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SIMPLE FARM IMPLEMENTS FOR RAINFED AGRICULTURE IN NORTHEAST THAILAND: DEVELOPMENT POTENTIAL, RESEARCH NEEDS AND LOCAL MANUFACTURING OPPORTUNITIES

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NORTHEAST RAINFED AGRICULTURAL DEVELOPMENT (NERAD) PROJECT

NORTHEAST REGIONAL OFFICE OF AGRICULTURE,

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PREFACE

This document has been printed and distributed by the Northeast Rainfed Agricultural Development Information and Coordination System (NERADICS) of the NERAD Project. The purpose of NERADICS is to establish, at the Northeast Regional Office of Agriculture, a system to manage Project-generated data and information in order to support the testing, transfer and dissemination of technologies, methodologies and approaches appropriate for integrated agricultural research and development in Northeast Thailand.

Technical working papers are produced with the objective of communicating project-generated information to the relevant research and development agencies in order to receive comments and feed-back and to help to ensure that the lessons learned within NERAD are made available to all interested individuals and organizations.

Working papers are produced on a number of topics and are grouped into three series according to their subject matter:

Problem Definition Series

Situation papers on the problems, constraints and opportunities currently facing rainfed agriculture and farm families in Northeast Thailand.

Methodology Description Series

Descriptions and methods of use of proven methodologies and techniques for the planning, analysis and evaluation of research and extension activities for rainfed agriculture.

Technology Documentation Series

Documentation of technologies considered appropriate for rainfed agricultural development in Northeast Thailand.

All papers in these series are listed in Appendix Three of this report and are available on request from the Project Director. The papers are updated at appropriate intervals and NERAD invites comments and discussion from readers on any topic covered in the reports.

SIMPLE FARM IMPLEMENTS FOR RAINFED AGRICULTURE IN NORTHEAST THAILAND: DEVELOPMENT POTENTIAL, RESEARCH NEEDS AND LOCAL MANUFACTURING OPPORTUNITIES

BACKGROUND AND JUSTIFICATION

The Northeast region of Thailand covers 170,000 square kilometres. It is bounded to the north and east by the Mekong River (which forms the common border with Laos), to the west by the Phetchabun mountain range and to the south by the Damrek mountain range, where it borders with Kampuchea. The Phu Phan mountains run in a southeast direction dividing the region into the Sakon Nakorn and Korat basins. The former drains by the Sri Songkram river directly into the Mekong while the Korat basin or triangle is drained by two major rivers, the Chi and the Mun which flow into the Mekong in Ubon. Both basins are at an elevation of approximately 200 meters above mean sea-level and are characterized by a gently rolling topography sloping towards the southeast.

Rainfall patterns are dominated by both the southwest monsoon and tropical cyclones originating over the Indian Ocean. There is a distinct rainy reason from May to October exhibiting a bimodal pattern with two peaks in June and September. Average annual rainfall varies from less than 1000 mm. in the rain shadow in the west to over 2,300 mm. along the Mekong in the northeast. The critical factor affecting agriculture, however, is the extreme variability both within and between years rather than the total amount of rainfall received.

There are 35 different soil types in the Northeast but the majority fall into one of 4 great groups. With the exception of some limestone areas in the hills, virtually all soils in the Northeast are derived from sandstone, shale or silt-stone and therefore are inherently low in potassium, calcium, magnesium and phosphorous and have extremely low organic matter levels and C.E.C.'s. (Ragland et al., 1986).

The region contains approximately 18 million people or about one third of the total population of Thailand and has an annual population growth rate of 2.3 percent. Farming is the major occupation of 80 percent of the population and, on average, 75 percent of household-income comes directly from farming (USAID, 1981). Average agricultural household income for the region is Baht 11,500, or approximately U.S.$ 460 which represents only 60 percent of the national average (OAE, 1987). Agricultural incomes are actually falling in the region by an average of approximately two percent per year (OAE 1983 and 1987). The Northeasterners are however, extremely mobile and often migrate to the provincial centers, Bangkok or other regions to find work in the off-season to supplement their agricultural incomes.

Farm mechanization levels in the region are also below the national average but are increasing at a significant rate (Table 1). Only 2.2 percent of farm families have power tillers and land preparation for both rice and upland crops relies predominantly on animal power and hand labor. Land preparation for some upland crops, most notably cassava, is done by large 4-wheel tractors virtually entirely on a contractual basis with charges ranging from 100 to 150 Baht per rai ($25 to 37.5 per hectare.) (NECDP, 1988).

Table 1. Large agricultural machinery use by region, 1986.

REGION	NUMBER	INCREASE (%/year)	PERCENT FARMS	NUMBER	INCREASE (%/year)	PERCENT FARMS
	POWER TILLERS (2 WHEEL)			LARGE TRACTORS		
N.E.	45,285	27	2.2	5,428	17	0.3
NORTH	163,470	29	12.7	10,454	17	0.8
CENTRAL	180,866	8	20.2	17,721	19	2.0
SOUTH	60,411	28	9.3	1,220	20	0.2
TOTAL	450,033	16	9.2	34,823	18	0.7
	WATER PUMPS			MECHANICAL THRESHERS		
N.E.	104,236	14	5.1	2,937	16	0.1
NORTH	178,890	15	13.9	8,532	11	0.7
CENTRAL	355,868	14	39.7	20,918	4	2.3
SOUTH	30,101	21	4.6	965	42	0.1
TOTAL	669,095	15	13.7	33,352	7	0.7
	MECHANICAL SPRAYERS			HAND OPERATED SPRAYERS		
N.E.	6,394	7	0.3	279,851	70	13.7
NORTH	21,234	11	1.7	563,867	48	43.8
CENTRAL	93,026	30	10.4	452,703	36	50.5
SOUTH	2,354	17	0.4	79,650	121	12.2
TOTAL	123,008	24	2.5	1.37M	48	28.2

Source: OAE, 1987.

