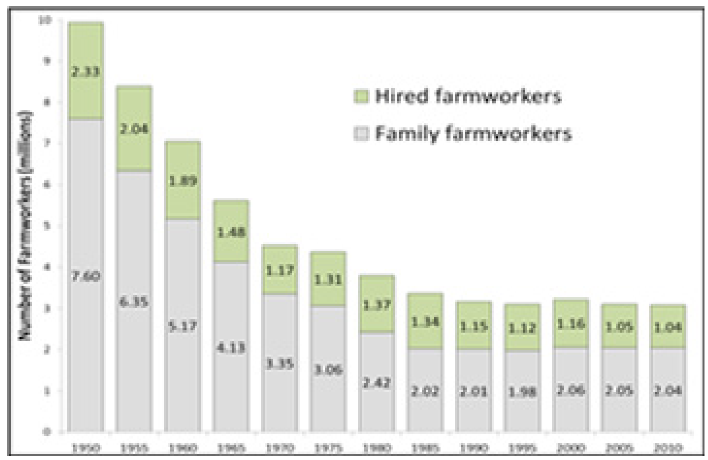
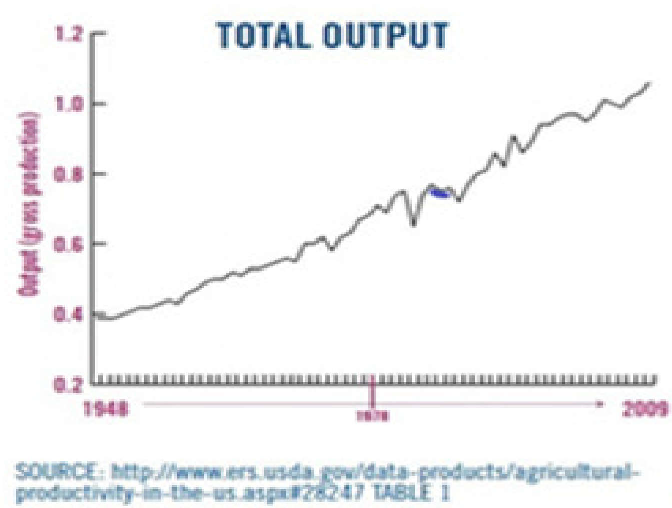
Labor and Automation Effects on Social Sustainability and Resilience in U.S. Agriculture

BANR proposes to develop a public webinar series to examine the complex issues at the intersection of labor and automation in U.S. agriculture. The series will engage scholars and worker representatives with farmers, scientists, engineers, and other supply chain actors to assess existing research and identify knowledge gaps. A balanced discussion of the trade-offs and consequences of automation on farm operations and farm workers will clarify needs for research and public policy.

Between 1950 and the 1990s, the number of farms and people involved in agriculture dropped by 70% while the total value of production more than doubled (Figures 1 and 2). This transformation was the result of consolidation of production on a smaller number of larger farms and was facilitated by the widespread adoption of labor-saving mechanization and automation.[1] In addition, while most U.S. farms remain family-run businesses, the proportion of workers on the farm that are nonfamily employees has increased over time. By 2010, one third of the farm workforce consisted of hired non-family workers, and these workers provided an estimated 60 percent of total farm work done in the U.S.[2] The production of labor-intensive specialty crops (fruits, vegetables, berries, tree nuts, horticultural products) and some forms of livestock (particularly dairy products) have become heavily dependent on a hired farm labor force.





Figures 1 and 2. Source: USDA/ERS

From the perspective of many farm business operators, the ability to access a supply of reliable and affordable labor has been critical to their survival and competitiveness. Agricultural production often requires a large number of workers during the harvest period. This is a "peak load" problem, meaning that the workers needed for harvest would be underutilized if they were employed year-round. Thus, many workers follow the harvest. Most of today's 1.0-1.4 million U.S. farm and food system workers are foreign born, work without legal work documentation, and many are "migrant workers" moving seasonally between farm fields, orchards, canneries, plant nurseries, and fish/seafood/meat/poultry packing plants. These workers also move back and forth between work in the farm and food system and construction, landscaping, or day laboring based on the prevailing economy.

Low wages lead to high rates of poverty and poor housing conditions among farmworkers. Farm work is also among the most dangerous occupations in the U.S., and workers typically lack access to sick leave or medical and retirement benefits. Moving at least seasonally often means migrant workers' children, very often birthright US citizens, experience disrupted or even inadequate education. While relatively low wages have contributed to lower food prices and allowed U.S. specialty crop farms in particular to compete on the world market, the difficult working conditions and low socioeconomic status of farm workers reflects a lack of social sustainability (in which workers benefit equitably) in the US food system.

Recent efforts to restrict the flow of legal and undocumented immigrants to the U.S. have decreased the supply of farmworkers, which has disrupted the harvest of many important crops. Annually it has become harder for specialty crop farms to hire qualified workers willing to perform arduous farm work for the wages the industry is offering. Compared to previous generations, fewer immigrants from Mexico are willing to work in the farm sector, and replacing them with workers from countries with lower reservation wages, such as in Central America, presents new logistical and immigration costs and accentuates the moral and ethical concerns about farmworker well being.[3] The Covid-19 pandemic has been particularly impactful on farmworker communities and further disrupted the supply of immigrant workers.[4] Farm employers are adjusting to the increasingly unstable availability of farm laborers by raising wages, advocating for more liberal immigration policies, and/or replacing labor with automation.

Meanwhile, advancements in hardware, software, data availability and algorithms have been accelerating the state of the art in robotics and automation. In the field of artificial intelligence (AI), innovations in Deep Learning have transformed capabilities in computer vision and their applications in agriculture.[5] In 2017, the world's first fully automated harvest was demonstrated, where all stages from sowing, fertilizing, collecting samples and harvesting were completed autonomously.[6] In 2019, the world's first raspberry picking robot launched in the UK and is expected to pick more than 25,000 raspberries a day, nearly double that of human workers.[7] Investments in farm robotics and automation startups were reportedly up 40 per cent in 2020.[8]

The net impact of automation on farmers, farm workers, and food production has been a controversial subject for many decades. Innovations in autonomous equipment that partially or completely replaces certain jobs could advance social sustainability, particularly if farm jobs require more technical skills (with workforce training), are better compensated, and protect the health and safety of workers. Automation, AI and robotics could reduce the need for humans to do menial and dangerous work, reward higher skilled employees, and increase the resilience of the supply chain to future shocks, such as those seen during the pandemic. It can also pose tradeoffs, such as the loss of job opportunities to workers with few alternatives, competitive disadvantages for smaller farm operations that may lack the economies of scale required to take advantage of automation, and redistribution of economic power and financial returns from the farm sector to input supply companies.

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[6] Pultarova, T. 2017. Robotic Farm Completes 1st Fully Autonomous Harvest. Available at: https://www.livescience.com/60567-robotically-tended-farm-completes-first-harvest.html

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