SOCIAL PROBLEMS OF THE INTRODUCTION OF NEW TECHNOLOGY IN LATIN AMERICAN AGRICULTURE: SOME IMPLICATIONS FOR HORTICULTURE

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The two most perplexing problems that confront most Latin American countries today are unemployment and a highly inequitable income distribution. In the 1970's, as new technology–like high yielding cultivars, fertilizers, mechanical equipment– is adopted in the agricultural sector at an increasing rate, more joblessness and increased income flows to the already privileged are likely. At the end of the decade the distribution of income will undoubtedly be even more unequal than it is today–probably unacceptably so from nearly everyone's point of view–unless governments soon act to redress these increasing imbalances (26).

It would be irresponsible to claim that new technology–including the green revolution inputs–is the cause of these problems. As J. George Harrar, President of the Rockefeller Foundation, claims, *"The roots of these ills are long and predate the Green Revolution by many decades and even centuries."* Nonetheless, technological change often has the effect of exacerbating social ills as well as bringing them to greater public awareness (13).

And because land and other resources are concentrated in a few hands in most of Latin America–a situation which dates from colonial settlement–the tendency of new technology to worsen distribution of income there will probably be greater than that reported for India and Pakistan where initial distribution is more egalitarian (2, 7, 8, 12, 31).

Even if the spread of new technology were not so pervasive, the employment problem in Latin America would probably become more serious as the decade passes: new workers born in the population explosion that began in the 1950's will be reaching a labor market that may well continue to be slack. As unemployment rates mount, distribution of income will become more unequal.

Robert S. McNamara, President of the World Bank Group, summarized the problem in his last address to the Board of Governors:

"In the developed countries, rapid economic growth implies full employment. But in the developing countries this is not necessarily the case. Venezuela and Jamaica, for example, both enjoyed average growth rates of 8% a year between 1950 and 1960, but, at the end of the decade in Venezuela, unemployment was higher than at the beginning; and in Jamaica it was just as high, in spite of the fact that fully 11% of the labour force had emigrated from the country (19)." When the OAS attempted to discover what part of the labor force was involuntarily unemployed it found that the unemployment rate rose from 2.9 million in 1950 to 8.8 million in 1965, or from 5.6% of the labor force to over 11%. Using a more inclusive definition–comparing available manpower (usually in terms of total man hours) over the course of the year to number of man hours actually devoted to work–in 1960 about 25% of the labor force in Latin America was unemployed or an equivalent of about 18 million workers (19). The UN estimated this figure at 25 million as the decade of the sixties closed (27).

While all this data obscures great differences between Latin American countries, it underlines the absolute necessity of population control. But it is sobering to consider that a rapid and immediate decline in the birth rate would have little impact on the size of the work force for 15 years. A faster economic growth rate and deep institutional change are also essential.

CURRENT INSTITUTIONAL PROBLEMS OF LATIN AMERICAN AGRICULTURE AND HOW CHANGING TECHNOLOGY WILL AFFECT THEM

A few more facts may help us define Latin America's current agricultural problems.

1. A few own most of the agricultural resources–1.9% of those engaged in agriculture own 50% of the land in tracts averaging 1,000 acres per farm, for example. These are agriculture's rich and their farms are usually organized as plantations or haciendas. Most of those who work in agriculture are landless campesinos, but about one quarter are minifundistas who hold only 2.4% of the farmland (14). The landless are usually completely dependent on large scale landlords for work while many minifundistas may supplement their income by working for them. Not surprisingly, income distribution is more skewed in Latin America than in other parts of the Third World. Fairly recent figures show that two-thirds of the agricultural population receive 28% of total farm income while 1.8% receive 20% (11).

2. Peasants are leaving the land rapidly for towns and cities where industry isn't growing rapidly enough to employ them. If industry were growing more rapidly, the capital intensive manner in which the sector is developing still makes it doubtful that all who sought jobs could find them. Many central cities in Latin America are growing at 10% per year and slum settlements at 15% per year. Unemployment, therefore, is becoming steadily more concentrated in large urban centers where the quality of life is deteriorating for many (25).

3. About half of the labor force in Latin America is engaged in agriculture and, in absolute numbers, the work force in agriculture is growing. Should the present rates of demographic growth continue and assuming the upward trend in rural out-migration will continue, about one-third of the net increase in population will remain in agriculture in the next decade or two. This means that the total rural work force will grow by about one million workers annually (14).