Mechanization of crop management and post harvest activities is very rare in the region; fertilizing, weeding, spraying, harvesting and threshing is virtually all done by hand, either by the farmer himself or using hired or exchange labor. Traditional exchange labor schemes for rice transplanting, harvesting and threshing still exist in some areas in the Northeast but the practice is declining in importance.

Diesel or gasoline powered water-pumps are used in areas with significant water resources and electric pumps are a popular means of utilizing water from smaller ponds or wells close to villages where electricity is available. Some of the larger pumps make use of the engines from power tillers and these engines are also used to power small 4-wheel trucks ('Rot Ttaen') and to pull small trailers or ox carts.

In the case of smaller hand implements, most farmers own a plow, hoe ('Jorp'), spade ('siam'), sprayer and threshing sticks. In addition, although not always classified as agricultural implements, bicycles or motorcycles and small 2-wheel push-carts or trailers are regularly used on nearly all farms for haulage of a wide variety of materials.

The significant rates of increase in the use of agricultural machinery presented in Table 1 indicate a growing demand by Northeastern farmers for mechanization. However it would be unwise to indiscriminately encourage the use of machinery merely because it is available, given the periodic under and unemployment patterns in the Northeast Region and the current migration of labour to the cities and Bangkok. Rather, machinery development within NERAD was seen as a means of helping to meet two major objectives of the cropping systems component of the Project.

First, machinery or improved implements have potential for overcoming labor bottle-necks which currently limit cropping intensification in the region. For example, weeding of pre-rice crops in most of the NERAD trials was is extremely poor or non-existent because the time for hand weeding coincides with rice nursery-bed preparation. Simple hand-weeders may therefore be worth considering to explore their potential for reducing this labor constraint. A further example concerns the importance of the timely planting of any post-rice crops if they are to mature on residual soil moisture. In order to conserve soil-moisture, zero-tillage techniques could be evaluated for the Northeast and if they are successful, a simple 'jab-planter' might be valuable to ensure the timely planting of these crops after rice when labor is limited due to the harvesting and threshing of rice.

The second area where simple machinery is seen to have a potential for the Northeast is to help to encourage good agronomic practices in the region. For example, most farmers recognize the yield advantage of accurate crop spacing but find it too time-consuming to achieve under conditions of hand planting. A simple hand-drawn, two-row, upland-crop planter may therefore may have potential for promoting accurate crop spacing. An implement for the deep placement and therefore more efficient use of fertilizer is another example of how agronomic practices might be improved through simple mechanization.

NERAD's FARM IMPLEMENT TESTING REQUIREMENTS

During a discussion of the Project's tambon development plans to the tambon councils in 1983, a request was made from one village for training on the development, operation and maintenance of small-farm machinery and hand-tool. Because of this farmer-interest, an approach was made to both the Thai/IRRI Farm Machinery Development Project and the FAO/DOA Agricultural Machinery Project of the Engineering Division, Department of Agriculture, Bangkhen. Both projects were concerned with developing, testing and stimulating the local manufacture of hand tools and simple machinery appropriate for small farmers in Thailand. Personnel from both projects expressed an interest in working with NERAD in the testing of this machinery and the Thai/IRRI project subsequently demonstrated some of their equipment at a training demonstration for NERAD Project Officers.

The demonstration stimulated much interest among NERAD personnel concerned with the cropping systems component of the Project. As a result, a subsequent request was made to the Thai/IRRI Project who agreed to make implements available for testing and evaluation in NERAD's cropping systems activities. In addition a training course for NERAD project personnel in the use, maintenance and demonstration of these implements was conducted by the Division of Agricultural Engineering. In return NERAD reported to the Thai/IRRI Project on:

- farmer interest and macinery adoption patterns,
- repetitive field problems and failures,
- suggestions for improvements and modifications,
- needs for local manufacture of promising implements,
- suggestions for future machinery development for the region.

The requirements of farmers in different parts of the region for agricultural implements obviously varied considerably. This was reflected in the initial requests from the various project sites for different pieces of equipment for testing and these are presented in Table 2. These implements were either purchased or borrowed by NERAD and demonstrated to and lent to farmers to test for themselves on their own farms. As a result of farmer testing, various promising implements and needed modifications were identified.

Table 2. Changwat requirements for simple farm implements.

	Implement	Changwat	Objectives	Notes
1	Modified buffalo plows (large, medium, small)	Chaiyaphum Sri Saket Nakornphanom Roi Et	Speed up land preparation for rice and allow earlier land preparation for pre-rice crops.	These plows are manufactured by Chan Thai Lek 3/3-5 Mitrapab Road, KhonKaen
2	Jab planter	Chaiyaphum	To speed up the planting of legumes in order to ensure timely planting.	
3	Cyclone seeder	Chaiyaphum	To be tested for broadcasting small-seeded legumes, fertilizer & granular pesticides.	Initially experimental rather than a demonstration activity
4	Reaper used with power-tiller	Chaiyaphum Nakornphanom Roi Et	Trial basis to determine potential feasibility	To be evaluated by farmers with power tillers
5	Single-row injection planter + Upland weeder	Chaiyaphum	Tested as a set to demonstrate how accurate spacing can simplify weeding operations.	Single-row implement with space bar to facilitate row-planting.
6	Rice-transplanter + Paddy weeder	Sri Saket Nakornphanom	Tested as a set to demonstrate improved practices for rice.	
7	Fertilizer placement machinery	Sri Saket	On an experimental basis linked to fertilizer trials.	
8	Marker for row-planting rice, possibly in conjunction with paddy weeder	Roi Et	Experimental basis to compare its efficiency with rice transplanter.	

RESULTS OF FARMER TESTING OF IMPROVED IMPLEMENTS

In Roi Et and Sri Saket there was much interest in the modified buffalo plows, and the project made some available to every village in each site for farmers to use on a trial basis on their own farms. The large plows helped to speed-up land preparation for the pre and post rice crops that are commonly grown in these areas and there appeared to be sufficient interest to justify the local manufacture of these plows. There was a need, however, to assess the market potential for commercial-scale manufacture of the plows and to communicate this to local engineering firms. As a result of the NERAD trials, a number of farmers purchased modified plows from the project thus demonstrating their commercial potential and a local manufacturer began producing them with technical assistance from the Thai/IRRI engineers.

