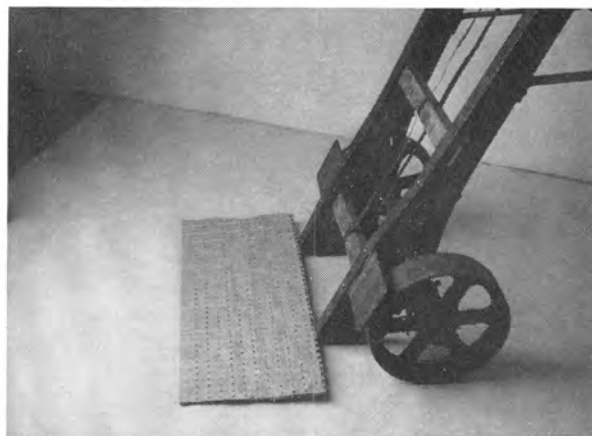
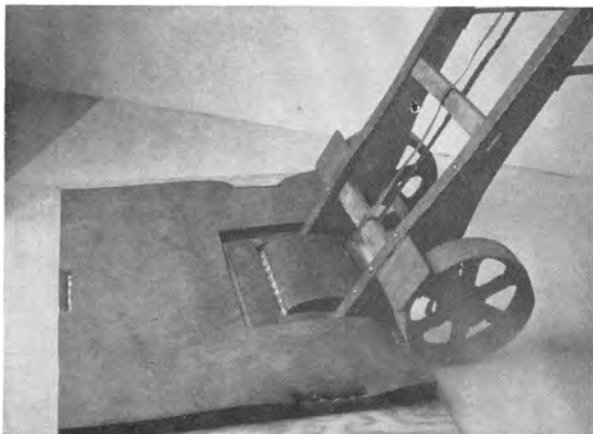


TREATMENT 1



TREATMENT 2

TREATMENT 3



## *Reducing* POTATO INJURY

MIKE ZAHARA • JOHN MC LEAN • DAVID WRIGHT

Breakdown of potato tubers during transit may be decreased by better handling practices before shipment. A full-length car liner of protective material, with a conveyor system transporting the sacks into the boxcars, would eliminate most of the injury during loading. When the hand truck is used, injuries to tubers can be minimized by padding, but the entire area around the lip must be treated or no benefit is gained. Individual paper pads also provide protection when the sacks are hand trucked. Increasing the area of exposure does not reduce the amount of injury.

**T**HIS STUDY of modifications of hand-truck loading operations was requested by the potato industry to find methods for reducing tuber injuries from loading. Several suggestions were made

for redesigning the hand truck, as well as for elimination of individual paper pads and replacement with a full-length car liner of protective material.

### Floor pads

Six types of floor pads for protection of potatoes during transit were tested in 1957 by J. K. Stewart and R. F. Kasmire. Each type of pad materially reduced the amount of damage incurred. Protection was found to be essential for the bottom bags. An excelsior pad provided more protection than any other tested, probably because of its thickness and resiliency. No consistent differences in transit temperatures were observed between potatoes shipped on individual sack pads and those shipped on continuous strip-type pads. Under similar icing services, adequate refrigeration was obtained on both types of pads.

With hand stacking used as a control

or check, a comparison was made of five different modifications of the hand-truck loading process, with three replications per treatment, as follows:

Treatment 1: The center or opening in the frame and the area around the frame were padded with 1½-inch foam rubber.

