TECHNISCHE UNIVERSITÄT DRESDEN

Chair of Business Adminstration, especially Environmental Management and Accounting

Farms.com – The case of the ethanol industry

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The teaching case study was developed to teach students to assess both the economic and the ecological implications of the ethanol business. Questions to be answered by the students are: How can farmers manage their economic risk? What is the ecological impact of ethanol compared to substitutes?

The U.S. ethanol industry

Due to increasing oil prices, 2005 was marked by a flurry of construction activities in the U.S. ethanol industry, with dozens of new plants being built throughout the U.S. Corn Belt and even more facilities planned every day. In February 2006 the annual capacity of the U.S. ethanol sector stood at 4.4 billion gallons, and plants under construction or expansion were likely to add another 2.1 billion gallons to the existing capacity. If this trend and the existing and anticipated policy incentives supporting the ethanol industry continues, U.S. ethanol production will reach 7 billion gallons by 2010, 3.3 billion more than the amount produced in 2005. This tremendous expansion of the ethanol sector raises a key question: From where will ethanol producers get the corn needed to increase their output?

Risk management for farmers

As the agribusiness had become more and more complex over the past decades and decisions nowadays depends not only on farming techniques and the weather, but also on worldwide economic and political development, many of the corn producers have started using the services of consultants like Farms.com Risk Management. The company is an agricultural commodity marketing and price risk management service provider for farmers, producers and agribusiness. Farms.com Risk Management currently provides price risk services for about 1-2 million hogs and over 8.5 million bushels of grain per year (including corn, soybean, soybean meal, wheat and canola). Against the background of the development of the ethanol industry, all of the farmers want to know how can they manage their economic risk. Some of them – mainly motivated by the request of critical stakeholder groups – start to ask for the impact on the environment: What is the ecological impact of ethanol compared to substitutes? Those two questions can be embedded in an analysis of the competitiveness of the ethanol industry.

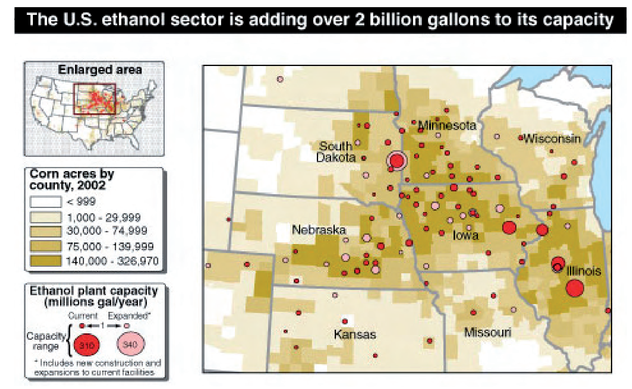

Fig. 1: The U.S. ethanol sector is adding over 2 billion gallons to its capacity. Source: (Baker / Zahniser 2006)

Observing the developments in corn demand from ethanol on the one hand and crude oil demand and prices on the other, the risk manager of Farms.com had to decide how to advise the farmer Joe Mastek about holding or selling his projected 2007 and 2008 corn crops.

Stakeholder Approach

As a first instrument a strategic analysis can be made, e.g. by applying the competitive forces of Porter. This approach could be completed by a PEST (political, economic, social and technological)-analysis. In order to analyse the competitive forces in the energy market, the following questions may be raised for the five forces:

Customers: How strong is the position of the buyers (food industry & energy producers)? Based on the economic development in China and India, what conclusions can be derived for the world-wide development of energy demand?

Supplier: How strong is the position of the sellers? Will the suppliers of farming machines and seeds also increase their prices?

Substitutes: How easily can a product be substituted? How can the role of ethanol as a substitute for crude oil or sugar cane be described?

Competitors: How easy is it for new entrants to start competing? What is the capacity of ethanol plants in the US, Europe and the world?