As we assess the impact of the introduction of new technology in the agricultural sector on employment and income distribution it will help to have these facts in mind.

Changing technology, much of it in the form of new agricultural inputs, has already had a profound effect in parts of rural Latin America. Indeed the green revolution was born in Mexico with the work of the International Maize and Wheat Improvement Center. The Center has been credited with increasing the avg yield per ha of wheat in that country from 800 kg in 1950 to about 2800 in 1970 (30).

But green revolution cultivars currently require careful water control, and since there is much dry land farming in Latin America, wheat yields in all regions of Latin America have not followed Mexico's lead. Furthermore, only a few basic crops in the region have been affected by these spectacular gains.

Nonetheless, what has happened to wheat in Mexico portends a brighter production history for Latin America in this decade. It is heartening to learn that per capita food production in Latin America increased nearly 3% in 1970 over 1969 (29). Why this happened and whether it marks the beginning of a trend is a matter for speculation. But it seems likely that many countries in Latin America will feel more of the effects of the green revolution in the 1970's than they did in the 1960's. Some countries have adopted agricultural research programs in the 1950's and in the last decade which should begin to pay some dividends in terms of increased production in the next 10 years. Experimentation by foreign investors seems to have played an important role in increasing the yields of some crops. Horticulture has made some important strides–the success of the higher yielding potato in Peru is an example. Cultural practices for many crops in some areas have improved markedly, often through cooperation between U. S. and Latin American biological and social scientists. Foundation researchers and other scientists are working on many crops other than those that have shown dramatic increases in the recent past and are even experimenting with a high yielding germ plasm for dry land wheat. Fertilizer use is increasing–so that the number of nutrient equivalents used in 1969 was about twice those used yearly from 1962-66 (29).

Furthermore, it is quite possible, even probable, that some Latin American countries will repeat, in different crops among which will surely be some usually defined as "horticultural," the "Pakistani experience" which spread the green revolution to Asia. In 1961 and 1962 young scientists from Pakistan returned from studying in Mexico with samples of high yielding Mexican dwarf wheats. According to Norman Borlaug: *"Perhaps 75 to 80% of the research done in Mexico on cultural practices was valid in Pakistan. Research undertaken in Pakistan while the imported seed was being multiplied provided the necessary information to cover those gaps where the Mexican data were not valid. Many years were saved by drawing on the Mexican experience* (5)." The outcome is legend. The 1970 harvest in Pakistan was a phenomenal 8.4 million metric tons compared with 4.6 million tons harvested in 1965. India expects self-sufficiency in food grains before 1975.

The International Rice Research Institute provides a similar success story. Five years ago the Philippines imported 1 million tons of rice annually; today the country is not only self-sufficient but will

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soon begin exporting the high yielding rice which is now planted by one-third of all the rice farmers in the Philippines. And, IRRI varieties are already being utilized by many other Asian nations (30). Ceylon, for example, has increased its rice crop by 34% over the past 2 years (13).

With these precedents, it does not seem unreasonably optimistic to expect substantial increases in farm production in at least some commodities in most of the countries of Latin America during the 1970's. Doomsday spokesmen who 5 years ago foresaw mass starvation by 1980 are now being answered by many writers who view the world food problem as far from hopeless. While this does not mean we should be complacent and regard production problems as solved, the green revolution should make it more possible to buy the time necessary for countries to control their rapid rates of population growth; widespread famine no longer seems as imminent as previously.[2]. Borlaug claims ". . . I *am optimistic about the outlook of food production in the emerging countries for the next 2 or 3 decades* (5)."

But possible self-sufficiency in food production does not speak to income distribution and employment questions. Indeed, if income distribution is not altered the green revolution could cause the ironic situation of market surplus at the same time many families remained undernourished, claims a recent report by the Inter-American Development Bank (14).

The overriding question to be addressed here is why, in the Latin American context, will the technological revolution in agriculture likely create a more inequitable pattern of income distribution? In attempting an answer, it is convenient to distinguish between 2 kinds of farm technology: Seed fertilizer revolution inputs (those that tend to increase yield per ha, such as high yielding cultivar seeds, improved tree stock, pesticides, fertilizer and better cultural practices which accompany them) and labor saving inputs (those that allow one man to cultivate more area, such as tractors and implements).

