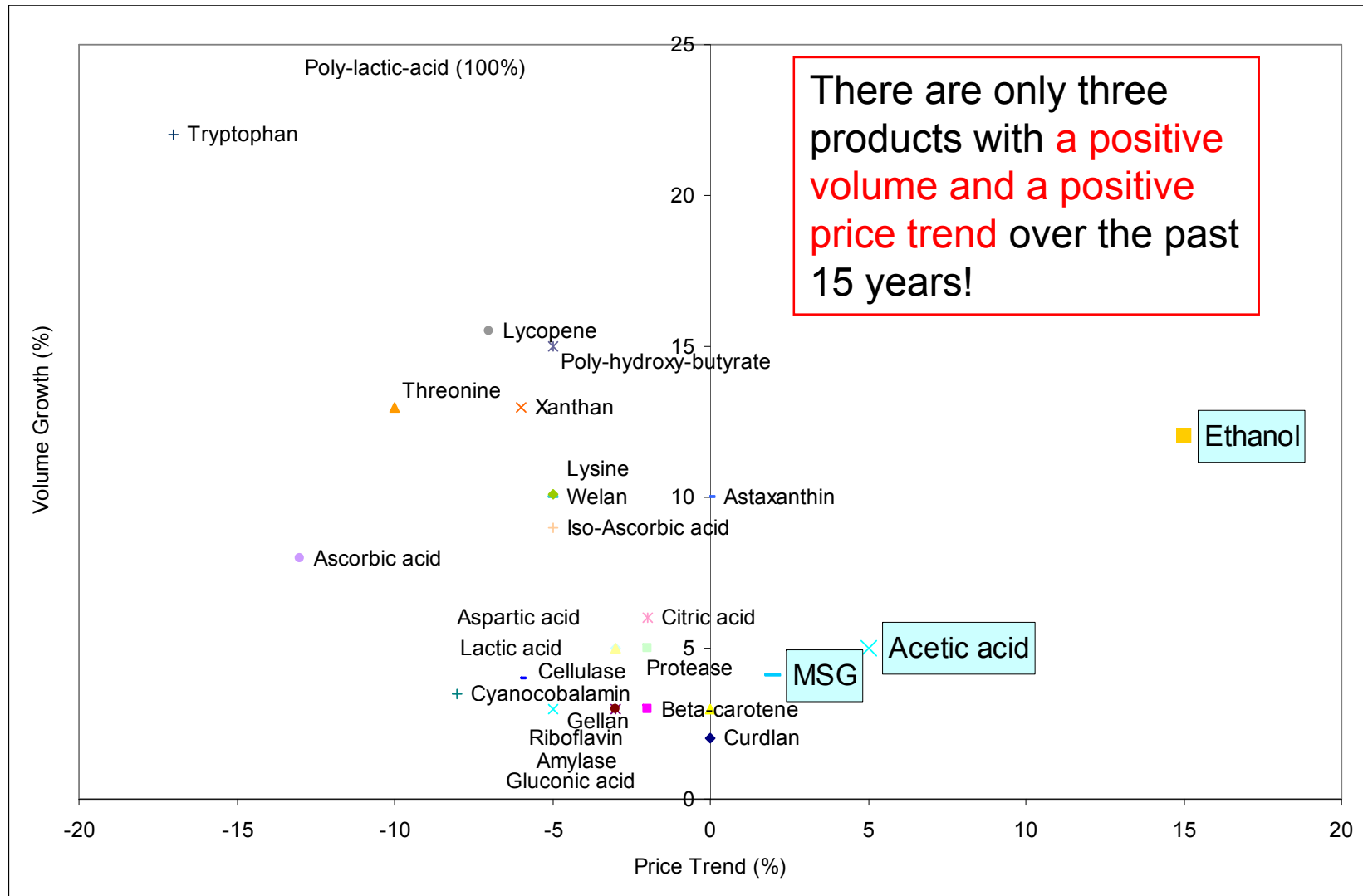


Highlights of Product Assessment

- A full assessment across all criteria is supplied in the report.
- Major highlights are:

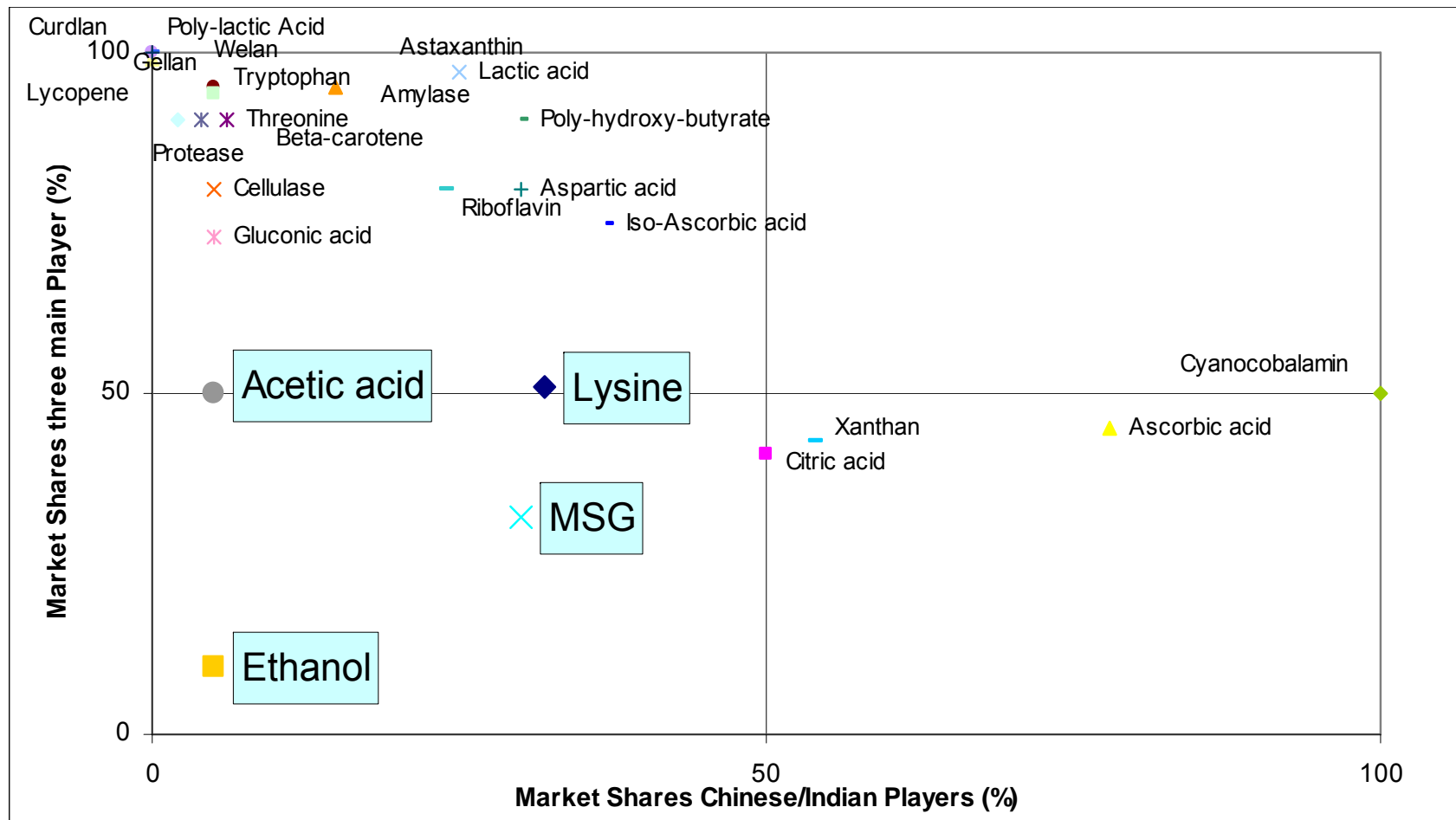


Historic Price and Volume Trends



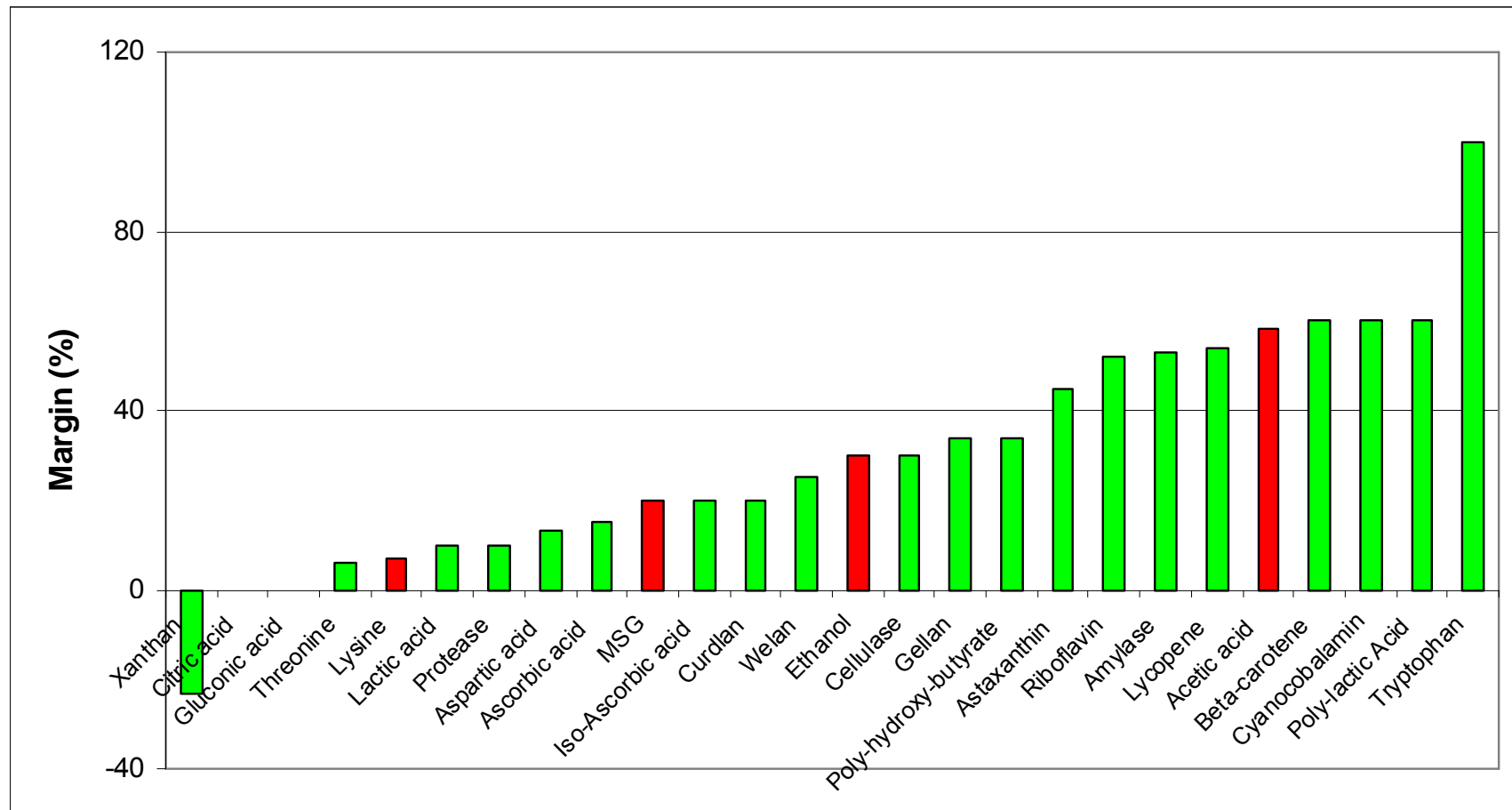
Competitive Environment

There are only four products which are **not dominated by a few global producer and for which Chinese/Indian competition is not (yet) important!**