In Nakorn Phanom farmers were enthusiastic about the rice transplanting machine but pointed out the disadvantages of the special seed-bed techniques required for its use. A request was therefore made to Thai/IRRI Project personnel about the existence of a transplanter which would be suitable for use with traditional seed-bed practices. Although no such machine currently exists, this information was valuable to the development engineers who are now exploring its feasibility. Such a machine would have high potential in transplanted rice systems throughout the North-east as a means of speeding up transplanting in order to ensure an adequate vegetative growth period for the photo-sensitive rice varieties used in rainfed areas of the region.

On-farm trials of pre-rice Cuban-kenaf in Sri Saket have given promising agronomic and economic results. However, a major problem encountered with this technology, concerned the lack of adequate supplies of water for retting the mature stalks prior to removing the fiber. For this reason, it was decided to test the use of a mechanical fiber-stripper that has recently been jointly developed and tested by DOA and Khon Kaen University. The use of the machine allows the fiber to be removed with the use of less water than is needed for the traditional retting method, which is extremely time consuming and is considered a dirty and unpleasant job by the farmers.

One hundred pendulum-hoe-weeders were purchased by NERAD from a local manufacturer in Korat who had been trained by the Thai/IRRI project in their manufacture. These were made available to participating farmers for weeding field crops such as kenaf, corn, sesame, etc. A number of these pendulum hoes were also lent to the NECDP project for use in their cassava-replacement crop trials. It was noticed, however, that the NECDP participating farmers were using these hoes for weeding their traditional cassava crop as well as the Project's trial crops. An assessment of the usefulness of this implement for use in cassava is therefore warranted because, if found to be suitable, its potential will be extremely high in the region where cassava is the major upland crop and requires one or two careful weedings for optimum yields.

The machine considered to have the greatest potential and for which there is an urgent need for local manufacture and marketing is the two-row-seeder used in NERAD's direct sown rice trials. Direct sowing rice helps to ensure a rice crop every year on the upper paddies in the region which normally only produce a crop in about one year in three. The direct sowing technique has been proven agronomically over many years but was not adopted by farmers to any significant extent for a number of reasons. First, direct sowing by dibbling was extremely tedious and therefore unpopular with the farmers. Secondly, the alternative method of broadcasting, produced randomly spaced hills and consequently made weeding extremely difficult. Broadcasting and hand-dibbling seeding methods also produced uneven seed coverage, which increased losses to birds and rats prior to germination.

The use of the two-row seeder enabled rapid planting with evenly-spaced hills and rows that were easy to weed at later growth stages. It produced a uniformly correct seed-depth especially in the more sandy soils common in the region and therefore reduced losses due to vertebrate pests. The machine can also be used for planting a wide range of upland crops including peanut, mungbean and corn which greatly increased its attractiveness to farmers. Although more expensive than many of the other implements tested by the project, the seeding machine proved to be extremely cost effective (See Table 3) and is considered to be the key to farmer acceptance of the direct sown rice technique.

Table 3. Costs, returns and economic analysis of the two-row-seeder as used for direct sown rice.

	(Baht)
- Current cost of the seeder	2500
- Amortized annual cost, assuming 12% interest and machine life of 12 years	450
- Cost per Rai, assuming 8 Rai per day and a two-week planting period	4
- Additional per Rai costs of direct sowing (extra seeds, insecticide, etc.)	52
- Total cost per Rai of using the seeder for direct sown rice	56
- Cost per additional kg. of rice produced (mean yield increase = 118 kg./Rai)	0.47

Project experience has shown that weed competition during the early vegetative stages is the biggest problem with the direct-sown rice technology. For this reason, a paddy weeder was demonstrated to farmers as part of the technology package. However, the weeding of rice was found to be unpopular with farmers, whatever the means employed, and thorough land preparation and weed clearing before seeding has proved to be a more acceptable practice which is now being recommended by the Project.

FURTHER RESEARCH AND DEVELOPMENT NEEDS

NERAD, with the assistance and cooperation of the Engineering Division of the Department of Agriculture, will continue testing simple farm implements until the end of the Project. There is also a need, however, for continuing development work on new machinery appropriate for the Northeast, especially as the range of potential implements is likely to widen with the increasing use of power tillers in the region. This will allow the use of heavier, implements once their size is no longer constrained by the limits of animal power.

Currently, much of the larger machinery such as threshers, water-pumps etc., have their own engines, however, as the use of power tillers rises, an increasing number of farmers will have access to their own mechanical power source for use with these implements. It is therefore recommended that future implements are designed for use with power tiller engines that are already available on an increasing number of farms. Similarly, many implements have their own road wheels for transport to the field. If these could be modified to accept the pneumatic-tyred wheels used by the push carts currently owned by most farmers in the region, then the manufacturing costs of such implements could be significantly reduced.

Approximate cost and the names and addresses of local manufacturers of the implements described in this report are listed in Appendix 1 and mechanical drawings and technical details of the implements are reproduced in Appendix 2.

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APPENDIX 1.

Names address and prices of agricultural machinery manufacturers.