What are the short run effects of green revolution inputs on income distribution among landholders?

Given the hacienda-minifundio structure of agriculture, the immediate effect of green revolution inputs in Latin America is to add to the incomes of the already rich. Even though these inputs are divisible and theoretically as useful on small farms as on large ones, for several important reasons they are not neutral to scale in most of Latin America. In the first place, credit institutions and those that are charged with diffusing technical information are usually designed for the large acreage farmer. As a recent study concludes, *"Most of the institutional credit in Latin America is currently lent to relatively large landowners....few of the benefits....are filtering down to the rural poor* (1)." Furthermore, credit institutions that have been designed with the small scale farmer in mind are often so undercapitalized that they either are not able to serve the many campesinos who need loans or give many of them so little that credit has a negligible impact on income. Sometimes lending agencies are theoretically open to large and small borrowers, but only men of some means have the time and education to cope with the red tape and delay endemic to many of them. At the same time high yielding cultivars of cereals that have been developed usually require from 3 to 4 times the amount of fertilizer than that which farmers are currently using, which means that they need credit in greater amounts than ever before. This tends to restrict the green revolution to an even smaller group than the one that has regularly used more conventional inputs. If credit is available, either yield raising inputs may not be at hand or supervisors may not know the proper cultural practices–or at least may not be skilled at effectively communicating them to campesinos. It has been shown that extension services, too, may be designed to serve large acreage farmers. To summarize this point, green revolution inputs may be neutral to scale, but if credit and technical assistance favor large enterprises, small farmers will be unsuccessful adopters, non-adopters, or late adopters. Added to these problems, adequate irrigation facilities are often available only to large land holders because they control local water associations.[3]

On the positive side, even though large scale farmers may be the prime adopters of the high yielding cultivars, the green revolution can have one favorable impact on the low end of the spectrum of income receivers: cultivars that double or triple yields may require more outside labor, especially at times of harvest and irrigation. Further, double cropping may become more prevalent, with whatever increase of labor use that implies (15).

What are the effects of labor saving inputs on income distribution?

A major part of the technological advance of the 1950's and 1960's has taken the form of the introduction of labor saving capital, and this technology tends to have its greatest unfavorable influence on the lower end of the spectrum of income receivers. That is, it increases rural unemployment and underemployment and accelerates the massive in-migration to cities where chances of finding a job are increasingly bleak. There is nothing to indicate that the current trend toward mechanization of farming is slowing down.[4] The number of tractors more than quadrupled in Latin America while in the rest of the world it rose 2.3 times in the period between 1948-52 and 1967 (4).

The conclusion of the ILO report on employment in the agricultural sector of Colombia is probably generalizable to much of the remainder of Latin America: *"The growth of commercial farming since the Second World War in Colombia has been intimately associated with the use of machinery, which has....reduced the need for human labour (relative to output) on the farms concerned* **(28)."**

That mechanization is increasing despite a growing rural work force in most Latin American countries is neither accidental nor unavoidable. It reflects deliberate governmental policy and is a predicatable consequence of the prevailing land tenure system: 1) When management is separated from labor, as it is in the hacienda, and when labor is ample, poorly organized, and there is little or no labor legislation, it is difficult to stop landlords from firing workers who have few employment alternatives. In contrast, while a family farm owner-operator may sell out, he does not fire himself or his family. Likewise in a labor managed enterprise, it may be difficult (but still easier than on a family farm) to displace fellow workers with a machine. 2) In some countries where modernization is equated with mechanization, machines can be obtained at a favorable exchange rate, with cheap credit and long term credit arrangements. In other words, the large farmer is, in effect, subsidized for contributing to the unemployment problem. 3) In some countries, minimum wage and fringe benefit legislation are increasing labor costs and making labor more expensive at the same time that mechanical power is becoming artificially cheap. 4) It is usually simpler to deal with a machine than with large numbers of campesinos. A machine tends usually to be predictable, may be more dependable, and does not strike. 5) Sometimes aid from developed countries comes with "strings" that make it mandatory for the recipient to buy equipment from the nation that gave the aid (17). This, in turn, encourages the use of the latest laborsaving machinery because machines tend to be developed for the factor proportions of the country in which they will find their biggest market (24, 25).

