



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

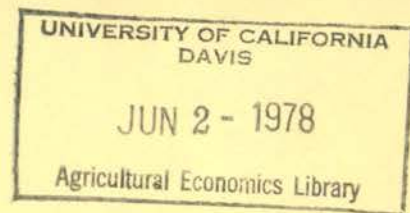
Help ensure our sustainability.

Give to AgEcon Search

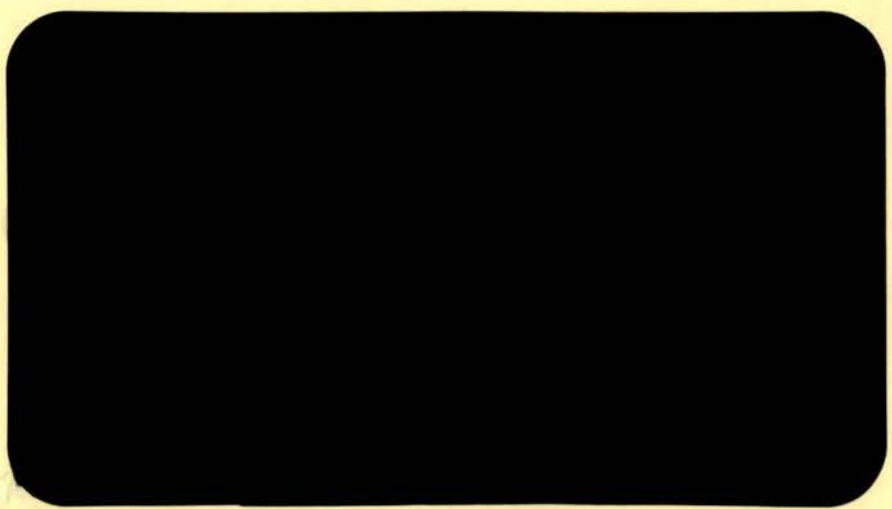
AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Mechanization
of agriculture



UCD Department
of Agricultural Economics



WORKING PAPER SERIES

University of California, Davis
Department of Agricultural Economics

Working papers are circulated by the author without formal review. They should not be quoted without his permission. All inquiries should be addressed to the author, Department of Agricultural Economics, University of California, Davis, California 95616.

AGRICULTURAL MECHANIZATION AND PUBLIC POLICY

by

Philip L. Martin

Working Paper No. 78-7

Agricultural Mechanization and Public Policy

Farm mechanization, prompted in part by publicly-supported agricultural research, displaces hired farm labor. Displaced farmworkers enjoy few legislative or private contract rights to adjustment assistance, which could cushion their unemployment between jobs. Studies of displaced workers in other industries show that the typical permanently displaced individual suffers real income and psychological losses. This paper explores the implications of adjustment assistance for farm labor in California.

Any adjustment assistance mechanism must address three basic issues: (1) how many workers are displaced; (2) what are the income losses of those displaced; and (3) who is eligible for various types of adjustment assistance. The first two issues are primarily empirical; adjustment assistance plans fall within the ambit of public policy. use

The number of persons displaced by any particular mechanization depends on the (previous) labor-intensity of crop production and the labor-saving qualities of the machine. However, the total number of persons displaced is a misleading indicator of individual and social hardship. Voluntary job changes and "natural" labor force attrition through death and retirement reduce the real labor impacts of mechanization. Labor force mobility reduces mechanization's impacts just as immobility increases hardship. Re-employment difficulties increase with age and aggregate unemployment and are greater if the displaced individual has less education and fewer skills, language difficulties, or personal traits that limit mobility to other areas or jobs. use

If necessary labor force reductions can be accomplished through "natural" attrition (as e.g. farmworkers find nonfarm jobs), the adjustment costs of mechanization are shifted from the existing labor force to potential labor

force entrants. Some observers argue that those who do agricultural work are "locked in" and unable to find nonfarm work without assistance. The composition and mobility patterns of the hired farm workforce are not known with certainty. It is apparent that off-farm labor mobility is sometimes limited by age, lack of education or relevant skills, language barriers, and labor market discrimination. These workforce factors tend to increase the adverse impacts of labor displacement. Other factors reduce adjustment costs. About 300,000 individuals do some farmwork for wages each year in California, but most farmworkers are young and engaged in agricultural work for less than 30 days. Fringe benefits and job tenure arrangements are sparse, making the losses of long-time farmworkers (who have few of the seniority rights or pension benefits which often accompany continuous employment) closely approximate those of new entrants to the farm workforce. Prediction of adjustment costs in agriculture based on the characteristics known to affect individual losses in the nonfarm sector is constrained by our limited knowledge about the hired farm workforce, but it is clear that factors working to both increase and decrease costs are present. // use

The number and characteristics of those displaced provide one important dimension for assessing agricultural mechanization. A second issue is the income loss suffered by typical individuals or cohorts. Most agricultural crops are produced in three distinct phases: pre-harvest, harvest, and post-harvest operations. Because harvesting is typically the most labor-intensive phase of agricultural production, most mechanization efforts, and most labor displacement, occurs when the harvest is mechanized. But crop harvests are of limited duration, typically six weeks or less. Thus, an individual displaced as a result of harvest mechanization in a single crop can lose only six weeks of potential income directly, 11 percent of potential work time. Since the individual is presumably engaged in other farm or nonfarm work, is } use

use this argument as a ~~rec~~ recommendation

unemployed, or is out of the labor force during the other 46 work weeks, it is apparent that agricultural work patterns usually guarantee multiple income streams. Since income is derived from several sources, the loss of any one source due to mechanization is automatically cushioned, to some extent, by the other income streams.