Item	Machine	Manufacturer	Approximate cost (Baht)
1.	Improved buffalo plow (large)	Chan Thai Lek, 3/3-5 Mitrapab Road, Amphur Muang, Khon Kaen.	200
2.	Improved buffalo plow (small)	"	170
3.	Inclined plate seeder	Kunasin, 107-8 Sri-Satchanalai Road, Suwankaiok, Sukhothai.	5,000
4.	Cyclone seeder	-	500
5.	Rice-transplanter	Aree-Authon, 235/1-3 Talad Chong Kae, Takli, Nakorn Sawan.	2,600
6.	Direct paddy seeder	Pinit Borikarn, Tambon Bung Thonglang, Lam Lukka, Pratumthani.	1,500
7.	Jab planter	Farm Suwan, Pakchong, Nakorn Ratchasima.	350
8.	Rolling injection planter	Powsila-Borikarn, 305/3 Jorhor Intersection, Nakorn Ratchasima.	2,000
9.	Paddy weeder	"	400
10.	Upland weeder	"	300
11.	Thresher: -3 ft drum	Thumyawiswakum, 593 Moo 3, Sriprachan, Suphanburi.	16,000
	-5 ft drum	Kunasin, 107-8 Srisatchanalai Rd. Sawankaloke, Sukhothai.	25,000
		Siam Karnyont Ltd. Part. 455 Sichan Rd. Khon Kaen.	
12.	Pendulum weeder, upland weeder, paddy weeder	Prasert Posila, Amphur Muang, Nakorn Ratchasima.	100 300 400

APPENDIX 2

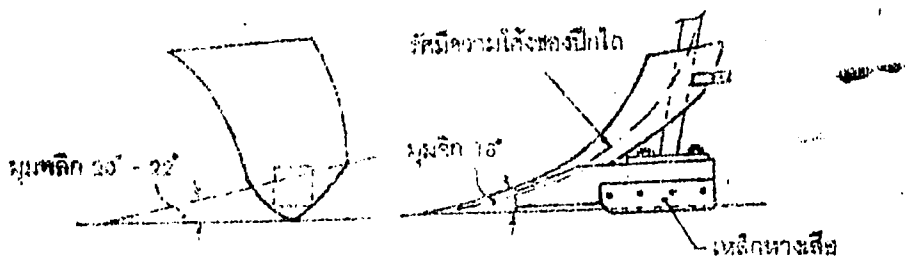
Mechanical drawings and technical details for some of the farm implements tested under the NERAD Project 1984-87

1. Modified Buffalo Plows
2. Jab Planter
3. Cyclone Seeder
4. Mechanical Reaper
5. Injection Planter
6. Rice Transplanter
7. Paddy Weeder
8. Kenaf Retting Machine

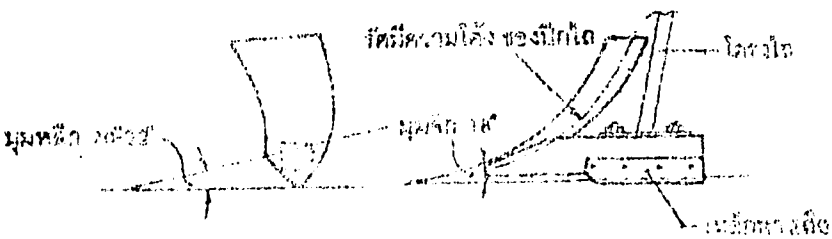
ใบไถแรงสัตว์ปรับปรุง

ใช้กับดินเนื้อหยาบหรือดินที่มีความชื้นเพียงพอสมควร

เอกสารหมายเลข	โครงการเครื่องจักรกลเกษตร	กรมวิชาการเกษตร
ที่ 25-004	ตู้ ปณ. 9-1158 อ.บางเขน กรุงเทพฯ 10900	โทร.5792757



ใบไถปรับปรุงขนาดใหญ่



ใบไถปรับปรุงขนาดเล็ก

ใบไถแรงสัตว์ปรับปรุงนี้ได้ทำการปรับปรุงจากใบไถพื้นเมืองที่มีใช้อยู่ทางภาคตะวันออกเฉียงเหนือของไทย โดยมีจุดประสงค์เพื่อให้สัตว์ที่ใช้งานออกแรงลากน้อยลงและไถได้พื้นที่มากขึ้น

ลักษณะความแตกต่าง

ใบไถพื้นเมืองที่ใช้กันอยู่โดยทั่วไปนั้น ส่วนหัวไถจะติดอยู่ในแนวเดียวกับโครงไถ และในขณะใช้งานเกษตรกรจะต้องโยกหางไถให้เอียงเพื่อให้ใบไถสามารถพลิกดินได้ดีขึ้น

ใบไถปรับปรุงมี 2 แบบคือ แบบแรกขนาดใหญ่กว่าและแบบที่สองขนาดเล็กซึ่งมีขนาดเท่ากับใบไถพื้นเมือง ใบไถปรับปรุงจะมีส่วนที่เอียงออกจากโครงไถประมาณ 20-22 องศา และตอนปลายผานี้จะทำมุมจิกประมาณ 18 องศา การวางตำแหน่งใบไถให้เอียงจะทำให้สามารถพลิกดินได้ดีโดยผู้ปฏิบัติงานไม่ต้องโยกหางไถ และจากการปรับปรุงขัดมีความโค้งของปีกไถทำให้ใช้แรงชุดลากไถปรับปรุงน้อยกว่าไถพื้นเมือง

การใช้งาน

ในการใช้ไถปรับปรุงนี้จะต้องปรับระยะจุดลากไถ จุดห้อยไถ ตำแหน่งไถและแนวเส้นเชือก โดยปรับจุดลากที่แตกใหญ่ จุดห้อยที่ปลายไถและหางไถให้อยู่ในแนวเดียวกัน จะทำให้แรงในการควบคุมหางไถ และรักษาแนวไถได้ดีขึ้น

ไถปรับปรุงใบใหญ่ควรใช้ไถในแปลงนาที่มีน้ำขังหรือดินค่อนข้างอ่อนร่วน ส่วนไถปรับปรุงใบเล็กใช้ไถในผืนนาหรือไร่ทั่ว ๆ ไป ที่ดินมีความชื้นพอสมควร