To sum up to this point, given the present institutional structure of Latin American agriculture, green revolution inputs initially tend to make the income distribution more unequal by making the rich richer, while laborsaving technology may depress earnings at the other end of the income spectrum–it usually causes unemployment and underemployment in the countryside and cityward flight before industry is able adequately to absorb the labor.

What are the longer run effects of the introduction of new technology in agriculture?

Yield increasing and laborsaving technology often become more interdependent in the longer run and this portends depression of employment opportunities and pushes down average income at the low end of the spectrum of income receivers. 1) In some instances, green revolution cultivars may need precision seedbed preparation that is difficult to accomplish with available hand labor. Furthermore, if double cropping becomes possible, there may be more need for speed in harvesting one crop and planting the next one which will encourage mechanization. In areas where triple cropping is possible, the pressure to mechanize may be even greater. 2) If less labor intensive, a green revolution crop comes to be more profitable than a competing more labor intensive crop, and it may have a negative effect on employment. 3) A single green revolution crop may be so profitable that a farm's cropping pattern is switched from a diversified one which spreads labor needs through the year to one in which there

[2]Issues involved in this disagreement are outlined in (3).

[3]Of a sample of farms in the Valle del Illapel in Chile, Steward concludes, *"In spite of the existence of a canal association....with its formally established system of homogeneous water rights....there are great variations in the quantities of water actually received per share.... Deviations....appear to be directly related to differences in sizes of farm units and to relative distances of units from heads of ditches. To a lesser extent, they seem to be related to positions of influence within the Canal Association. These positions are themselves related to farm size* (23)."

[4]It is not always correct to equate the terms "mechanization" and "labor saving capital." As I point out later, some mechanization may be yield increasing while, in the case of chemical weed killers, labor saving capital may not be "mechanical" in nature.

are peaks of great labor need and deep "troughs" in which workers are idle. It also may become difficult to shift labor in sufficient quantities to areas of harvest–especially when vast acreages are ready at the same time. 4) Current experimentation is with triple dwarf wheat cultivars which have such short straw that they are difficult to cut by hand and shock. 5) As domestic markets fill, prices for the commodity affected will drop. Farmers who have not been able to adopt the new technology, and who also have no way to export, will likely find that their meager crop has to be sold for less with no chance to make up in quantity what they lose in price. 6) As the early adopters increase their profits, they may become more and more willing to invest in laborsaving technology even if labor remains relatively cheap. Especially in an inflationary economy, buying mechanical equipment may look like, or actually be, a good investment. And in other cases the mechanical power is sought merely for the prestige it confers on its owner. 7) The possibility of making a good profit from the plot of land formerly grazed by draft animals may encourage farm owners to buy machines and sell their horses or oxen. 8) As green revolution inputs begin to increase the profit margin in farming, land prices will rise. This will increase the net worth of agricultural real estate in Latin America (and probably serve to reinvigorate the political and economic position of the landed oligarchy which has been steadily losing power and prestige to other elites). If renting is a common form of land tenure arrangement, the landholder will probably be able to capture these windfall profits, denying them to his tenant; because there are so many potential renters, a landlord can raise the rent every time the tenants' income rises above the subsistence level. It is possible that sharecroppers and resident laborers (who are usually allowed a subsistence plot) would benefit, but Nair's observation about India is likely to hold true in Latin America. She claims that: *"Hitherto....the large and upper caste group of landowners were, as a rule, renting most parts of their land to several tenants and sharecroppers. If they retained any portion, it was cultivated by hired wage labor....Since the introduction of the new seeds, however, rents have risen sharply. Land values have sky-rocketed–3, 4, even 5-fold and more. Landlords are scrambling to resume the leased out land for self-cultivation....because it is highly profitable now....* (21)." 9) While internal pressures to mechanize are most important, external pressures–centered in developed countries–may add to the pressure for mechanization. For example, a large North American tractor firm probably is not working on the program to improve wheat cultivars and cultural practices in Brazil for purely altruistic reasons.

WHAT CAN BE DONE DURING THE COMING DECADE TO OFFSET THE POTENTIALLY NEGATIVE EMPLOYMENT AND INCOME CONSEQUENCES

Since decisions about technology adoption are made by those who own the land, it would seem that the only way to decrease these inequities is to modify the traditional land pattern in Latin America in favor of individual family farms or labor managed units. If this does not happen we can expect more unemployment and an increasingly skewed distribution of income–problems that will likely become so serious as to be unacceptable to nearly everyone in Latin American society. Concomitantly, governmental service and marketing institutions would have to be reformed so that inputs and the knowledge of how to use them become much more widely available. This means a massive land reform program coupled with changes in the institutions that service the existing small farm sector and the reformed sector with credit, new seeds, fertilizer, markets, and technical information.