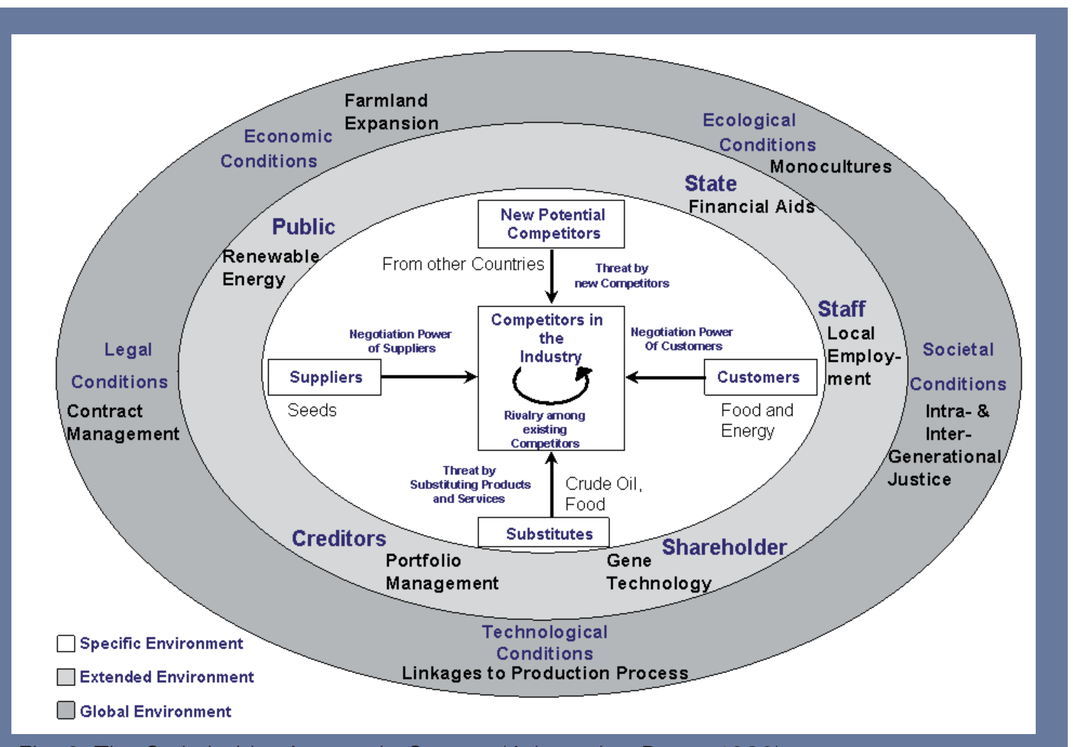

Fig. 2: The Stakeholder Approach. Source: (Adopted to Porter 1980)

Scenario Analysis

The second instrument to be used in order to manage the economic risk is the scenario analysis. Relevant factors such as ethanol prices can change considerably in time. The scenario analysis identifies the factors which have the most important impact on the decision and combines them in order to derive a manageable number of scenarios. Most adapted scenarios are the worst-case and best-case scenarios (Eriksson & Ritchey 2002). The scenarios illustrated in Table 1 are a possible combination of the relevant factors. Based on the information given in the case, the students can make assumptions for the probabilities of the different scenarios. Scenario 2 leads to the suggestion to sell the corn today, all other scenarios lead to the decision to wait. In the teaching case, a decision is not given, moreover it should be found by the students.

Scenario	Crude oil prices	Corn prices	Corn demand for ethanol	Spot / for-ward price for corn
1	+	+	+	+ o
2	-	+	-	-
3	+	-	++	++
4	-	-	+o	o
5	o	o	+o	o
+ increase, o staedy, - decrease				

Tab. 1: Possible scenarios in ethanol production

Life cycle assessment (LCA)

If moreover the impact on the environment shall be assessed, the instrument of the life cycle assessment can be applied. Defined in the international standard ISO 14040 LCA is the "compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle" and "Through such a systematic overview and perspective, the shifting of a potential environmental burden ... ... between life cycle stages or individual processes can be identified and possibly avoided." (ISO 14040:2006) A study of the bifa environmental institute, that compared the environmental impacts of oil based and renewable resources based processes, derived the impact indicators illustrated in table 2.

	Unit	Biotechnical process	Chemical-technical process
Impact categories (aggregated)			
Cumulated native energy demand	GJ		
Global warming potential	Mg CO2-eqv.	34.8	51.8
Acidification potential	Kg SO2-eqv.	177.0	557.0
Eutrophication potential (terrestr.)	Kg PO2-eqv.	12.9	24.5
Eutrophication potential (aquat.)	Kg PO2-eqv.	26.8	10.1
Photochemical ozone creation po-tential (POCP)	Kg Eth-eqv	8.3	28.7
Human toxicity substances			
Benzopyren (A)	Kg	–	–
Lead (A)	Kg	–	–
Cadmium (A)	Kg	105.0	424.0
Sulfur dioxide (A)	Kg	–	–
Dust (A)	Kg	–	–
cotoxicity substances			
Ammoniac (A)	Kg	2.87	0.80
Hydrogen fluoride (A)	Kg	–	–
Sulfur dioxide (A)	Kg	105	424
Hydrogen Sulfide (A)	Kg	–	–
Nitric oxide (A)	Kg	91.7	186
Ammonium (W)	Kg	0.072	14.6
AOX (W)	Kg	0.00021	0.39
Chloride (W)	Kg	40.1	922
Hydrocarbon (W)	Kg	0.063	0.39
(A) – Emissions to air (W) – Emissions to water			

Tab. 2: Impact indicators (Hoppenheidt 2005)

Decision of the risk manager

"So 2.88 $ or 2.91$ was historically a great price. But we are holding back and I will explain why: Driven by the continuous increase of crude oil prices, ethanol is becoming a major source of energy in the country. We are deriving from ethanol consumption – and USDA and RFA confirm this information – that ethanol plants will use about 14% of all the corn produced. And possibly by this time next year, this percentage will increase to 20 or even 30%. This is driven by high crude oil prices and relatively cheap corn prices, that we still have. So if I think, that ethanol production will increase that much, we could actually reach a situation where corn prices are significantly higher this time next year than the forward corn contracts are currently presenting. This is challenging for my producers!"

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