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48%

of Britons think supermarket self-service checkouts are a nightmare



£35,000

is the UK's national average household income

SOURCES: FATCHESE/DAILY MAIL

Fuel proof

ENTREPRENEURSHIP When scientists need to think like businessmen

The Google tool 'Trends' will plot the number of searches on a keyword over time. Searches for the word "biofuel" peak on 30 April, 2008, coincidentally the date an article entitled 'Scientists want to stop using food to make biofuel' was in the news. And if Google Trends is any indicator of general sentiment, interest in biofuel has been cut by well more than half since spring 2008, dropping precipitously even prior to the global financial crisis. Whatever the reason for this, the fact remains that despite any historical correlation between biofuel production and food prices, first generation biofuels based on corn, soy and rape seed have lost public appeal and will likely not expand beyond today's production levels to provide the cure to our energy woes.

TECHNOLOGY ENERGY

End of the story? Not for Per Falholt, chief scientific officer

at Novozymes. Today, biofuel is made by physically grinding corn, breaking down the starch into sugar with enzymes, converting the sugar into ethanol with microorganisms and distilling the ethanol. Per's research team of 150 scientists designed the enzymes at the centre of the process. From their expertise they know that other vegetation also offers the sugars necessary to make energy and have been working on a second generation of enzymes capable of converting waste corn stalks or wood chips into clean fuel.

Technically, Novozymes is successful: it can produce 'cellulosic' biofuel (based on refuse or crops grown on marginal land). But there is a cost. Corn converts easily into fuel, at around \$1.88 per gallon. Corn stalks require more effort and consequently more cost to convert, around \$2.35 per gallon. With fossil-based fuel at less than \$120/barrel, the economics don't work.

Corny ideas
Bioinnovations company Novozymes is planning how to make a viable business out of the manufacture of second generation biofuels converted from waste matter such as corn stalks

ENTREPRENEURIAL ENERGY

Must Per and his team wait patiently until the price of oil goes up for the next chapter of the story? Not necessarily. While scientists invent, entrepreneurs innovate: they shape, package and deliver an invention to make it useful and valuable. For Per and his team at Novozymes, this means changing from white lab coat to business suit to transform second generation biofuel technology into a business. Their new tasks are as follows:

RE-ENGINEER PARTNERSHIPS

First generation biofuel production involves a long 'value chain' of partners: farmers, grain processors, processing plants, financiers and oil companies. But second generation biofuel can start with waste. That long chain of partners might now include organisations ranging from paper companies and municipalities to owners of marginal land (acreage not profitably cultivated today). Any of these partners could benefit by working with Novozymes to design a new business model around second generation biofuel.

RECONSIDER THE CUSTOMER

If you buy corn to make fuel, you build large factories to drive down processing costs with volume production. If you help cities or companies save money

disposing of waste, smaller distributed facilities located near that waste might be desirable. And while input is a cost in the first generation, it may be free or even a source of income in the second. Partners also may buy the finished product, as activities such as paper processing have significant energy demands.

RETHINK INVOLVEMENT

Today, Novozymes supplies only a single step in the process. It needs external entrepreneurs to turn its inventions into innovations. Though this limits risk, it also limits the company's ability to shape the market. In the second generation, Novozymes may go beyond existing partnerships with grain processors and oil companies to build business models for cities or even design processing plants for industry in order to ensure its invention becomes the catalyst of a genuine innovation.

MARKET ENERGY

Biofuel illustrates the power entrepreneurs can have over markets. The fate of the second generation, a big potential answer to the energy crisis and to greenhouse gas emissions, lies with the entrepreneur, not the technologist. As with everything technical, from search engines to hybrid car engines, the real innovation is in creating the opportunity. ●



details

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