Technology can be divisible in fact as well as theory: small scale farmers can therefore benefit directly from green revolution technology, especially if very large acreage farmers are not prevalent. Lack of adoption by small holders is probably more due to society and the structure of its institutions than to farm size and farmer psychology. While many writers have decried the income distribution and employment problems that have been exacerbated by the green revolution where it has had an impact, there is mounting evidence that in parts of India–where something akin to a system of land tenure nearer the family farm is predominant–new technology has not wholly bypassed the farmer with a miniscule plot. Chowdhury finds that net return per rupee spent does not improve with the increase in farm size (9). Mukherjee also found that for wheat in Punjab, all size groups of farmers participated in the high yielding variety program (20). Harrar is most optimistic, claiming: *"Available evidence indicates that about 62% of the beneficiary farms are small ones; about 6% are large farms (with more than 25 acres of land per farm); and about 32% are medium sized farms* (13)."

What can agrarian reform contribute to development?

I do not suggest the result of land reform must be small scale farming. Production cooperatives such as those being established in Chile and Peru, may be alternatives especially if they can be integrated regionally and nationally. But half-hearted reforms will not have the desired results. The institutional structure of agriculture must be changed so that campesinos can either have farms of their own or can participate meaningfully in profits. This will make it possible for green revolution inputs to benefit the campesino; later, these inputs and the knowledge of how to use them must be provided. It is doubtful that the entire job can be done at once; resources are scarce. But it is especially important for countries to reshape the institutional structure as a first step.

If an effective agrarian reform program were instituted, it should have favorable effects on the economy. It could, for example:

1. Slow the rate of farm-to-city migration by employing people more productively on the farm until industry is ready to employ them.
2. Increase the demand for simple consumer goods since the economy would rest on a broader base. In addition to providing more jobs in the countryside, land reform should yield more city jobs, too. Products which beneficiaries of agrarian reform are likely to demand are textiles, processed food and clothing; methods of manufacture for these items are typically more labor intensive than for consumer durables.
3. Provide a basis for decentralizing the industrialization effort; for example, agricultural processing could be done in regional capitals, thus creating more jobs outside of the central city.
4. Improve balance of payments. Simpler goods require fewer imported inputs than more complex goods, and are more economically feasible for poor countries to manufacture.
5. Permit more public revenues from agriculture, since governments will no longer be dealing with the predominantly large-farm landlords who are so adept at evading taxation.
6. Lessen the growing disparities of income distribution in the farm sector.

The time to act is now. Political resistance to land reform will increase as the green revolution makes hacienda farming more profitable.

After land is redistributed, what role can be played by horticulturists?

As we have stressed, reforming the tenure structure is only the first step, and it is a political one about which social and biological scientists can do little. The next one involves us, however, for we must do the research that will improve yields, help the market or the state make appropriate inputs available, and provide the campesino with the knowledge of how to use them.

As a non-horticulturist I can only explain, as I have attempted to do, some social problems Latin America will face in the next decade and call upon you and the research ingenuity always exhibited by members of this association to help cope with them. Perhaps the following are worth considering:

1) Research on high yielding vegetable and fruit crops in the U. S. has been highly successful–indeed has yielded spectacular results. Is it possible to allocate more research time to adapting these cultivars–or developing new ones–for use in less developed countries?

2) Since perishability is such an important characteristic of vegetable crops, is it possible to emphasize development of a less perishable product–but one that is still palatable and of high nutritional content–in breeding research. And could more cooperative research be conducted with economists and engineers who could help develop economic cooling units which could be purchased by beneficiaries of land reform? Could less complex and labor intensive processing plants be designed and built that could be located near the source of production? If this growing site were nearer small towns than urban complexes the exceedingly rapid migration to metropolitan centers might be slowed.

