It is remarkable, perhaps, as the first sugar factory ever constructed using American-made machinery, previous attempts having relied on French or German machines. It is also said to have been the first to use beets grown by irrigation.

The first year the output was about 11,000 bags; by the third year this had been stepped up to 41,000 bags. Ultimately the factory more than paid its way, and about eight years after its construction the company began its program of expansion which has carried its activities into several states. Other states have surpassed Utah as beet sugar producers, but this state still ranks high, as you know.

The industry has its problems, to aid in their solution we look to you technologists for help and assistance. Your skill and vision and inventive genius have brought sugar manufacture to its present standing.

The field is yours, technologists. For what you have done we honor you and thank you. For what you may still do we shall be deeply grateful.

THE DEVELOPMENT OF THE SUGAR INDUSTRY IN UTAH

Heber J. Grant, President of the L.D.S. Church

President Heber J. Grant of the L.D.S. Church gave an extemporaneous address on the early struggles of those connected with the sugar beet industry in the West. He told of the establishment of a factory at Lehi, Utah, which was wiped out by the depression of 1883; of his endeavors to raise capital for building another factory and the final interest taken by Wells-Fargo Company and the late David Eccles. He eulogized the pioneers of the sugar beet industry and held out high hopes for its future development.

LOOKING FORWARD TO BETTER SUGAR BEET PRODUCTION MACHINERY

H. B. Walker
Agricultural Engineer, California Agricultural Experiment Station

Aristotle, the famous Greek philosopher, defined hope as a waking dream. For many years the producers and processors of sugar beets have lived in the hope that some genius, philanthropist, scientist or inventor might devise suitable equipment and machines, which would eliminate from sugar beet production problems, the back-breaking, tedious stoop labor which now seems to be necessary for growing this crop. Our progress in overcoming these problems has been slow. We have yet to find the talent and the method of attack to bring to reality this waking dream.

The sugar beet industry, however, has not attained the hopeless stage. This sugar beet machinery problem is very much alive and, therefore, still in the hopeful stage.

I am more than conscious of the tremendous amount of thought, energy and money which has been put into the various machinery phases of sugar beet production by beet sugar companies, inventors, implement companies, research workers, farmers and others. It is a problem which has challenged some of the best minds of the country and certain progress has been made, but still the industry is unserved, and may I say, unconvinced that a practical answer can be found to meet the increasing hazards of stoop labor crop production.

I shall divide my discussion into three parts: (1) the need of better machinery, (2) the possibilities of securing better machines and (3) suggestive methods of attainment.

This problem of providing better machinery for sugar beet production is meritorious because it involves an industry in which both the producer and the processor of the crop are vitally concerned. It involves also the future security of a crop in our agricultural system which has been found not only useful as a source of raw products for a necessary food staple, but it is a crop which fits into good farming practices, involving appropriate crop rotations, soil management, weed control, livestock production and other vital practices connected with good land use policies. These, however, are only indirect influences which have developed the urge for better machinery. The farmer who produces crops, making intermittent demands on labor, and particularly where this labor is of the stoop type, seems to be facing rather serious problems. These, likewise, are reflected into the industry which processes the raw products of the farm.

Farmers have two important costs which must be considered and successfully met in any farm enterprise. These are, the fixed charges and the operating costs. In the former we have such things as interest, taxes and rentals. The second represents labor, power and machinery charges and these are costs in which the farmer as an individual is most interested, because ordinarily he can do more about these than the other.

The operating charges include labor, which in the beet industry, represents a considerable proportion of the total operating costs. Labor charges are now somewhat different than in former times, due to the unusual tendency in these modern times of social consciousness, to regulate hours of work and to fix minimum rates of pay. This tendency has the potential effect at least, of increasing fixed charges if hired labor in any volume is required in growing the crop.

Hand labor is very important in the growing of beets and most of this labor is required at critical periods during production, that is, during the blocking and thinning period following planting, and later during the harvesting period. These, likewise, are stoop labor periods. The character of the labor required and the intermittent demand for such labor has focused rather unfavorable attention on the industry.

The public attention which has been focused on "the more abundant life" and the underprivileged groups, has prompted legislative attempts to fix the hours of labor and the rates of pay so that in effect, all farmers are facing the possibility of adding certain wage increments to his fixed charges.

These matters are serious enough in themselves, but with these changes, farmers are faced with the additional hazards of labor unrest, organized labor

groups, and organized resistance to the profit features of the production enterprise. The labor problem, therefore, becomes a vital issue in the future of the industry.

