

Agricultural Productivity Growth in the United States: Measurement, Drivers, and Impacts

Sun Ling Wang

Economic Research Service, U.S. Department of Agriculture

slwang@ers.usda.gov

Washington D.C., United States

Abstract

The U.S. Department of Agriculture (USDA) has been monitoring the sector's productivity performance for decades. Today, the Department's Economic Research Service (ERS) routinely publishes total factor productivity (TFP) measures for agriculture based on a sophisticated system of production accounts. The official TFP statistics are based on the translog transformation frontier; the model relates the growth rates of multiple outputs to the cost-share weighted growth rates of labor, capital, and intermediate goods. The applied USDA model is quite detailed. Agricultural chemicals and contract labor services are measured based on a hedonic framework. The changing demographic character of the agricultural labor force is used to construct a quality-adjusted index of labor input. Similarly, much asset specific detail underlies the measure of capital input.

According to USDA-ERS productivity accounts, productivity growth was the major factor driving U.S. agricultural output growth in the post-war period. From 1948 to 2009, the U.S. agricultural output grew at an average rate of 1.63 percent annually. With a slight input growth of 0.11 percent per year, TFP growth accounts for most of U.S. agricultural output growth, at an average annual rate of 1.52 percent. Although input growth has been of marginal impact, the composition of the input mix changed dramatically. While labor use declined by 78 percent and land use by 27 percent over those 61 years, materials (intermediate goods) use grew by 140 percent. The positive growth in materials (including fertilizer, pesticides, fuel, and purchased services,) reflects the substitution of those inputs for other inputs.

TFP growth is mainly driven by technology innovation in the long run. However, in the short term TFP growth can fluctuate considerably from year to year, largely in response to weather events. This presentation will address the methodologies applied in the accounts, the types of data needed for estimation, and the adjustments required when data sources are discontinued. The presentation will also address the factors that may influence the productivity change in the long run as well as in the short term, and the consequences of a slower productivity growth.

Key Words: Total Factor Productivity (TFP), Törnqvist Index, translog transformation frontier, Hedonic function