STUDIES OVER AGRICULTURAL MACHINES PERFORMANCES

STUDII PRIVIND PERFORMANTELE MASINILOR AGRICOLE

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Abstract: *The research wants to present a global characterization of agricultural machines performances, considering the higher and higher importance which mechanization has in a modern agriculture. The paper refers to machines capacities, time efficiency, machine manoeuvrability, field patterns, field shape, crop and soil conditions and system limitations. The degree of accessibility is very high and the originality of the paper consists in a global presentation of the many aspects concerning the agricultural machines performances*

Rezumat: *Lucrarea doreşte să prezinte o caracterizare globală a performanţelor maşinilor agricole, luând în considerare importanţa din ce în ce mai mare pe care mecanizarea o are într-o agricultură modernă. Lucrarea se referă la capacităţile maşinilor, eficienţa în timp, manevrabilitatea maşinii, scheme de întoarcere în câmp, recoltele şi condiţiile de sol şi limitele sistemelor. Gradul de accesibilitate al lucrării este foarte mare, iar originalitatea lucrării constă în prezentarea globală a multor aspecte privind performanţele maşinilor agricole.*

Key words**:** *machine capacity, time efficiency, machine manoeuvrability, field patterns*
Cuvinte cheie: ***capacitatea maşinii, eficienţa de timp, manevrabilitatea maşinii, scheme de întoarcere***

INTRODUCTION

In the conditions of modern agriculture inside European Union, the role of mechanization of agriculture is bigger and bigger. In these conditions, the performances of agricultural machines are very important and it is intended to improve these performances. Most agricultural field machine performance is reported as area per hour. Harvesting machine performance is quoted as bushels per hour, quintals per hour, and tons per hour. Processing equipment performance is usually expressed as bushels or tonnes per hour. Such performance figures are properly called machine capacity.

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Capacities

Capacities, when expressed as area per time, are not a sufficient indicator of machine true performance, particularly with harvesting machines.

The concept of weight and mass must be understood for confidence in expressing machine capacity and crop yields in both customary and SI units.

Combines, potato harvesters and similar machines that separate desired material from undesirable material need a special capacity comparison term. Rather than a report on the weight of material harvested, the weight of material handled is the proper capacity measure. Calculation of machine capacity involves measuring areas or masses and times.

Time efficiency

Time efficiency is a percentage reporting the ratio of the time a machine is effectively operating to the total time the machine is committed to the operation. Any time the machine is not actually processing the field is counted as time waste. Field efficiency is the ratio of the time the machine is operating to the total time spent in the field. Field efficiency are not constant values for specific machines, but vary widely. In Table 1 are presented the ranges for some of the common farm machines.

Table 1

Range in Typical Field Efficiencies

Operation	Equipment	Field efficiencies %	Operating Speeds km/hr
Tillage	Mouldboard plough Disk harrow Spring-tooth harrow Field cultivator	88- 74 90-77 83-65 90-75	5-9 6-10 6-12 6-9
Cultivation	Row crop cultivator Rotary hoe	90-68 88-80	3-9 9-20
Seeding	Row planter with fertilizer Grain drill with fertilizer Potato planter	78-55 80-65 80-55	7-10 5-10 9-12
Harvesting	Mower conditioner Baler, rectangular Forage harvester Combine Windrower	95-80 80-65 76-50 90-63 85-75	5-9 5-10 6-10 3-8 6-10

Machine manoeuvrability

Farm machines need to be easily manoeuvred both in the field and on the road to the field. Field machines need to be designed to permit them to make short turns at the end of the field and while following crop rows planted on the contour and in curves. The total field turning time for large machines is slightly less than for smaller machines if the large machine can negotiate a turn within the same multiple or fraction of its width as the smaller machines.

The turning radius of implements is an important factor affecting the time lost in end travel and at corners. It refers to the outer radius of the effective path of the implement when in its sharpest turn.