The fact that agricultural workers obtain income from several sources, and that mechanization typically eliminates only one income source in any year, does not mean that mechanization minimizes real income losses. Most farmworkers have low annual incomes, and the income derived from a six-week harvest may constitute 20, 30, or even 40 percent of an individual's total annual income. Some farmworkers (about 8 percent nationwide) are migratory, and the mechanization of one crop harvest may interrupt a work pattern which permits the farmworker to move from crop to crop. When farmworkers work in family units, mechanization may eliminate the better-paying male jobs while preserving those of teenagers and females.

Precise data on average annual earnings among California farmworkers are unavailable. California dominates a nationwide survey of hired farm labor in the West, which estimates average 1973-75 hired farm employment at 700,000 persons. Hired farmworkers in the western states averaged 105 days of farmwork and 41 days of nonfarm work in 1975, providing average incomes of \$2,157 and \$908 from farm and nonfarm work, respectively. With a median daily farm wage for males of \$20 in the West, six weeks of harvest work (with six day weeks) would result in farm earnings of \$720, or 33 percent of the average farmworker's total income from farmwork. Multiple income sources mitigate, but in no way eliminate, the income losses suffered by farmworkers displaced by mechanical harvesting equipment.

The number of persons displaced and their average earnings losses define the extent of worker income losses emanating from harvest mechanization.

Given the existence of such losses, should "adjustment assistance" be provided? If adjustment assistance is provided, several operational questions arise. Who is eligible for assistance: those with a minimum period of agricultural employment or all ex-farmworkers? How much assistance should be provided--100 percent of earnings losses or some fraction? In what form should assistance be given--retraining and extended unemployment insurance or a lump-sum payment? Finally, how should adjustment assistance be financed, through a tax on machines, a tax on the product mechanically harvested, or with general tax revenues? use

Justification for providing adjustment assistance to displaced individuals derives from several premises. Since society as a whole benefits from reduced production costs in competitive markets, it is argued that society at large should provide assistance to all unemployed persons, regardless of the source of unemployment. This "universal eligibility" belief operates through effective pursuit of full employment and "active manpower policies," which provide unemployment insurance benefits at levels close to the average wage, subsidized retraining and relocation, and extensive counseling and placement services. Active manpower policies emphasizing full employment and a variety of retraining and relocation services are common in Europe, notably Sweden.

A second justification for adjustment assistance derives from the "job property rights" each individual is assumed to possess. Ideally, individuals selecting among alternative employments compare both wages and the stability of the wage. But the individual typically holds only one job, prohibiting individual diversification and reduction of risks, as an owner of capital does by holding a diversified portfolio. The inability of the individual to diversify and reduce income risks as a worker can justify a scheme of legal rights to existing jobs. For example, before an individual worker can be terminated, severance pay and/or adjustment assistance could be required. use

In America, some form of job property right is found in about 70 percent of all collective bargaining agreements, although many clauses merely require advance notice of termination. In Europe, notice before layoff and mandatory severance pay are standard features of protective labor laws.

Job property rights can assume various forms. At one extreme, an employer's current labor force can be protected against job loss by requiring "social impact statements" which detail both the employment consequences of any planned change and the efforts that will be undertaken to ameliorate these consequences. At the other extreme, a job property right may be the minimal requirement of advance notice (e.g., 30 days) before an individual may be permanently discharged because of mechanization or organizational changes. An array of intermediate rights have been suggested or are now in force.

The case for some form of job property rights in agriculture rests on the public subsidy to agricultural research and the benefits thought to redound to society through the operation of competitive agricultural markets. Public monies are used to fund basic engineering and biological research, and the efforts of extension personnel often accelerate the diffusion of resulting innovations among farmers. Some farm labor displacement can be traced, directly or indirectly, to the publicly-subsidized research. Since public policies should not aid one group (growers, machinery producers, and consumers) at the expense of another (farmworkers), it is argued that public subsidies to agricultural research inevitably create public culpability for the hardships of displaced farmworkers.