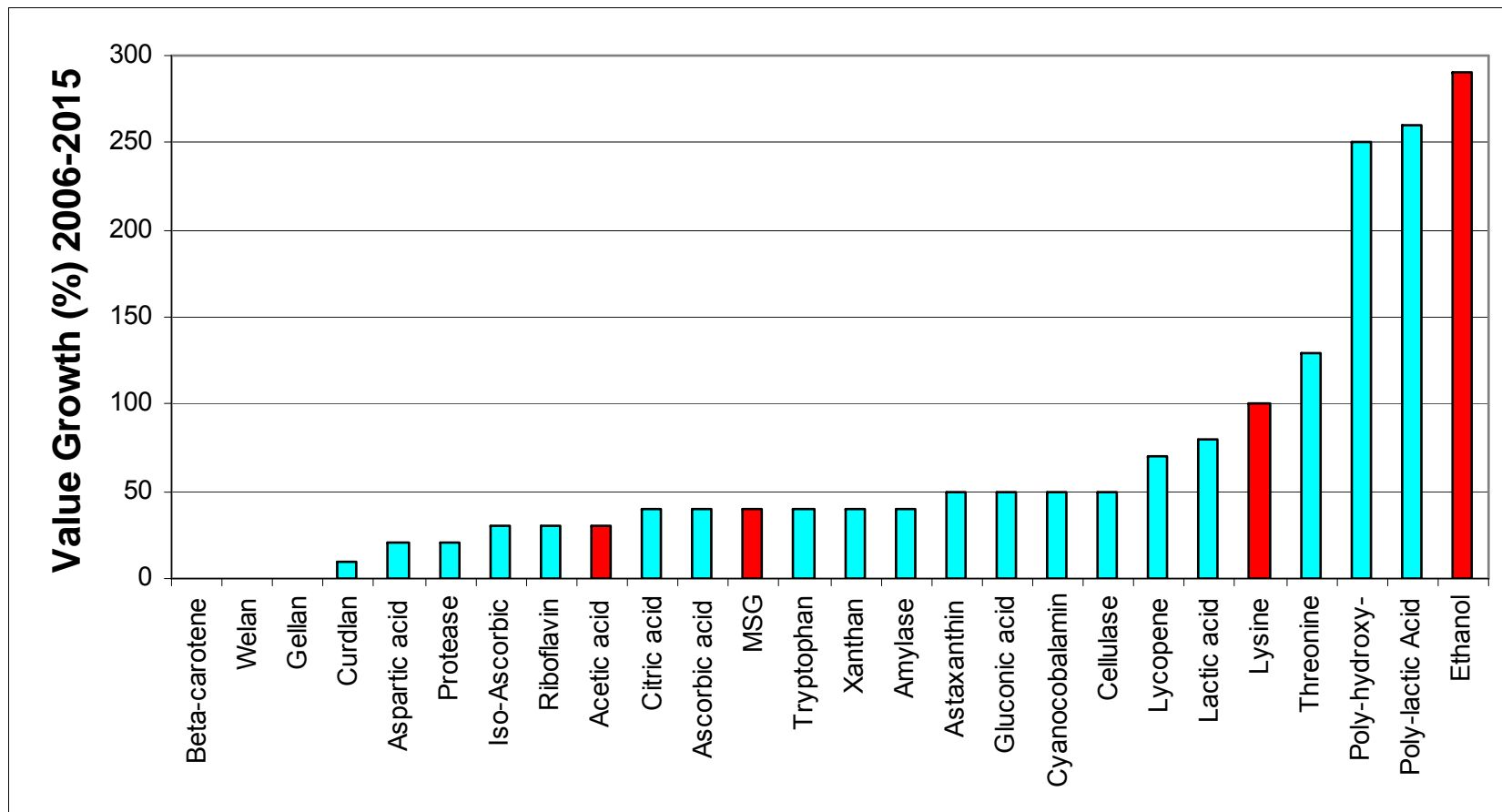
Margins

Xanthan, Citric Acid and Gluconic Acid are products for which the competition is so strong, that margins are extremely difficult to generate. Most other products show considerable, partly high margins but.....