รูปแสดงการปรับแนวในการไถ

ข้อแตกต่างของไถปรับปรุง เมื่อเทียบกับไถพื้นเมือง			
	ไถปรับปรุงใบใหญ่	ไถปรับปรุงใบเล็ก	ไถพื้นเมือง
ระยะความโค้งของปีกไถ (มม.)	380	380	277
มุมจิกดิน (องศา)	18	10	22
มุมพลิกดิน (องศา)	20	20	0
เนื้อที่ต้านแรงฉุดที่ความลึก 5 นิ้ว (ตร.ซม.)	241	161	161
แรงฉุดที่ใช้ลาก (กก.แรง)	120-146	65-78	129-140
เปรียบเทียบเนื้อที่	เพิ่มขึ้น 66 %	เพิ่มขึ้น 25 %	

เครื่องหยอดเมล็ดพืช-1
แบบเดี่ยว ใช้มือจับ

เอกสารหมายเลข กวศ. 22-003	กองเกษตรวิศวกรรม กรมวิชาการเกษตร : ถนนพหลโยธิน บางเขน กรุงเทพฯ 10900 : โทร. 5792153, 5794497

เครื่องหยอดเมล็ดพืช-1 เป็นเครื่องแบบง่าย ๆ ออกแบบโดยกองเกษตรวิศวกรรม สามารถใช้หยอดเมล็ดข้าว หรือพืชไร่ เช่น ข้าวโพด ข้าวฟ่าง ถั่วเหลือง ฯลฯ เครื่องหยอดชนิดนี้ทำงานโดยใช้แรงคน

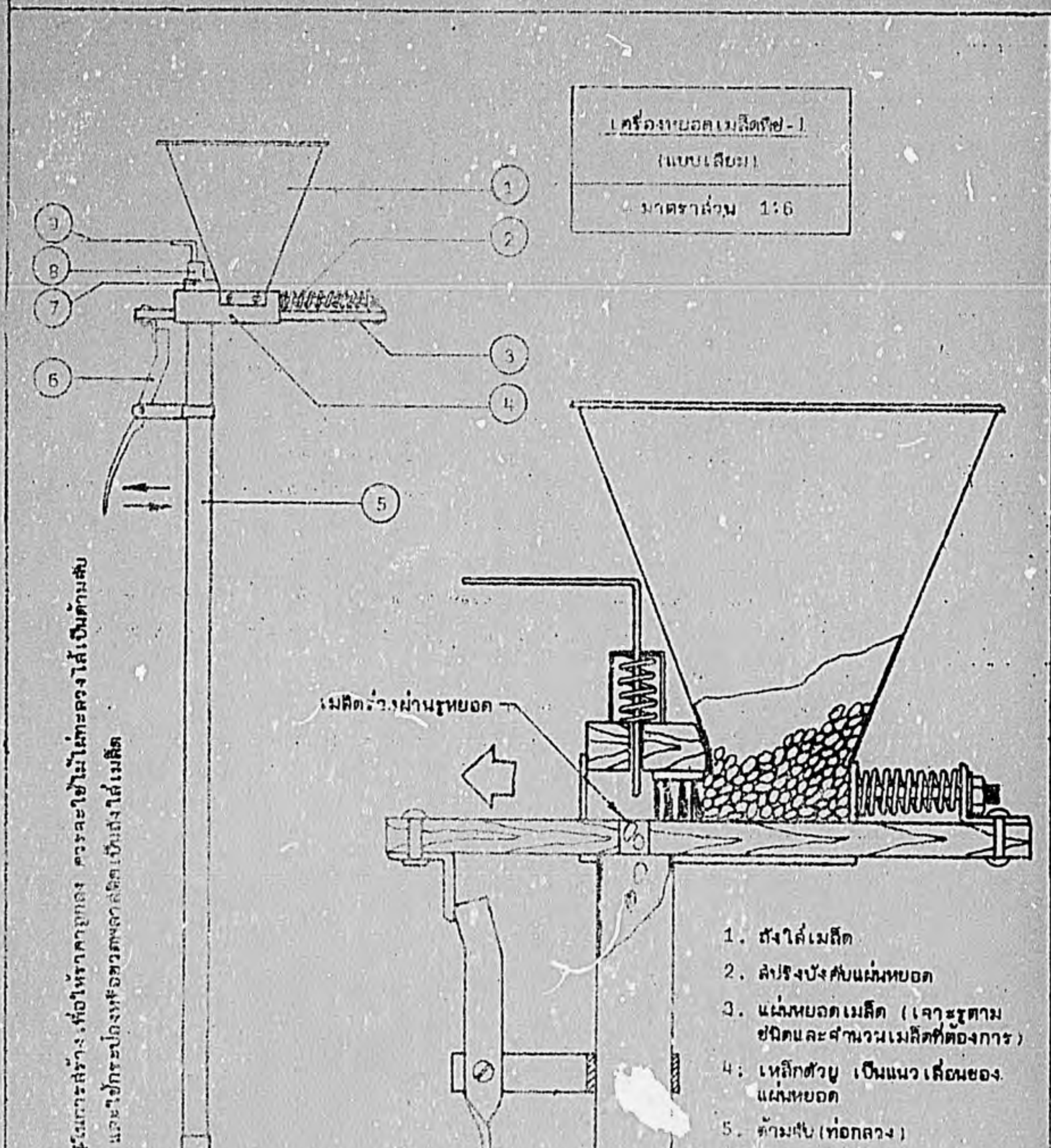
<u>ลักษณะโครงสร้าง</u> เครื่องหยอดเมล็ดพืช-1 มีลักษณะเหมือนเสียม ตอนบนมีถังเก็บเมล็ด และมีแผ่นหยอดซึ่งเจาะรูสำหรับหยอดเมล็ดอยู่ตอนล่างของถังเก็บเมล็ด แผ่นหยอดจะเลื่อนไปมาโดยการกดไกบังคับและแรงดึงของสปริง ความหนาของแผ่นหยอดและขนาดรูหยอดจะขึ้นอยู่กับขนาดและจำนวนเมล็ดที่ต้องการใช้ ผู้ใช้สามารถเลือกขนาดโดยให้เมล็ดที่จะหยอดไหลลงในรูหยอดแล้วใช้แปรงปัดเมล็ดที่ค้างตอนบนของรูหยอด จำนวนเมล็ดที่ค้างอยู่ในรูหยอดจะเป็นจำนวนเมล็ดที่จะหล่นลงหลุมแต่ละครั้ง