3) Is it possible to develop more cooperative research with extension personnel, communication experts and horticulturists that might have as its goal the diffusion of adaptable high yielding varieties of vegetables and fruits to small scale farms? I can visualize a system of test and demonstration plots on the farms of the most progressive and receptive peasants. Once success has been proven, wider adoption should be a result. Or is a package-of-inputs scheme feasible so that extension personnel might distribute, say, fertilizers, seeds, and insecticides in proper proportions and explain their economic use? This might be an appropriate follow-up to a demonstration plot experiment.

4) Given the growing labor supplies in the Latin American countryside and the fact that city population is burgeoning and industry is unable to employ the swelling work force, doesn't it seem

as though development of mechanical labor-saving devices in planting, cultivating, and harvesting must take a lower priority in developing countries than in developed ones? It would be tragic if horticultural crops would prematurely lose their potential of being among the most labor absorptive of crops.[5] Here the Japanese model is applicable: *"The essence of mechanization in the agriculture of Japan is that the acreage worked by a farmer was expanded by the adoption of labor-saving equipment only after the growth in output per acre had become slow and extremely costly. Until that point the remarkable rise in yields in Japan had been achieved primarily by the diffusion of improved varieties, cultural practices, and fertilizer; assisted by irrigation pumps, better animal-drawn plows and harrows, revolving weeders, and pedal threshers* (16)."

5) Given the widespread malnutrition, shouldn't horticulturists and nutritional scientists develop more cooperative extension projects which will point out the necessity of using the fruits and vegetables that can be grown locally to peasants? But these professionals must also have a clear idea of what fruits and vegetables are not acceptable because of lack of palatability, traditions or taboos to their use, and other cultural factors.

6) Research that will lead to a shortened planting-to-maturity period will free up land for other crops and should mean a higher income for land reform beneficiaries. In some countries cultivars that are adaptable to changing altitudes are needed. In countries where irrigation is a necessity–especially in areas with gravity flow systems and/or poor storage facilities–cultivars that are tolerant to wide variations in water supply will be useful. In countries where foreign exchange must be used to bring in fertilizer, cultivars that do well without heavy doses of commercial fertilizer are called for.

SUMMARY AND CONCLUSIONS

I have not argued here that it is impossible to obtain substantial production gains from agriculture should the present latifundio-minifundio structure remain intact. As the green revolution becomes a reality throughout Latin America, and, as advances of horticultural science spread, "modernization" of haciendas–many of which now are idle or poorly utilized–will probably become highly profitable and marketable surplus should rise. Thus the green revolution may allow Latin America to stave off widespread famine for a decade or more–or forever if it succeeds in controlling population growth. But more food will not solve the other severe social and political problems that most of these countries confront. If institutions do not change, the income benefits of agricultural production will continue to enrich those who already hold the bulk of the nation's agricultural resources, while campesinos who comprise the vast majority of those in agriculture will fall further and further behind. There is no reason why the production gains could not be made by campesino agriculture rather than hacienda agriculture, thus ameliorating adverse effects of a worsening income distribution and more unemployment and underemployment. In most Latin American countries this necessitates a massive agrarian reform program. It also means that the new inputs must be channelled to new landholders as soon as research makes them available. For as soon as reform occurs an employment problem becomes a production and income problem. Also needed in most of Latin America is a set of policies which allows careful scrutiny of each step toward further mechanization in terms of how much employment is lost for every increment gained in production.

In conclusion, just as the social scientist must use data from the "harder" sciences, the horticulturist, for example, must become more aware of social problems. Indeed, we all must become aware of the social implications of new technology. As one commentator has observed: *"The emergence of the scientist as an active, responsible, if biased, citizen was a relatively radical idea a few years ago; this role is now more widely accepted. But the important thing is not the politicization of science, but the active involvement of scientists and engineers in those areas where decisions in uses of technology are really made* (6)." This argues for more interdisciplinary research and action programs and, at the very least, clear channels of communications between engineers and the social, physical and biological scientist, between the scientific community and government policy makers.

[5]It should be recognized that mechanization of horticultural crops in the U. S. is not an unmixed blessing. *"Agriculture's labor force has been shrinking steadily, but in recent years the sharpest rate of reduction has occurred in migratory farm wage workers.... The reductions in recent years were primarily due to adoption of labor saving devices and practices in vegetables and sugar beets.... Because of lack of skills and low levels of educational attainment, displaced migrants generally are poorly prepared for other jobs (18)."* A recent summary of the interaction between mechanization and workers' unions in California is given in (10).

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