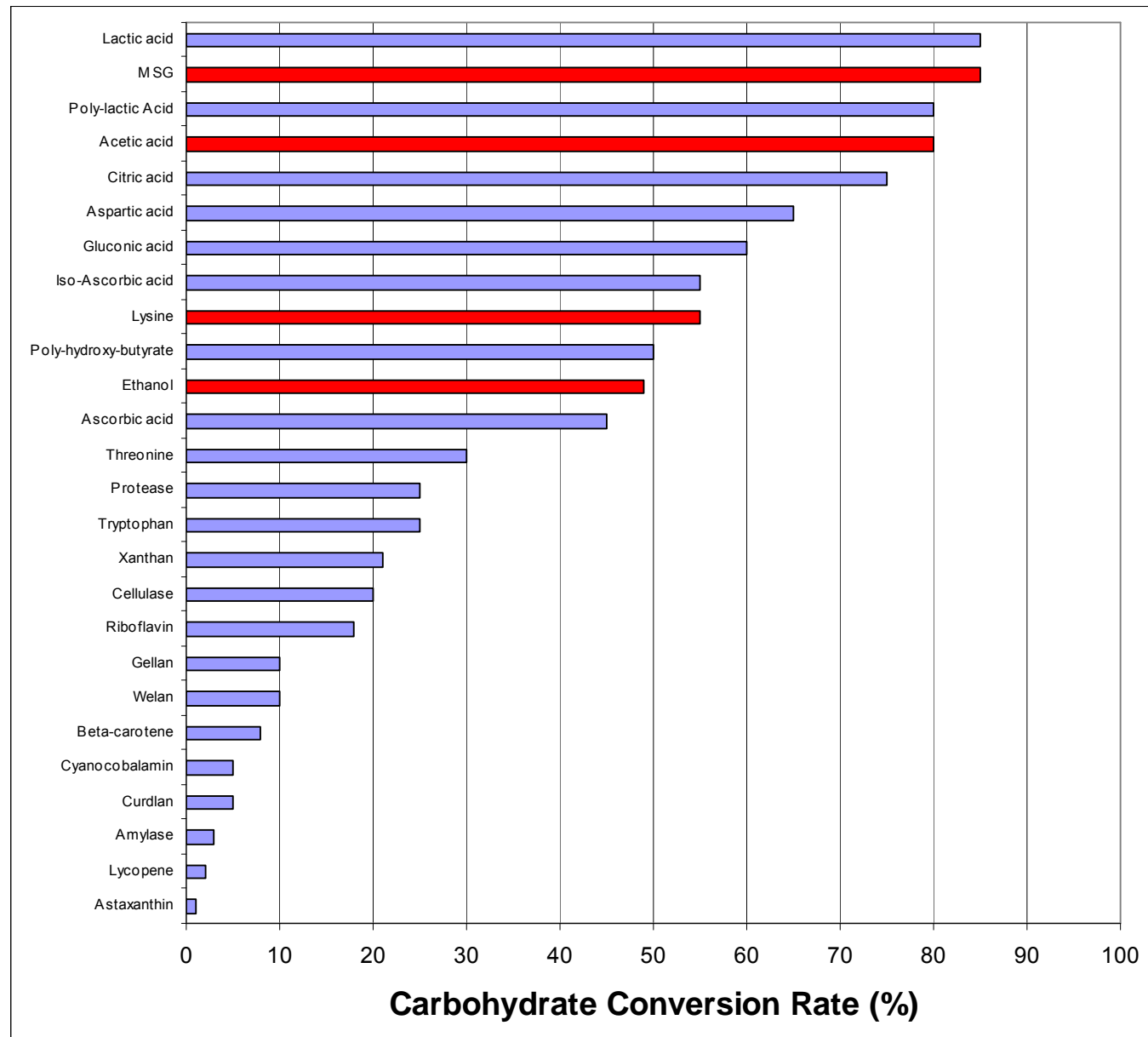
Future Growth

.....future growth does not always correlate with margins. The brightest market prospect over the next years will be seen for Bio-Ethanol and Bio-Polymers.



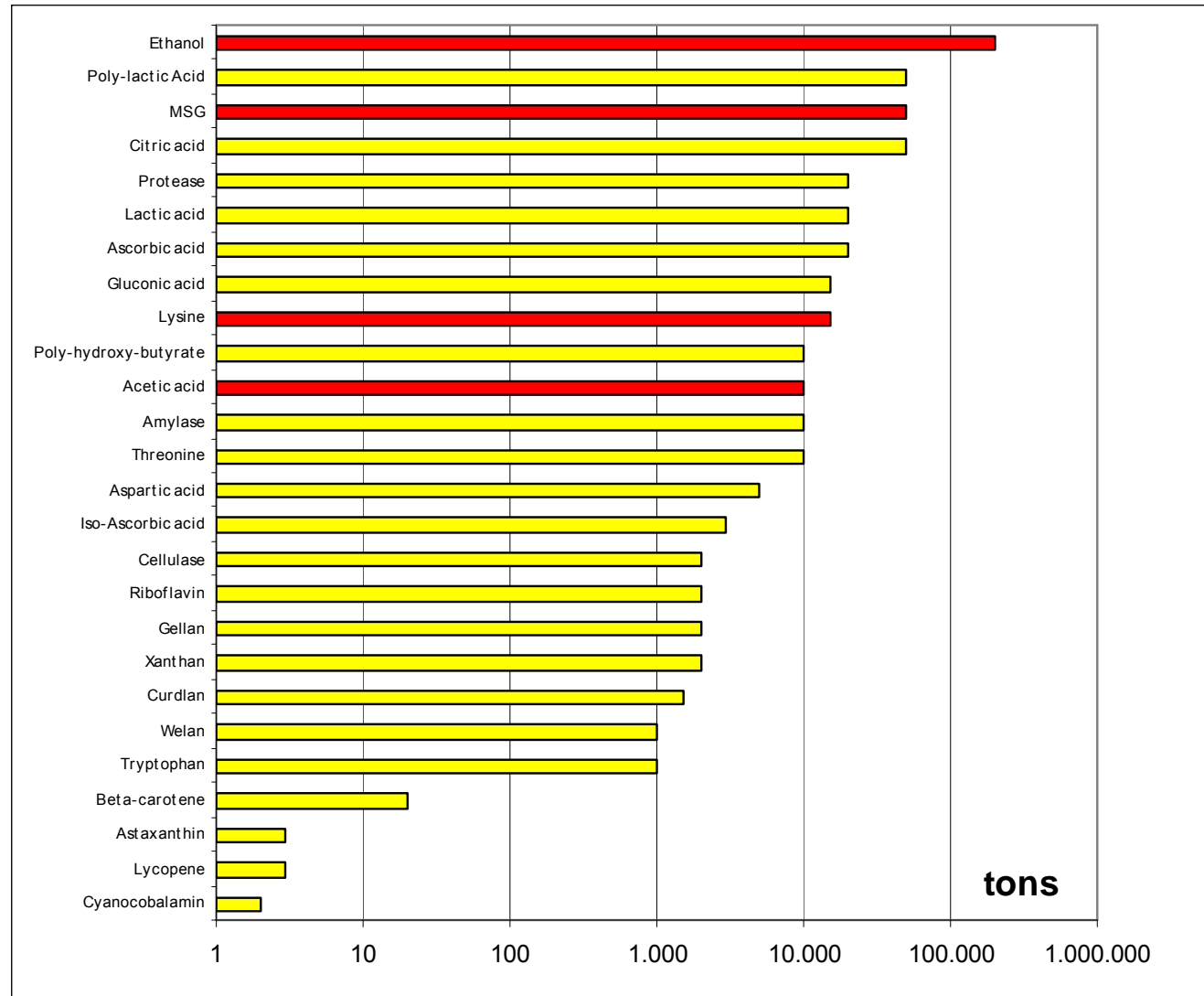
Carbohydrate Conversion Rate

The carbohydrate conversion rate is the key parameter on efficiency of a fermentation process. A whole variety of products can be produced at a high efficiency – 40% of the screened products show conversion rates $\geq 50\%$.