<u>การทำงาน</u>

1. ใช้มือจับที่ด้ามเครื่องหยอดตอนบน ปักเครื่องหยอดลงดินแล้วผลักไปข้างหน้า เพื่อเปิดหลุม
2. เหนี่ยวไกบังคับแผ่นหยอดจนแตะท่อด้ามจับ เมล็ดจะร่วงลงจากรูหยอดผ่านท่อด้ามจับลงสู่หลุม
3. ดึงเครื่องหยอดขึ้นและใช้เท้ากลบหลุม

เครื่องหยอดนี้มีน้ำหนักประมาณ 2 กิโลกรัม สามารถทำงานได้ประมาณ [illegible] ไร่/ชั่วโมง

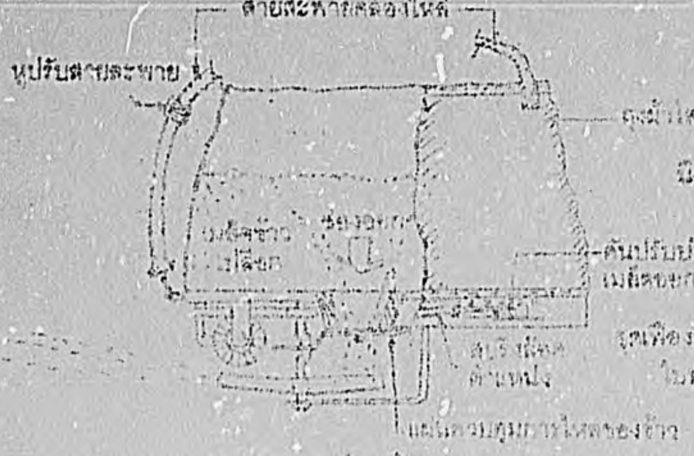
ปักเครื่องหยอดลงดิน   เปิดหลุมและหยอดเมล็ด


เครื่องหยอดเมล็ดพืช-1
(แบบเสียบ)
มาตราส่วน 1:6
เมล็ดร่วงผ่านรูหยอด
1. ถังใส่เมล็ด
2. สปริงบังคับแผ่นหยอด
3. แผ่นหยอดเมล็ด (เจาะรูตามชนิดและจำนวนเมล็ดที่ต้องการ)
4: เหล็กตัวยู เป็นแนวเลื่อนของแผ่นหยอด
5. ด้ามจับ (ท่อกลวง)
6. ไกบังคับแผ่นหยอด
7. แปรงกั้นเมล็ด
8. สปริงบังคับก้านเขี่ยเมล็ด
9. ก้านเขี่ยเมล็ด
10. แผ่นกันเมล็ด
11. หัวเสียม
ควรจะใช้ไม้ไผ่ทะลวงไส้เป็นด้ามจับ
กระป๋องหรือขวดพลาสติกเป็นถังใส่เมล็ด

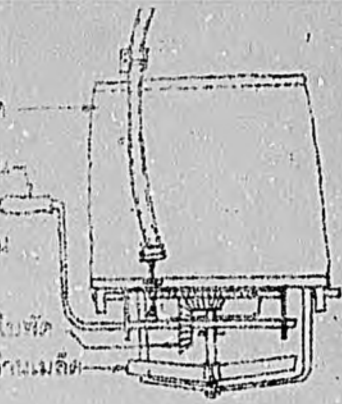
เครื่องหว่านเมล็ดพืช -1

แบบถุงผ้าสะพาย, ใช้มือหมุน

เอกสารหมายเลข ที่ 25-032	โครงการเครื่องจักรกลเกษตร กรมวิชาการเกษตร -ธีรี่ ตู้ ปณ. 9-153 อ.บางเขน กรุงเทพ ฯ 10900 โทร.5792757



รูปด้านข้าง



รูปด้านหน้า

เครื่องหว่านเมล็ดพืช-1 เป็นเครื่องหว่านเมล็ดพืชแบบง่าย ๆ ใช้แรงคนในการทำงาน สามารถใช้หว่านเมล็ดพืชได้หลายชนิดเช่น ข้าว ถั่วเขียวและข้าวนาหว่านในการทำนาน้ำตม ข้าวฟ่าง งา ฯลฯ นอกจากนี้ยังสามารถใช้หว่านปุ๋ยชนิดที่เป็นเม็ดได้อีกด้วย

ลักษณะโครงสร้าง

เครื่องหว่านเมล็ดพืช-1 มีส่วนประกอบที่สำคัญ คือ ถุงใส่เมล็ดใบพัดหว่านเมล็ด มือหมุนและชุดเฟืองหมุนใบพัด

1. *ถุงใส่เมล็ด* เป็นถุงผ้าและมีสายสะพายสำหรับคล้องไหล่ขณะทำงาน

2. *ใบพัดหว่านเมล็ด* อยู่ตอนล่างของถุงผ้า ใบพัดหว่านเมล็ดจะหมุนในขณะที่ผู้ปฏิบัติงานหมุนมือหมุน