Few tillage or seeding machines can make square turns. With most cutter bar mowers, the turning radius is short enough to permit square corners.

Trailed harvesters can make an essentially square corner if the hitch will clear the tractor wheels in a tight turn. In figure 1 is presented is presented the limiting row curvatures for vehicle with 2s wheel spacing.

Field patterns

Substantial improvements in field efficiency can be made by analyzing and varying the pattern or field operations. The pattern of operation is closely related to the size and shape of the field. The primary objective in establishing an efficient field pattern is to minimize the amount of field travel.

Objectives other than time minimization modify the choice of a field pattern. In flood-irrigated field especially, a ploughing pattern should produce a level surface to eliminate water ponding. Efficient planting patterns may be sacrificed occasionally to permit more efficient harvesting patterns. Soil conservation measures are probably the most important modifier of time efficient field patterns.

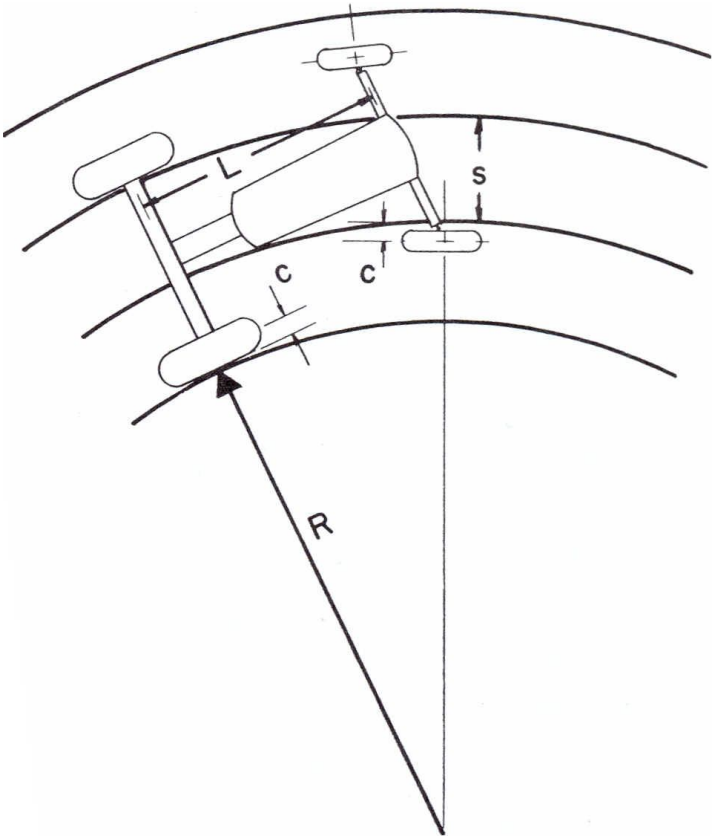

Figure 1. Limiting row curvature for vehicle with 2s wheel spacing

Field shape

The field efficiency for irregularly shaped fields is expected to be significantly less than for rectangular fields because of excessive turning time. Even if the irregular fields are straight-sided the ratio of turning time to operating time will be high.

Crop and soil conditions

When crop and soil conditions are poor for machine operations, forward speed must usually be reduced. This condition will improve field efficiency, but this is not a desirable operating condition. The field efficiency of any single machine may be limited by the capacity of other operations in the system. Harvesting operations furnish the best example of a system of machines.

The timing of one individual operation with respect to another is the feature that defines a machine system. The timing is sequential when tillage must precede seeding.

Quality performance

All farm machines handle materials as a part of their performance. Harvesting machines gather and process grain and forage. Seeding machines distribute seed and fertilizer. Tillage machines manipulate soil as a material. The quality of a machine performance is described by the efficiency with which it handles materials.

CONCLUSIONS

Experimental research showed the following: the machines performances can be approached from different points of view: capacities, time efficiency, machine manoeuvrability, field patterns, field shape, crop and soil conditions and others.

LITERATURE

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