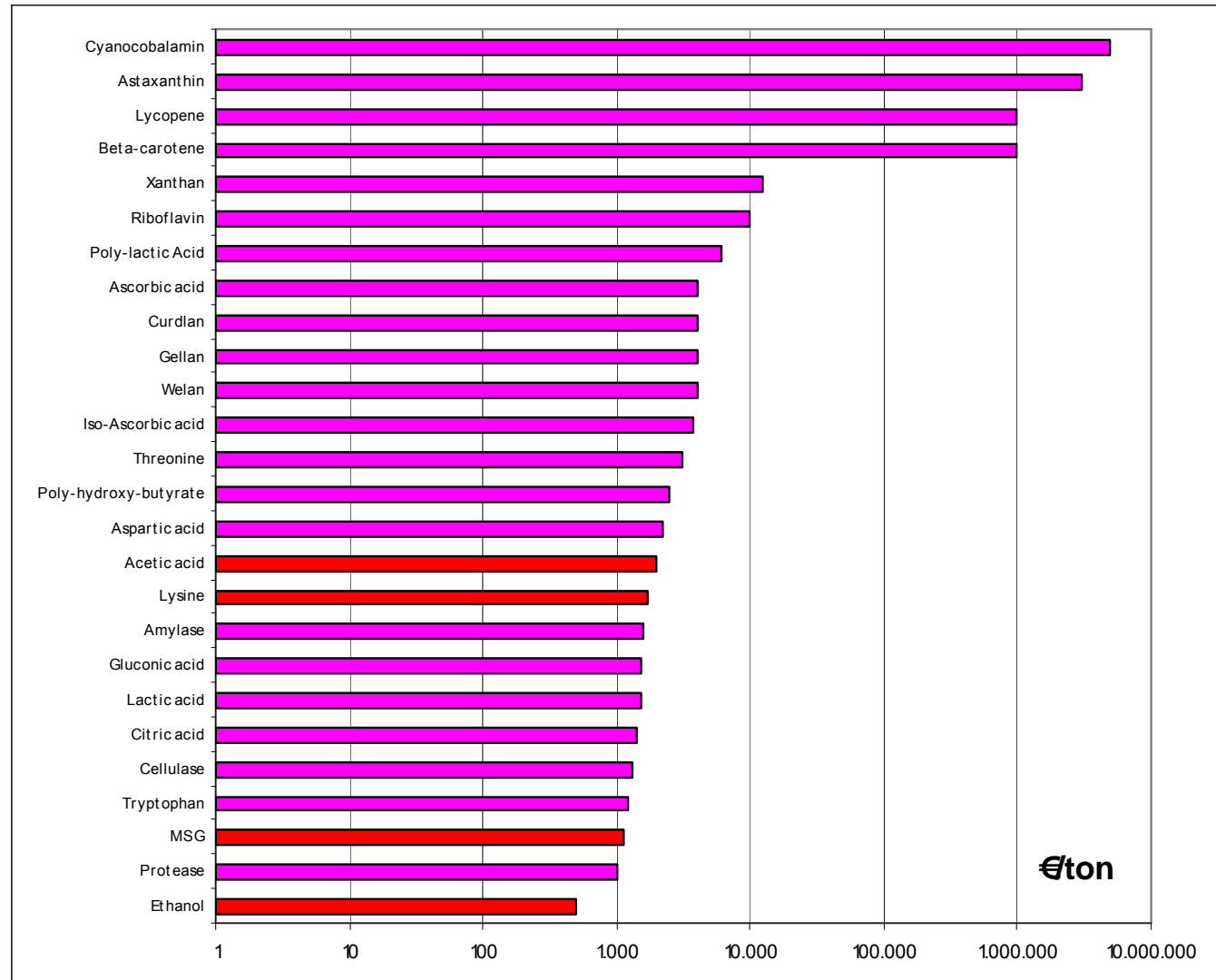
Typical Plant Size

Fermentation is in many cases a large-scale operation. Economy of scale is of high importance. For 50% of the screened products, plant size must be \gg 10.000 tons; for 10% of the products \gg 50.000 tons and for Ethanol not smaller than 200.000 tons