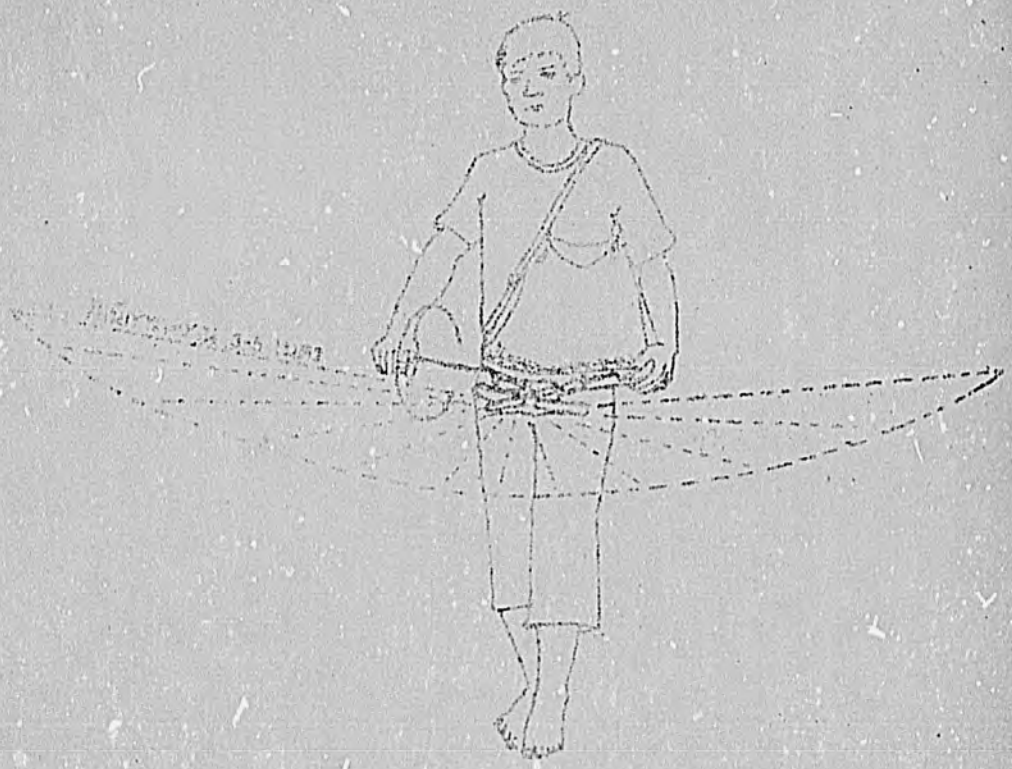
3. *ชุดเฟืองหมุนใบพัด* จะเป็นตัวส่งกำลังจากมือหมุนมาหมุนใบพัดหว่านเมล็ด

การใช้งาน

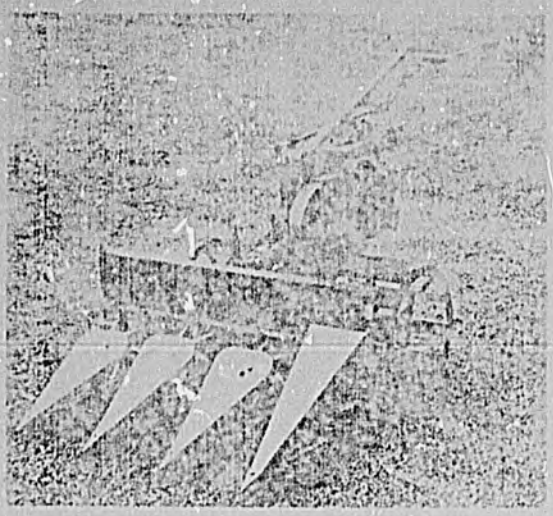
ในขณะเริ่มทำงานผู้ปฏิบัติงานจะต้องเปิดช่องเมล็ดซึ่งอยู่ตอนล่างของถุงใส่เมล็ดพร้อมกับหมุนมือหมุน ในขณะเดียวกันก็ก้าวเดิน การปฏิบัติงานทั้งหมดจะต้องสัมพันธ์กันคือ ถ้าเปิดช่องให้ปล่อยเมล็ดลงมาก จะต้องหมุนใบพัดหว่านเมล็ดและก้าวเดินเร็วขึ้น ในทางกลับกันถ้าผู้ปฏิบัติงานเปิดช่องปล่อยเมล็ดน้อย การหมุนและก้าวเดินก็ต้องช้าลง การหมุนและการก้าวเดินจะต้องสม่ำเสมอเพื่อให้เมล็ดกระจายลงบนพื้นที่อย่างสม่ำเสมอ อัตราการหว่านโดยทั่วไปจะอยู่ระหว่าง 14-16 กก./ไร่ในขณะก้าวเดินปกติ

ข้อกำหนดเครื่องหว่านเมล็ดพืช

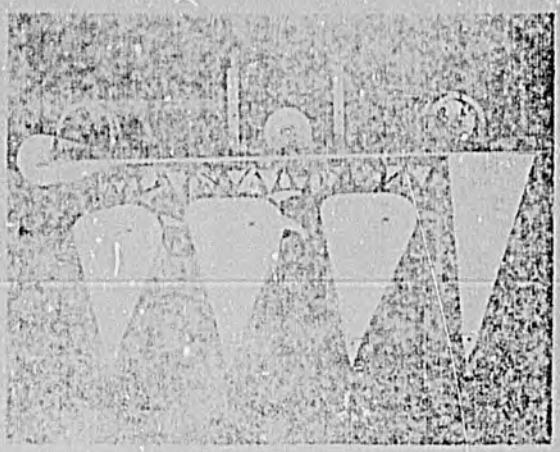
น้ำหนักเครื่อง	1.5 กก.
ความยาวทั้งหมด	40 ซม.
ความกว้าง (รวมทั้งมือหมุน)	32 ซม.
ความสูง (ไม่รวมถุงผ้า)	12 ซม.
รัศมีการหว่าน	3-5 เมตร
อัตราการหว่าน	ปรับได้
ความจุของถุงผ้า	8 กก. ลิตร(ข้าวเปลือก)
อัตราการหยอด	2.5 ไร่/ชม.



