Development and eveluation of multi-crop thresher

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Annually, Egypt cultivates around 1.8 million feddan of wheat and 800.000 feddan of paddy rice. The harvesting system for both crops primarily consistsof mannual 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. Toassist with this task various combines, mowers, reapers and threshers have beenintroduced throughout the last decade.The main objectives ofthis 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 USAIDINARP project and carried out at theAgricultural Engineering Department of Purdue University, West Lafayette, Indiana of theU.S.A.This research was intended to improve the stationary thresher as a multi-cropthresher tool, for wheat and paddy rice under Egyptian condtions. It was designed toprovide an optimal performance machine for small farmers. This techniques used, includeddeveloping 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 rangesdetermined the thresher capacity and results showed it increased for wheat, soybean andcom without affecting seed quality (i.e. damage and losses).This research contains results on three feed rates, optimum cylinder speed forthreshing different crops, moisture content, separation efficiency, material movementsalong 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 wheatfeed rates was determined.Important results could be summarized as follow:- By attaching a conveyor belt to the thresher, the crop throughput increased to3600 kg/h for wheat, 2400 kglh for soybean and 6000 kgIh for com.- The new design thresher cylinder improved the threshing performance for wheat,soybeans and com. Grain loss and grain damage within ASAE Standards. Also, grainpurity was 99 %.- The optimum cylinder rpm for threshing wheat was determined to be 800 rpm, forsoybeans 300 to 400 rpm and 350 rpm for shelling com.- The clearance between cylinder and concave used was 18 mm and cleaned successfuly.- The slotted concave performed better in threshing high moisture content cropsthan the 18 mm round holes.- The theoretical calculated time of the crop in the threshing section was 0.8 second, butthe 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 andcylinder rpm was accomplished to aid design engineers in modifying and optimizing thisunit further.- The straw fan needs to be redesigned to throw the straw further.- This project was deemed successful in developing intermediate mechanizationtechnology.- The new design of the thresher cylinder should be extensively tested in many differentcrops under Egyptian conditions.- The new thresher machine’s performance and economics benefits should comparewith other existing threshing systems under Egyptian Agriculture conditions.