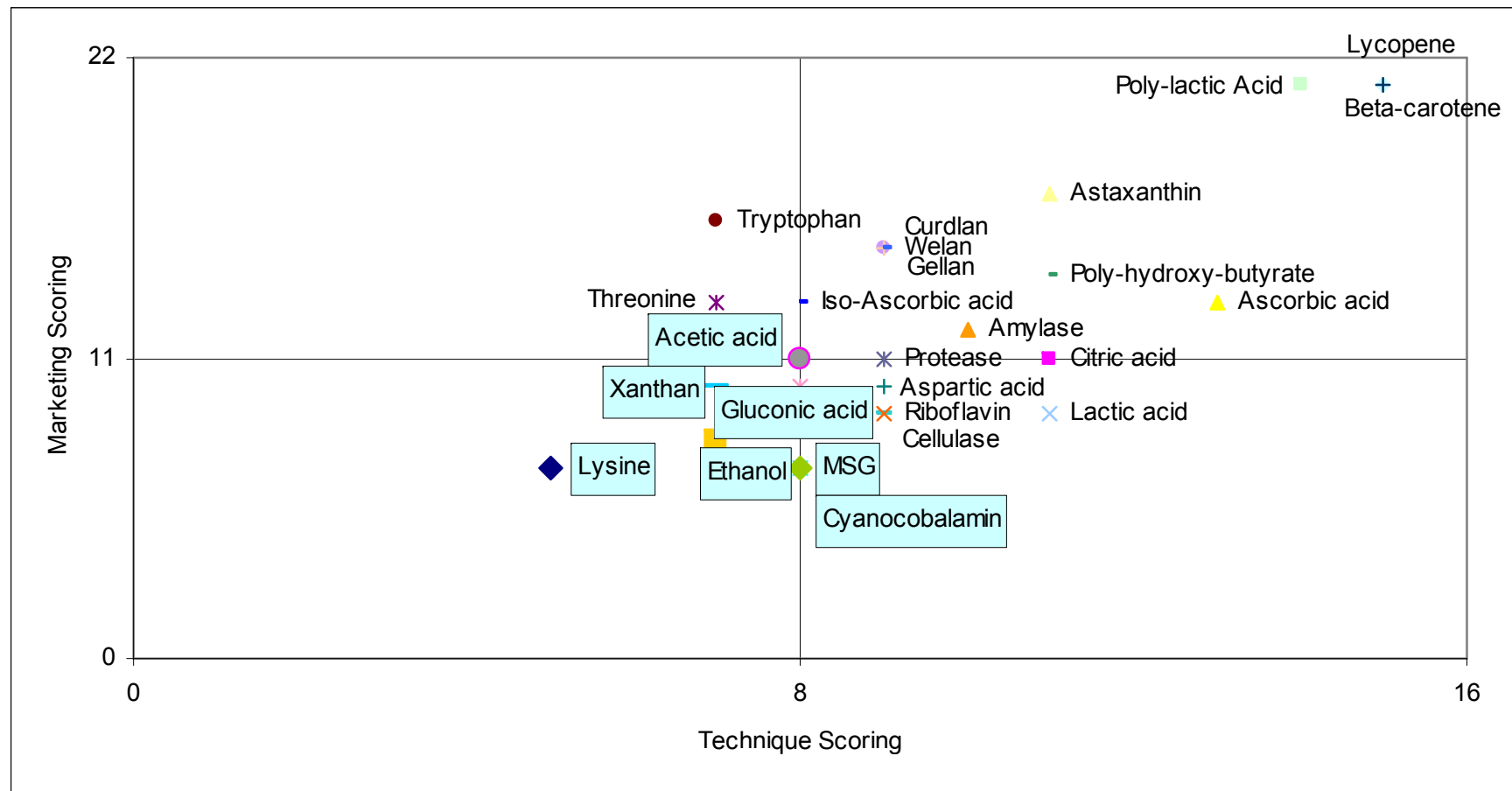
Specific Investment Costs

Required minimum plant size correlates with specific investment costs. The smaller the plant the higher the specific investment. The lowest specific investment need is found for an Ethanol plant.



Marketing and Technical Know-how Requirements

Most products demand high skills in production and marketing. There are only seven products for which marketing and technical skills requests are moderate.



What to do now?

Scoring!



