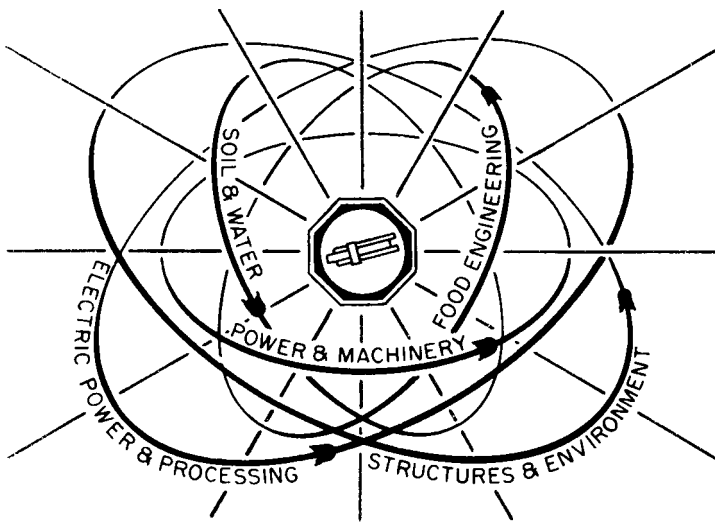


Agricultural Engineering



EPP - 1

A. W. Selders

MATERIALS HANDLING IN AGRICULTURE

Materials handling in agriculture is concerned with the movement and handling of materials and products in a systematic manner from point of origin to destination. Movement may be in any direction--horizontal, vertical or any combination of the two. Handling of agricultural materials and products is important, not only because of the work involved, but because of its effect on costs, product quality and management.

Materials handling costs account for as much as 25 percent or more of the total production cost for certain agricultural crops. These costs can be lowered with efficient materials handling systems in which the components are integrated to provide a smooth flow of materials. A thorough analysis of materials handling can oftentimes offer great opportunities for reducing costs. Consider a 100,000 bushel production orchard operation. Product handling alone involves almost 2,500 tons and in many cases this tonnage is handled six or more times before it reaches market destination so that a total of 15,000 tons or more will be handled. In addition, production materials and supplies such as fertilizers and chemicals involve considerable handling.

Functions of Materials Handling Systems

A materials handling system should have several functions, none of which will add anything to the value of the product, but which, if not properly planned, can reduce the value of the product, particularly perishable agricultural products.

Reduce Production Costs. A properly designed materials handling system can reduce costs by integration of components of the system and by substitution of mechanical power for manpower. A man serving as a power source is not very efficient. Materials can be handled less expensively with machines if volume is sufficient to spread high fixed costs. Small operations will be limited in the degree of mechanization feasible for handling materials.

Effect on Other Inputs. Materials handling is a part of the total cost of production and can have a direct effect on other production costs. Improvements and better efficiency in other operations are possible with good materials handling methods and equipment.

Productive Capacity of Labor. Volume of business can be increased without additional labor if materials handling is improved and mechanized to the fullest. Mechanizing materials handling to expand productive capacity rather than adding workers, even if they were available, avoids adding labor management to the business, a problem which many operators cannot cope with successfully. It also lessens the chance of subjecting the operation to a lower management level because of a changing labor force.

Other Functions. Systems which embody a relatively high degree of mechanization perform some functions the results of which are difficult to measure. Working conditions may be improved and disagreeable tasks may be eliminated making it easier to employ and keep competent workers. More young people may choose to stay in agricultural work rather than seek other occupations.

Principles in Analyzing Materials Handling Systems

Questions which should be considered when analyzing materials handling systems are listed. If the answer to any of these questions is "yes" it is likely that some improvements can be made to make the system more efficient.

1. Can the number of times the material is handled be reduced?
2. Can the system be more continuous for a smoother flow of materials?
3. Can the speed of handling be increased?
4. Can the material be handled in larger containers or in greater volume?
5. Can distances the material is handled be reduced?
6. Are workers kept waiting for material to be moved?
7. Are there times when the equipment is not used to full capacity?
8. Can gravity be used more to move material?
9. Do workers have to make unnecessary movements?
10. Can hand operations be done mechanically at the same or less cost?
11. Can layout and material flow patterns be improved?
12. Can the system be made more flexible?
13. Does the system damage or waste the product?

Planning Materials Handling Systems

1. Use Mechanical Equipment. Mechanize handling wherever feasible to reduce labor costs, increase capacity, reduce worker fatigue, improve safety and speed up handling of perishable products.
2. Utilize Equipment Fully. Materials handling equipment costs money and should therefore be utilized to the fullest capacity. If present equipment is inadequate, additional equipment should be added, or a new system planned.
3. Equipment Selection. Improvements in material handling will depend on proper selection of equipment and methods. Economics is the controlling factor. The main objectives, namely reducing costs, increasing capacity and improving working conditions, should be kept in mind. Decisions should be based on facts about methods and equipment, and selection made with care and without prejudice.
4. Select Standard Equipment. Use of standard equipment is important because it allows for easier training of operators and permits interchangeability of equipment. In addition, parts are more readily available, maintenance and servicing will be easier, and standard equipment will be more economical to purchase.
5. Integrate Equipment. A single piece of equipment, or a single handling system is not applicable to all materials handling operations. Equipment should be integrated into a smooth, efficient, over-all materials handling system.
6. Provide Alternate Methods. Thought should be given to alternate methods and equipment in case the desired equipment is not economically feasible, readily available or the system breaks down.
7. Consider Unit Cost. Material handling equipment should be selected on the basis of comparative unit costs of handling--not on initial cost of equipment.
8. Check Limiting Factors. Doorway sizes, ceiling clearances, elevators, ramps, terrain and other farmstead conditions must be considered before selecting equipment.
9. Plan for Future. Nothing is more sure than change. When planning a materials handling system, try to anticipate changing needs.
10. Don't Forget Maintenance. Adequate maintenance programs should be set up for materials handling equipment, and then followed through. Preventive maintenance cuts equipment costs, improves equipment performance, and lengthens equipment life.

Arthur W. Selders
Arthur W. Selders, PE
State Extension Specialist
Agricultural Engineering