If some form of adjustment assistance were granted farmworkers, i.e., if some set of job property rights were assigned hired farmworkers, several pragmatic issues would arise. Any compensation policy would need a definition of agricultural labor. Because a majority of farmworkers are employed less

than 30 days in agriculture, a program that limited eligibility to "regular" farmworkers would omit a significant share of the farm workforce. Alternatively, a compensation program providing benefits to all those who did any farm work could encourage some persons to do farm work only to qualify for compensation after mechanization. A generous, effective program limited to "full-time" farmworkers may be inequitable to the majority of short-term individuals, but inclusion of these "casual" farmworkers may greatly increase the number of eligible individuals and thus program costs.

After eligibility criteria are defined, any compensation proposal must establish individual benefit levels. Since benefit levels will influence the program's total costs and the chances for successful transitions to nonfarm employment, choices between lump-sum payments and extended unemployment insurance, between nonfarm and farm training services, and between relocation and local re-employment efforts must be made. Decisions concerning requisite job search efforts and requirements defining when alternative jobs must be taken are necessary. In designing any program, the cost trade-off between the staff necessary for personal attention versus simple income supplements must be weighed.

Because the California farm labor force is less than 3 percent of the California workforce on an annual average basis, the cost of any adjustment assistance program designed and operated only for farmworkers may be high on a "per-person helped" basis. The potential complexity and cost of a farmworker specific program have led some to advocate mandatory Social Impact Statements before public monies can be committed to agricultural research. Such statements, similar to Environmental Impact Statements, would attempt to anticipate the displacement consequences of any research effort before the research was undertaken. But research results are uncertain, making the value of long-term predictions dubious. Even if one could accurately assess the consequences of

a research effort, it would be difficult to actually predict the timing of displacement. Since re-employment ease or difficulty is critically dependent on the time and extent of displacement--low unemployment rates or limited displacement in any area make re-employment easier for individuals--any Social Impact Statement would have to forecast both macroeconomic conditions and the rate of machine adoption in addition to predicting the duration and success of the research. Moreover, such a statement fails to identify the specific individuals who would be eligible for assistance.

The real key in assessing agricultural research may lie not in predictions made at the outset of research but rather in the predictions made before diffusion occurs. In many instances, machines that can reduce labor usage exist, but are not adopted until wage costs make machine use more profitable or improvements in the machine make mechanical harvesting economically viable. If society is to exert some control over the pace and extent of agricultural mechanization, it may be more efficacious to focus on the determinants of innovation diffusion rather than attempting to predict research success.

The concepts of job property rights and impact statements derive from the legal principle of culpability for damage. If the public universities are in some way responsible for displacing farmworkers, then the public is assumed to incur some responsibility for the fate of those displaced. Such a legal approach to the issue raises a host of issues. How much responsibility is incurred? How direct must the link between research and displacement be? Should any such "labor responsibility" rest with the researchers or in a specially created university or state office? It should be noted that, e.g., federal safety and environmental regulations sometimes result in temporary unemployment or permanent displacement, yet the agencies initiating such displacing changes refer displaced individuals to Department of Labor programs.

If the concept of culpability were exorcised from farm mechanization discussions, the issue could be seen as one in which society is pursuing incompatible social goals. Society strives for both full employment and increased agricultural productivity. These goals inevitably collide. In other instances of incompatible social goals, society has acknowledged that the achievement of one goal results in hardship for some individuals and has sought to cushion their losses. Under the Trade Adjustment Assistance Act (1974), society has recognized that the lowering of tariffs and quotas can permit imported products to displace workers in competing domestic industries. If workers are displaced because of import competition, they are entitled to supplemental and extended unemployment insurance benefits, retraining and relocation allowances, and counseling services. Similarly, the recently enacted law expanding the Redwoods National Park (preserving natural resources) includes funds to aid any loggers and sawmill workers who may be displaced when park expansion halts timber operations on the new park acreage.

Similar arguments could be adduced to bring hired farm labor under the ambit of an assistance program. Under a "competing social goals" justification, society at large, rather than universities, farmers, or machine manufacturers, would bear the cost of retraining and/or relocating displaced farmworkers. Many manpower researchers argue that the concept of culpability should be eliminated when designing and administering labor market programs, that the source of unemployment should be irrelevant for obtaining labor market assistance. In a socialistic economy, productivity increases that displaced labor would be automatically included in the social welfare function which relates changes in all sectors. The fact that the gainers and losers in agricultural mechanization are often distinct and separate complicates but does not make a remedial policy impossible.

The economic system operates to increase both individual and social welfare. During its evolution, structural changes are required. These structural changes, including the movement of labor from agriculture to the manufacturing and service sectors, increase long-term social welfare but impose adjustment costs on individuals. Few would argue that this inevitable structural transformation should be halted, that all farmworkers should remain farmworkers. What has been shown is the existence of individual adjustment costs in the course of an agricultural transformation, a transformation often expedited by public policies. Rather than arguing about blame in specific instances of mechanization, both farmworkers and society may be better off if energies are directed toward designing programs that reduce the hardship accompanying inevitable labor displacement. Past investments in agricultural research have returned high social dividends. Investments in people promise the same high returns.

