498026 5/68 CWB
PD-AAL-944

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Final Report

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Title: Conclusion of Buffalo Plow Draft Comparison

Introduction:

Results for the last two test using continous recording equipment in paddy were used for conclusions. The results in prior tests in paddy were generally similar with intermittent draft readings and a moldboard that was comparable in area and curvature radius to the new moldboard.

These results bring the shape of plow (radius of curvature of moldboard, projected area, suction angle and attitude tilt angle) in order to minimize the total draft compared with the total draft required by the Khon Kaen plow at standard orientation.

Conclusions:

The shape of improved plow are divided in two categories as listed in Table I.

1. Increasing projected area or furrow area about 50% without significant difference in total draft/when compared with Khon Kaen ../in paddy plow at standard oreintation.

2. Reducing total draft in paddy about 34% compared with Khon Kaen plow at standard oreintation, when both plows have the same projected area.

3. Based on earlier upland tests in sandy loam, the moldboard for reduced total draft should require approximately half the total draft as that required by the standard Khon Kaen plow.

Table I. Shape of Improved Plow

	Radius of curvature of moldboard c.m.	Projected area cm^2	Attitude tilt Angle	Suction Angle
1.	38.0	241.9 - 244	20° - 25°	18°
2.	38.0	161.3	20° - 25°	18°

Discussion of data:

Results from the last two tests indicated that the minimum specific drafts were performed on thenew plow at attitude tilt angle between 20°-25° with 18° suction angle.

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These minimum specific drafts were 31-37% less when compared with the specific draft of Khon Kaen plow at standard orientation as shown in Table II.

Table II. Comparison of specific drafts in paddy

Test No	Plow type	specific draft in kg/cm^2	attitude tilt angle	% variation in specific draft	Suction angle
1	Khon Kaen plow*	0.87	0°		22°
	New plow**	0.60	20°	-31	18°
2	Khon Kaen plow*	0.80	0°		22°
	New plow***	0.50	25°	-37	18°
			Ave.	-3.4	

* Khon Kaen plow at standard oreintation

** New plow at 20° attitude tilt angle and 18° suction angle

*** New plow at 25° attitude tilt angle and 18° suction angle

\+ increasing

\- decreasing

The results from the last two tests indicated about 50% greater projected area of the new plow with only 1% difference in total draft, when these plow conditions were compared.

Table III. Comparison of total drafts in paddy and projected areas

Test No	Plow type	Total draft kg.	Projected area cm^2	% variation in total draft	% variation in projected area cm^2
1	Khon Kaen plow*	140.33	161.30		
	New plow**	146.4	244	+4.33	+51.27
2	Khon Kaen plow*	129.04	161.30		
	New plow**	120.95	241.9	-6.27	+49.97
			Ave.	-0.97	+50.62

Results from the tests indicated that if the projected area of the new plow with 18° suction angle was decreased to the same projected area (161.3 cm^2) as the Khon Kaen plow at standard orientation, the total draft could be predicted based on the specific drafts from the tests as shown in Table IV.

Table IV. Predicted total draft in paddy of the new plow for reduced draft

Test No.	Plow type	Projected area cm^2	Total draft Kg	% variation in total draft
1	Khon Kaen plow*	161.3	140.33	
	New plow**	161.3	161.3x0.60=96.78	-31.03
2	Khon Kaen plow*	161.3	129.04	
	New plow***	161.3	161.3x0.50=80.65	-37.5
			Ave.	-34.27

Results from Table IV indicated that the new plow with the same projected area to Khon Kaen plow at standard orientation would produce 34% less total draft when comparing to the total draft of Khon Kaen plow at standard orientation.