The Multi-Scoring System

- | | |
|---|--|
| <ul style="list-style-type: none">• Historic market growth (%)• Unit price (€/kg)• Share of base product converted (%)• Powder/liquid• Historic price trend (%)• Regulation/free• Share of three main producer (%)• Share of Chinese/Indian (%)• Steps in value chain• Formulation• Future market growth (value 15/06)• Organism• Number of carbohydrates | <ul style="list-style-type: none">• Carbohydrate conversion rate (%)• Valuable by-product• Overcapacity• Minimum size of plant (1.000 tons)• Investment costs (1.000 €/ton)• Margin (%)• Patent• Flexibility in using carbohydrates• Degree of sophistication• Dedication of plant• Marketing requirements (total scores)• Know-how requirements (total scores) |
|---|--|

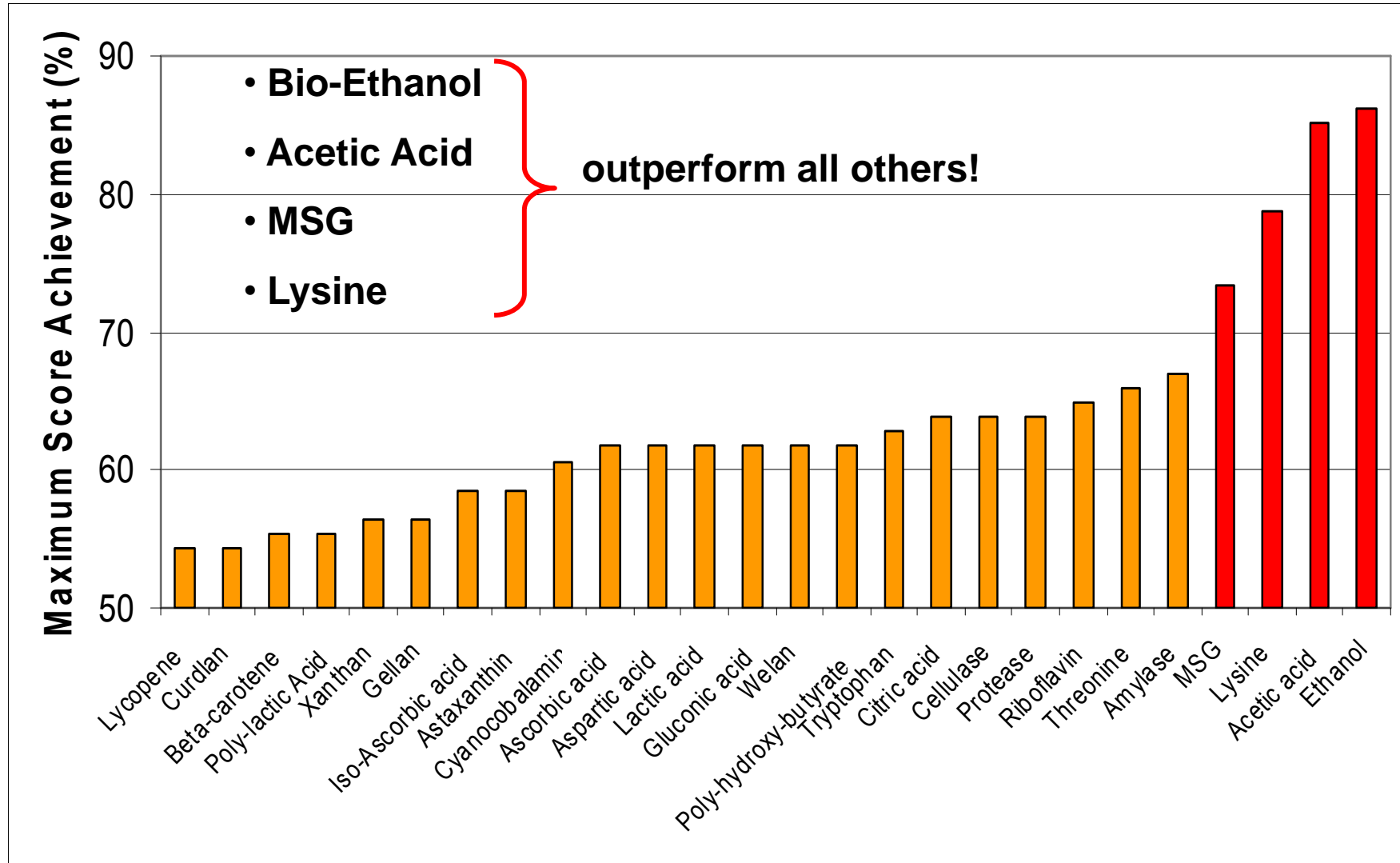


.....and what is the Result?

**An ideal fermentation product
does not exist, but....**



Scoring Results



Robustness of Scoring

Prioritisation	Overall Scoring	Only Marketing Parameters	Only Technical Parameter
1	Ethanol	Ethanol	Acetic Acid
2	Acetic Acid	Acetic Acid	Lysine
3	Lysine	Poly-Hydroxy-Butyrate	Ethanol
4	MSG	Lysine	MSG

Conclusion: Ethanol and Acetic Acid are the most attractive international fermentation products!



And now?

Let's explore how well these products fit to Egypt!