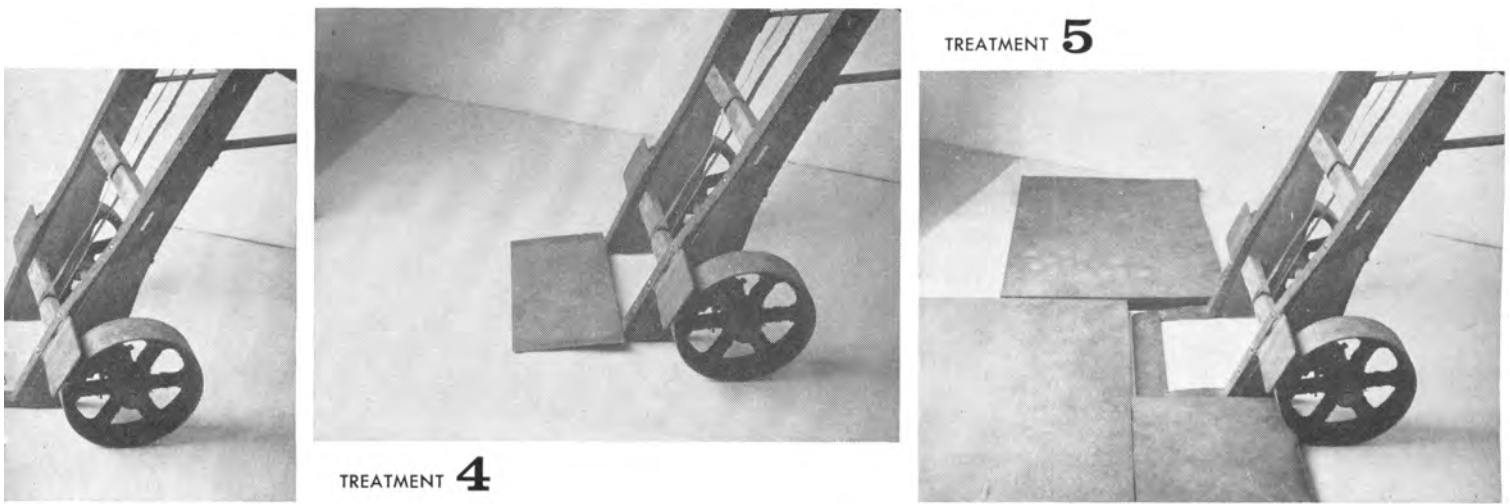
Treatment 2: Individual paper pads were used.

Treatment 3: No padding was used—only bare hand truck.

Treatment 4: A thin, solid metal sheet ¾ × 10 × 18 inches was placed on top of the frame of the hand truck.

Treatment 5: Only three sides of the hand truck frame or lip were padded with 1½-inch foam rubber.

In all treatments except the control, the



## *during loading for shipment*

bottom sack was placed on edge on the hand truck, the areas of impact were marked on the sack, and the other four sacks were placed on top. The load was hand-trucked a short distance and the sacks were stacked as in loading a boxcar. In each treatment the bottom sack was set aside and the tubers examined for injury.

### **Damage classification**

Tuber damage was classified as slight, cracks less than  $\frac{1}{2}$  inch in length and very small bruises; moderate, cracks between  $\frac{1}{2}$  inch and  $1\frac{1}{2}$  inches long and medium-sized bruises; and severe, cracks or cuts longer than  $1\frac{1}{2}$  inches and severe bruises. Only those tubers with moderate and severe injury were considered in evaluating the total injury for any one treatment. This was expressed as a percentage by weight—based on a 100-pound sample.

Three of the five treatments showed significant increases in the amount of injury when compared with the control. No padding (treatment 3), a bare plate (treat-

ment 4), and padding only three sides of the slip or outer area around the lip of the hand truck (treatment 5) had about the same effect on the amount of injury produced. Damage ranged from 25 to 30%. Individual paper pads (treatment 2) decreased the amount of injury slightly to 24%, and padding the center of the slip and outer edges (treatment 1) reduced the injury to 17%. Use of conveyors and hand stacking in the cars would reduce the injury to approximately 15%.

### **Contact areas**

The area of contact with the lip or bare plate was marked on each sack and the amount of tuber damage was recorded. Again the same three treatments were high in percentage of injured tubers, ranging from 41 to 43%. Use of individual pads lowered damage to 29%, and padding the center of the slip and around the sides, to 27%. To reduce injury, the contact areas must be padded.

Using a standard carlot of 360 sacks,

with 150 sacks on the bottom layer, injury ranged from 6% for the control to 12% for the padded three-sided slip. Expressed in dollar loss per carlot (based on an average price of \$2.71 per sack), damage with the hand-stacked control would amount to \$57; with the three-sided slip and center padded, \$69; with individual paper pads, \$96; with the hand truck (no padding), \$103; with the bare plate, \$107; and with the padded three-sided slip, \$120.

Only a small investment in material and labor, with proper training and supervision of potato shed personnel, would reduce these losses considerably. Elimination of the hand truck and the adoption of a conveyor system could lessen tuber damage during loading.

*Mike Zahara is Associate Specialist, Department of Vegetable Crops; and John McLean is Extension Vegetable Crops Specialist, University of California, Davis. David Wright is Farm Advisor, Kern County.*