The shapes improve plows were shown in figure I, II

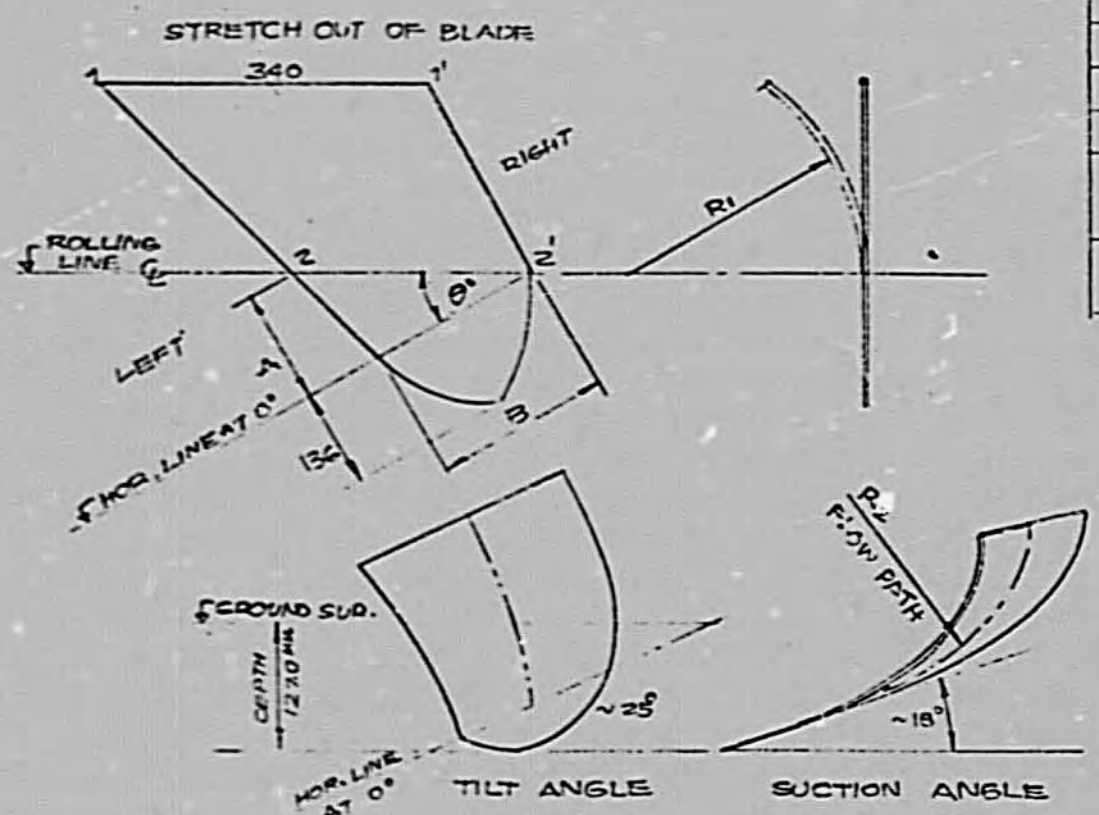
*Radius of curvature of moldboard in reports is the radius of the moldboard measuing at the center line along the moldboard which is expected to be the path of furrow slice on the moldboard.

cc: MRV
CWB
BRJ
JST
CC
RCF

DATE	REVISION	BY	DETAILS OF CHANGE

NEW LARGER BLADE PLOW DESIGNATION EQUIVALENT IN DRAFT to Std. KHON KAEN PLOW

NOTE: R_2 = RADIUS OF THE MOLDBOARD MEASURING AT THE CENTER LINE ALONG THE MOLDBOARD WHICH IS EXPECTED TO BE THE PATH OF FURROW SLICE



DIMENSIONS OF LARGER BLADE		
A (MM)		140
B (MM)		207
R_1 (MM)		260
R_2 (MM)		380
θ°		31.1
LENGTH OF CURVE (1TO2) MM.	L	330
	R	255
PROJECTED AREA CM^2 RECLINED 25°		240.2

REF	PART NO.	PARTS NAME	QTY REQ	MATERIAL

THE INTERNATIONAL RICE RESEARCH INSTITUTE
COOPERATIVE AGRICULTURAL MACHINERY PROJECT IP THAILAND G.P.O. BOX 2453 BANGKOK
สถาบันวิจัยข้าวระหว่างประเทศ