Reformers, of course, object to the use of labor saving production equipment on the grounds of technological unemployment, but this industry cannot afford to be idealistic when we have acres to cultivate, factories to operate, interest charges to meet, and taxes and wages to pay.

Labor charges are important, particularly hand labor, which represents from two-thirds to three-fourths of the total man hours required to produce a crop. Likewise, a high proportion of this labor, more or less specialized as to type, places the industry in a particularly vulnerable position should issues arise between growers and organized labor groups. Top this out, if you please, by the fact that certain labor costs may, in a way, take the form of fixed charges like taxes, rentals, insurance, etc., and it becomes apparent that the principle of self-preservation dictates to the industry the necessity of doing what it can directly, to overcome these unfavorable factors.

Apparently, there is but one clear path to travel in combatting these handicaps, that is, to reduce, if not overcome entirely, stoop labor in sugar beet production by the substitution of machine methods.

We now come to the second phase of this problem which calls for a review of the possibilities of finding, or developing, machines to relieve the peak labor demands of sugar beet production and to relieve the industry of the "so-called" stigma of stoop labor. This is not a new problem as you well know, neither is it one that has not been thought of before. Some of these problems have been in the minds of producers as long as we have had the sugar beet industry. The plant breeder, agronomist, plant pathologist, entomologist, practical farmer, sugar chemist, field superintendent, engineer, inventor and others may have contributions and if so, these should be integrated into the solution of the problem we are discussing tonight. Failure to consider the viewpoint of any one of these may result in disappointing achievements.

May we consider for a few moments the particular problems of blocking and thinning beets. Immediately we are concerned with seed germination, damping off of seedlings, the effect of doubles, economic spacing and other factors not directly connected with the mechanical problems of blocking and thinning. In fact the recent work of Mervine and McBirney (U.S.D.A.) with planters of the single beet seed placement type appears to be a foundation start toward the subsequent tasks of blocking and thinning.

It is believed that improved planting equipment of the single seed drop type using graded seed may make possible the final thinning by long handled hoes thus eliminating the undesirable stoop labor. The Spring peak demand for stoop labor undoubtedly can be reduced by the development of new types of farm machines and continued progress may be anticipated because this phase of machinery development is not so expensive and work thus far has produced encouraging results.

The harvesting problem is not simple and it is not likely that it will be quickly or easily solved. In this project there are two operations which must be completed separately or simultaneously. These are topping and lifting. The general inventive approach has been principally along the line of topping the beets in place with subsequent lifting, but in recent years

considerable development work has been achieved with machines which lift the beets first and subsequently top them. Topping beets in place has been a difficult task to accomplish satisfactorily, particularly where stands are thick and with the beets spaced more or less regularly, due to inequalities in crown elevation and beet sizes.

While I have a feeling of optimism toward the ultimate success of the harvesting machinery problem, I also realize there can be no definite forecasts of the ultimate outcome. It is a most difficult problem on which many excellent and capable persons have worked without complete success.

We now come to the third phase of this discussion: Suggestive methods of attainment? While I perhaps lack the courage and foresight to forecast the ultimate outcome I do believe a carefully planned cooperative project involving science, industry and agriculture offers more promise than any other of bringing to fruition the objectives sought.

The time has arrived to depart from the independent and perhaps the unrelated method of approach by some cooperative arrangement which will bring about a pooling of talent, funds, equipment, and ideas for a common purpose, that is, to get the best answer possible in the shortest time.

It would appear feasible, sensible and appropriate for these various agencies to get together on a program which would make possible the fullest utilization of facilities and talent at our experimental stations supplemented by special research grants from the industry, to work on these vital problems.

LIGHT AND BIOLOGIC EFFECTS

H. T. Plumb
General Electric Company

Everything of material value comes to us on a beam of sunshine. An abundance of sunshine means health, happiness and prosperity. Absence of sunshine results in darkness, ignorance, sickness and eventually death. Since sunshine means so much to everyone it is important to know about sunshine.

Practically all of the energy on earth arrives in the form of light from the sun center of our planetary system. The sun radiates in every direction through space while our earth intercepts only a small portion of the total energy. However, that portion amounts to one horsepower for every square yard of the earth's surface, or to about one man-power for each square foot on which we stand when the sun is shining down. Every second the total sun energy reaching our earth is more than was in all the coal ever mined in America.

The sun energy is radiated in the form of light, not as heat. There is no heat present until the light waves are stopped by the earth or the earth's atmosphere. Without sunlight we would all perish within a few hours. Sunshine keeps us well and, properly used, sunlight will cure our sicknesses.