What Constrains 'Identity-Preserved' Product Growth? An Exploration of High-Oleic Soybean Oil with Group Model Building

'Identity-preserved' products are bulk commodities (often agricultural) that are marketed in a manner that isolates and preserves the identity of shipments because of characteristics that have value to an end user that would otherwise be lost through during normal storage, handling and shipping procedures. One example is soybean varieties with a higher oleic acid content in their oil, which would be distinguished from 'conventional' soybeans. These high-oleic soybeans (HOS) have value to end users because the oil has extended useful life in cooking applications such as frying and provide other health benefits to consumers. Since the early 2000s, analysts have predicted that HOS oil (HOSO) would experience rapid growth, with some going so far as to say that HOS will transition from 'IP' status to being 'commoditized'—the principal soybean variety produced and sold. However, the observed growth pattern has been far from robust (Figure 1). Even in 2018, HOSO constituted a very small fraction of the overall market for soybean oil. The actual use of HOSO usage is considerably below repeated rapid-growth projections from different organizations, which raises the question of why rapid growth expected by so many analysts has not occurred. This is a relevant question for organizations (seed companies) that have made major investments in the development of HOS technology.

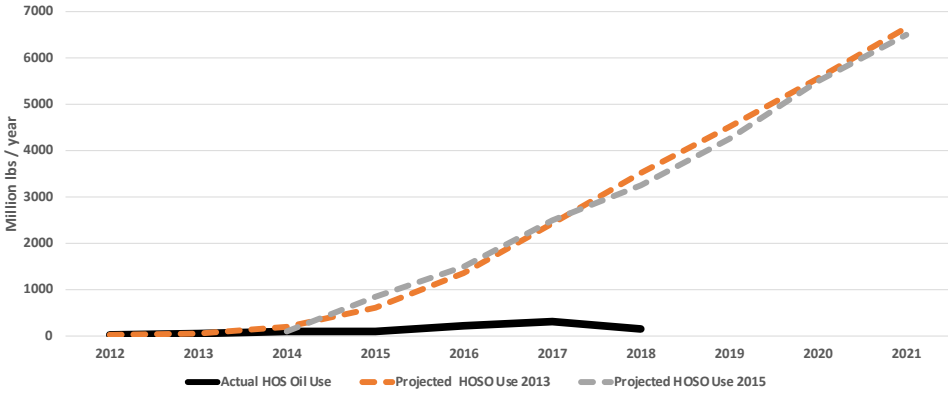

Figure 1. Actual and Projected HOSO Use, 2012 to 2021

Through Group Model Building (GMB; (Vennix, 1996, Rouwette and Franco, 2015) we developed a quantitative model to assess the reasons for slower-than-expected growth in IP high-oleic soybean oil (HOSO) in collaboration with key supply chain stakeholders (soybean farmers with and without experience in growing HOS varieties; seed companies that have produced seed for HOS varieties, major oilseed processors, buyers and end users of HOSO). The model emphasizes stakeholder viewpoints about the linkages among supply chain organizations and how these can promote or limit the uptake of high-oleic soybean (HOS) varieties and use of HOSO. In contrast to many previous analyses the model focuses on the value proposition for each of four stakeholder groups: farmers, seed companies, oilseed processors and vegetable oil end users (often, restaurants or food processors). In addition, the model emphasizes the importance of time delays and decision rules by stakeholders that can limit supply chain coordination and create disincentives to act given that future decisions by others are uncertain.

A first workshop took place over two days in June 2019 and developed stakeholder perspectives on what motivates farmers, seed companies, oilseed processors and end user to make a switch from conventional to HOSO, and what potential constraints had affected growth. The initial conceptual model was developed and critiqued and modified with stakeholders during the first workshop and served as the basis for subsequent development of a quantitative model that incorporated core

concepts from the conceptual model. At a second in-person workshop in October 2019, the model was presented to a group of the same stakeholders for additional critique. Stakeholder comments and input from key informants within the sponsoring organization were used to finalize the quantitative model structure and to develop the scenarios to be assessed. The final model consists of the following sectors: farm; seed production; processor costing; processor inventory management; end user awareness. Thus, our model emphasizes the principal constraints as those identified by stakeholders: the need for a clear value proposition for all supply chain participants, awareness of the cost and functionality benefits of HOSO by end users and the time delays involved in implementing a HOS planting program.

Our scenarios analyze the impacts of value proposition components to supply chain participants coupled with efforts to communicate to end users the cost and functionality benefits of HOSO. We also assess the impact of the time delays and coordination issues on the potential for growth in HOSO, recognizing that in the near term it would be difficult to modify the nature of time delays and related coordination processes (Table 1).

The key takeaway from the scenario analysis so far is that the main factor determining HOS growth is relative cost compared to alternatives to supply the HO market, albeit also affected by end user awareness through communication efforts. Relative cost is affected by changes in cost of alternatives, premiums paid to HOS farmers, processor margin goals and conventional soybean prices. However, changes in relative costs can be difficult to assess given the proprietary nature of some data and its interaction with functionality (i.e., unit cost of product versus cost-in-use or value added). It is notable but not surprising that previous studies of IP markets have focused attention on factors other than cost, and that projections for growth have not specifically linked future sales volumes to sustained cost advantages. Even under our simplified coordination mechanisms among supply chain participants, delays in the signals regarding growing demand for HOSO did not constitute a substantive constraint for growth of HOSO.

Table 1. Scenarios Analyzed and Summary Results

Scenario	Units	Reference Mode	Smaller Cost Advantage More Communi-cation	Higher Processor Margin	Higher Farm Premium for HOS
Scenario Assumptions					
Premium for HOS	$/bushel	0.50	0.50	0.50	1.00
Conventional Soybean Price	$/bushel	9.00	9.00	9.00	9.00
Processor markup required	% cost	5.0%	5.0%	10.0%	5%
Cost Advantage of HOSO	$/lb	0.00	0.05	0.10	0.10
Communication Efforts	Proportion	0.0	1.0	0.5	0.5
Outcomes					
Ending volume of HOS sales	mil lb /yr	155.0	1137.0	891.6	1167.8
Ending acres of HOS planted	000 ac/yr	209.1	1,534.0	1,202.8	1,575.5
Ending market share for HOSO	% market	5.6%	41.4%	32.4%	42.5%
Cumulative change in farmer margin	$ million	68.0	303.5	252.2	614.1