TITLE: LARGER BLADE PLOW

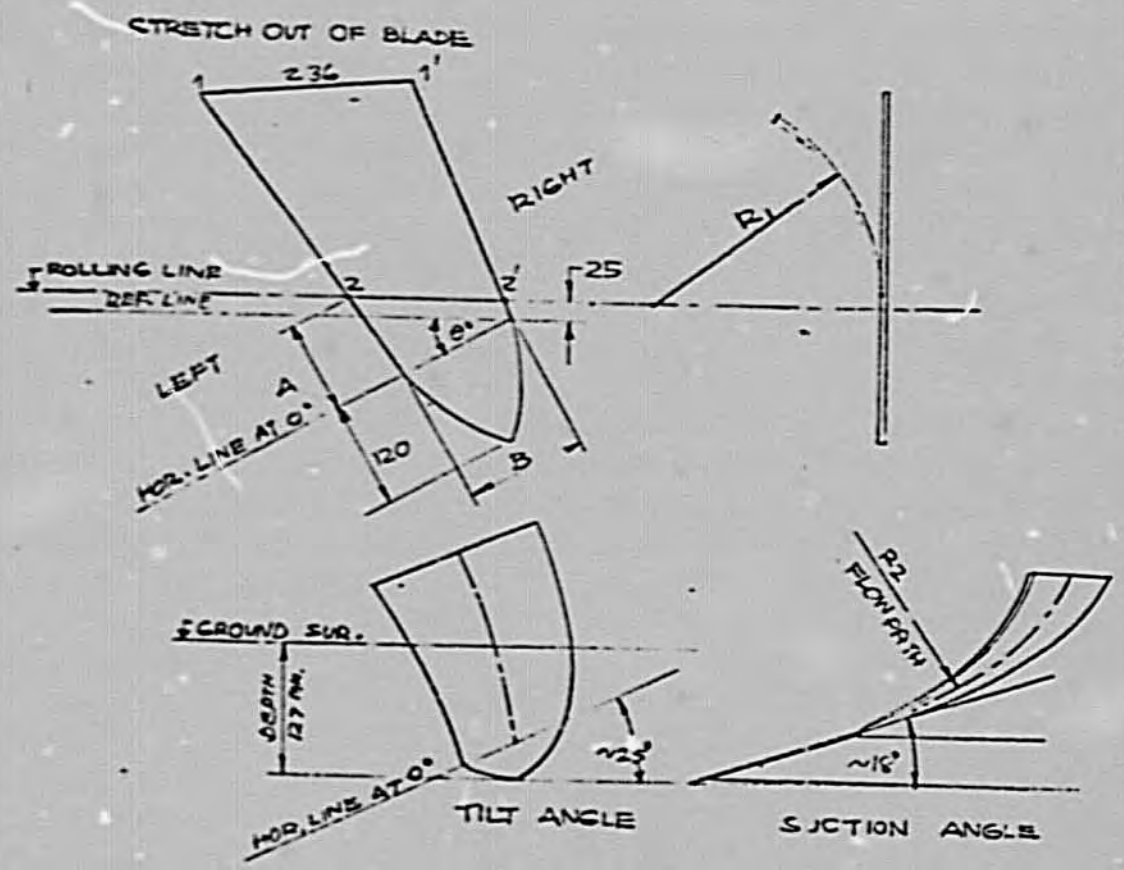
STD TOLERANCE IF NOT SPECIFIED: DECIMAL INCH ± .030", MILLIMETER ± 1.0", ANGLE ± 1°
FINISH NOT APPLY TO HOLE SIZE
THIRD ANGLE PROJECTION
REF TO DIMENSIONS: INCH (MILLIMETER) | INCH (MILLIMETER)

DRAWN BY: VACH
DATE:
SCALE: NONE
CHKD BY:
ISSUED BY:
CONCEPT:
REVISION:
APPROVED:
DWG. NO: TA0226

DATE	REVISION	BY	DETAILS OF CHANGE

NEW SMALLER BLADE PLOW DESIGNATION, EQUIVALENT AREA, 5" DEPTH, to KHON KAEN PLOW, LESS DRAFT

NOTE: R_2 = RADIUS OF THE MOLDBOARD MEASURING AT THE CENTER LINE ALONG THE MOLDBOARD WITH IS EXPECTED TO BE THE PATH OF FURROW SLICE.



DIMENSIONS OF LONGER BLADE		
A	(MM)	110
B	(MM)	127
R_1	(MM)	260
R_2	(MM)	380
θ°		31.1
LENGTH OF CURVE (1TO2) (MM)	L	300
	R	275
PROJECTED AREA (CM^2) RECLINED 25°		162.0

REF	PART NO.	NAME	MATERIAL

THE INTERNATIONAL RICE RESEARCH INSTITUTE
COOPERATIVE AGRICULTURAL MACHINERY PROJECT IN THAILAND C.P.O. BOX 1033 BANGKOK
สถาบันวิจัยข้าวระหว่างประเทศ

TITLE: NEW SMALLER BLADE PLOW

STD TOLERANCE IF NOT SPECIFIED: DECIMAL INCH ± .030", MILLIMETER ± 1.0", ANGULAR ± 2°
NOTES NOT APPLY TO MILL SIZE
THIRD ANGLE PROJECTION
KEY TO DIMENSIONS: INCH (MILLIMETER) | INCH (MILLIMETER)

DRAWN BY: Khoh
DATE: 4.8.81/1/65
SCALE: NONE
CHKD BY:
USED IN:
CONCEPT:
DESIGN:
APPD:
DWG. NO. TA0227