

SUMMARY AND CONCLUSION

9- SUMMARY AND CONCLUSION

Annually, Egypt cultivates around 1.8 million feddan of wheat and 800,000 feddan of paddy rice. The harvesting system for both crops primarily consists of manual cutting, mowing, gathering and transporting the crop to one location, which causes losses up to 25 % in the field. Improving this harvesting system has been a main national objective. To assist with this task various combines, mowers, reapers and threshers have been introduced throughout the last decade.

The main objectives of this work are:

- a- Define the thresher component which hinders capacity.
- b- Redesign components to increase capacity.
- c- Estimate the power required for operation.
- d- Test and report machine performance.

This research work was conducted as a USAID/NARP project and carried out at the Agricultural Engineering Department of Purdue University, West Lafayette, Indiana of the U.S.A.

This research was intended to improve the stationary thresher as a multi-crop thresher tool, for wheat and paddy rice under Egyptian conditions. It was designed to provide an optimal performance machine for small farmers. The techniques used, included developing a new cylinder, can thresh wheat and paddy rice without major changes. Also, the shape of the louver fins was modified and improved. Study of operating ranges determined the thresher capacity and results showed it increased for wheat, soybean and corn without affecting seed quality (i.e. damage and losses).

This research contains results on three feed rates, optimum cylinder speed for threshing different crops, moisture content, separation efficiency, material movements along the rotor cylinder, and power required kW for the thresher. No-load data of each

component of the system was taken. Also, the the power required kW at various wheat feed rates was determined.

Important results could be summarized as follow:

- By attaching a conveyor belt to the thresher, the crop throughput increased to 3600 kg/h for wheat, 2400 kg/h for soybean and 6000 kg/h for corn.
- The new design thresher cylinder improved the threshing performance for wheat, soybeans and corn. Grain loss and grain damage within ASAE Standards. Also, grain purity was 99 %.
- The optimum cylinder rpm for threshing wheat was determined to be 800 rpm, for soybeans 300 to 400 rpm and 350 rpm for shelling corn.
- The clearance between cylinder and concave used was 18 mm and cleaned successfully.
- The slotted concave performed better in threshing high moisture content crops than the 18 mm round holes.
- The theoretical calculated time of the crop in the threshing section was 0.8 second, but the actual time of the crop in the threshing section was measured to be 2 second.
- Determination of power required for each component at different feed rates and cylinder rpm was accomplished to aid design engineers in modifying and optimizing this unit further.
- The straw fan needs to be redesigned to throw the straw further.
- This project was deemed successful in developing intermediate mechanization technology.
- The new design of the thresher cylinder should be extensively tested in many different crops under Egyptian conditions.
- The new thresher machine's performance and economics benefits should compare with other existing threshing systems under Egyptian Agriculture conditions.