

Valuing the Option to Convert from Conventional to Organic Farming

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The realisation that agriculture has a major impact on the environment has led to a change in policy to make organic production more attractive to farmers. Notably, the federal Conservation Security Program (CSP) will make direct payments to farmers for preexisting and ongoing conservation work. Under this program, many growing practices that are standard on organic farms will qualify for payments. With the announcement of the CSP it becomes relevant to ask the question: what level of direct payments will induce a conversion to organic farming?

At present, there exists little theoretical work or empirical evidence on the dollar compensation that would be needed to induce U.S. farmers to voluntarily adopt organic practices. The literature has focused on the use of discrete choice methods to analyze farmers' decisions whether or not to adopt organic farming. While these methods yield probabilities of adoption, the resulting estimates cannot be readily converted into dollar compensation levels. For a discrete choice model to provide this information, direct subsidies have to be included as an independent variable (e.g., Lohr and Salomonson, 2000; Pietola and Oude Lansink, 2001). However, this is not an option in the context of the CSP, because direct payment is yet to be introduced. Thus, we take a different modeling approach.

Our theoretical model starts from the observation that organic farming is perceived as more risky than conventional farming by many non-organic farmers. Legally, a farm in transition from conventional to organic must keep rigorous records for three years before being fully certified. The physical transition cost may be incurred for several more years, including penalties in yield or costs due to agro-ecosystems adjustments and management inefficiencies while new practices are learnt. Financial key constraints are the lack of access to premium prices until conversion is complete, conversion-related investments and disinvestments, and information gathering cost for production and marketing. In the presence of these transition costs and uncertainty about the future development of the earnings, a risk neutral farmer is not indifferent between organic and conventional if current returns per acre are similar for both practices.

Our theoretical model of a farmer's decision to convert to organic farming under uncertainty is based on option value theory. The difference between the option value approach and the traditional net present value approach is that a farmer switches to organic farming when the net present value of the difference in expected future cash flows from conventional and organic farming exceeds the costs of transition plus an option value. The option value is the discounted value of the dollar compensation required because of the additional uncertainty. The theoretical model depicts two effects of a change in policy in favour of organic practices. The direct effect of such policies is to decrease the option value. In addition, the possibility of future changes to the policy may indirectly increase or decrease the option value, depending on farmers' expectations.

Based on the option approach, our empirical model for conversion from conventional to organic farming is a switching regression model with two regimes. We implement the empirical model using a data set from the Organic Farming Research Foundation (OFRF). As a proxy for conventional returns, we use county-level data on price and yield reported by the USDA National Agricultural Statistics Service. In addition, we assume that there is no difference between production costs for conventional and organic corn and soybeans. We are well aware of the work by Delate and others who find that the higher seed, fieldwork and production costs incurred in growing organic corn and soybeans are outweighed by the greater pesticide and fertilizer costs incurred for conventional varieties. We prefer a conservative stance and assume equal production costs for conventional and organic corn and soybeans.

We present results from the switching regime model for the combined corn-soybean data and for soybean separately. Estimates for the pooled data provide evidence of option values in the transition to organic farming; the regime with an option value is dominant. Depending on the assumed interest rate (0.05-0.15), the significant estimate for the risk premium (option value) ranges from \$1,154 to \$3,642 per acre and the estimate for conversion cost ranges from \$211 to \$631 per acre. The estimation separately for soybean yielded similar option values but higher estimates for the conversion costs. A second model specification includes a time dummy to capture changes over time in the option value. For 2001, we find a significant reduction of 53 % in the option value for the pooled soybean-corn data; for soybean alone the reduction was 30 %.

We discuss the estimates for 2001 in the context of the Conservation Security Program. Assuming an interest rate of 10%, a conventional corn-soybean grower would need to receive a one-time payment of \$315 per acre to compensate for the conversion cost and an additional \$1,088 per acre to cover the long run higher production and market risks. The sum of these two values equals an annual payment of \$228 per acre for a 10 year contract.

Publications Resulting From This Work

Wossink, Ada and Koos Gardebroek, Environmental Policy Uncertainty and Marketable Permit Systems: The Dutch Phosphate Quota Program, *American Journal of Agricultural Economics* (accepted).