รูปแสดงการใช้เครื่องหว่านเมล็ดพืช



Compact design



Reaper is adaptable to other hand tractor unit

Machine specifications:

POWER	3 hp gasoline engine
WEIGHT OF REAPER-TILLER UNIT	135 kg
WEIGHT OF REAPER ALONE	48 kg
TOTAL LENGTH OF REAPER PLUS 3 HP TILLER	218 cm
TOTAL WIDTH	117 cm
TOTAL HEIGHT OF 3 HP TILLER, MINIMUM	90 cm
FIELD CAPACITY	2.4 hectare per day
FIELD LOSSES	Less than 1%
MINIMUM CUT	7 cm
FORWARD SPEED	2.5 to 4.5 kph
KNIFE AVERAGE SPEED	1.3 x forward speed
CONSTRUCTION	All steel except the non-metallic starwheels
ADJUSTMENT	Throttle (synchronized with cutting speed), flat belt tension, windrow deflector.
FUEL CONSUMPTION	Approximately 1 liter per hr

For further information write: Agricultural Machinery Development Program
International Rice Research Institute
P.O. Box 933, Manila, Philippines
Cable: RICEFOUND, MANILA

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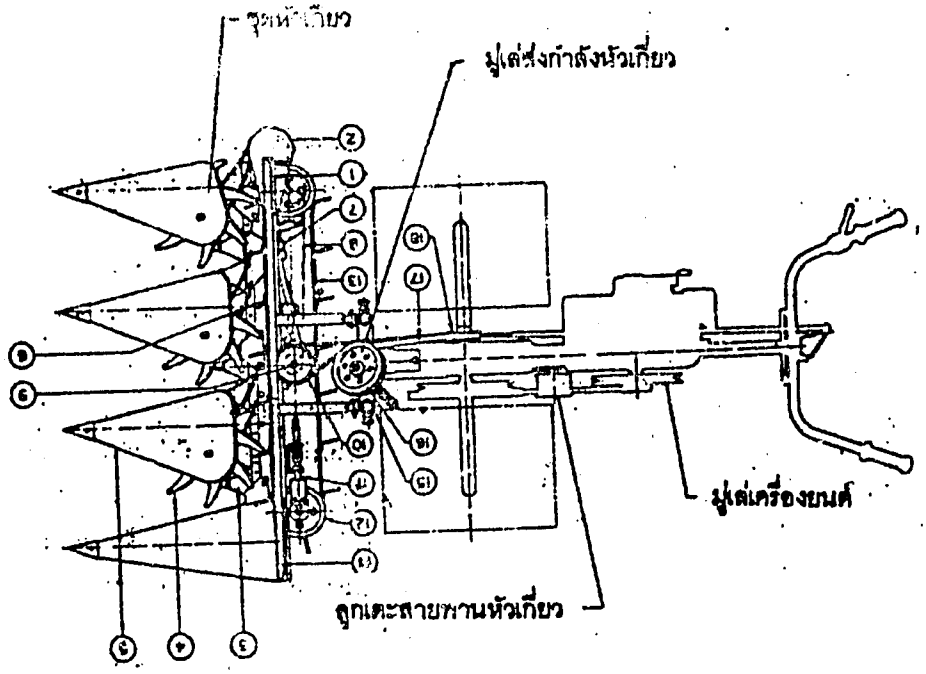
CAAMS*-IRRI 1.0m reaper



Harvests paddy of different varieties

FEATURES:

HIGH CAPACITY . . . . . 2.4 hectare per day

LOW HORSEPOWER REQUIREMENT . . . . . 3-hp engine

LOW LABOR REQUIREMENT . . . . . One to three men to operate, prepare plots and gather crop.

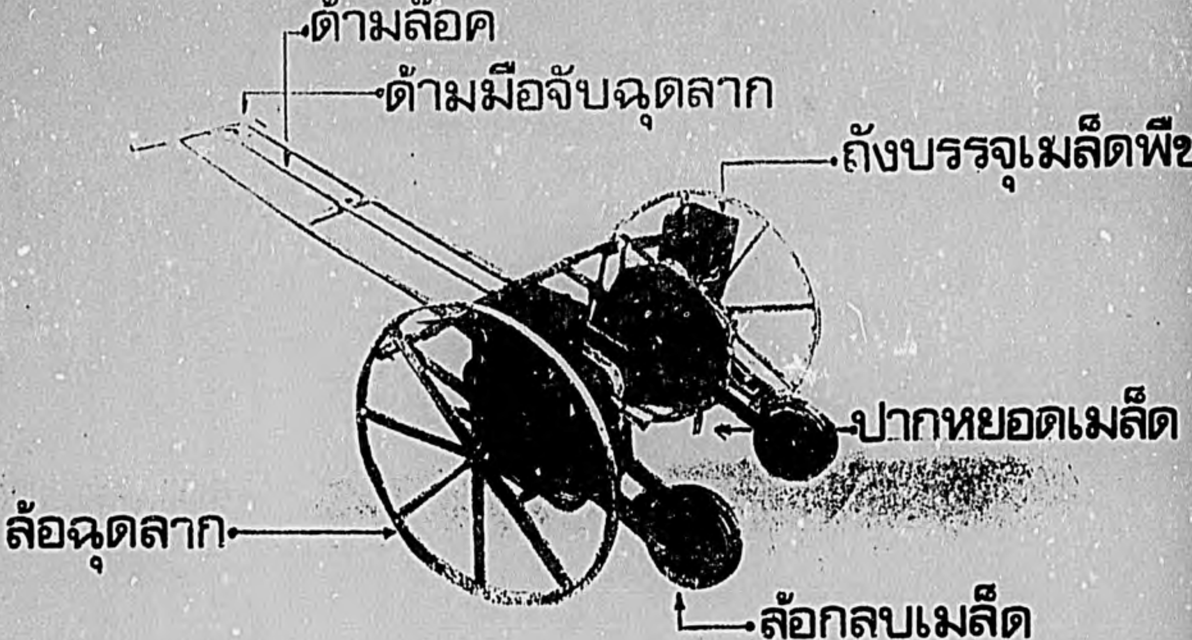
EASE OF OPERATION . . . . . Simplicity of design-reduces operation and maintenance problem.

HIGHLY MOBILE . . . . . Can be operated and carried with ease

* CHINESE ACADEMY OF AGRICULTURAL MECHANIZATION AND SCIENCES

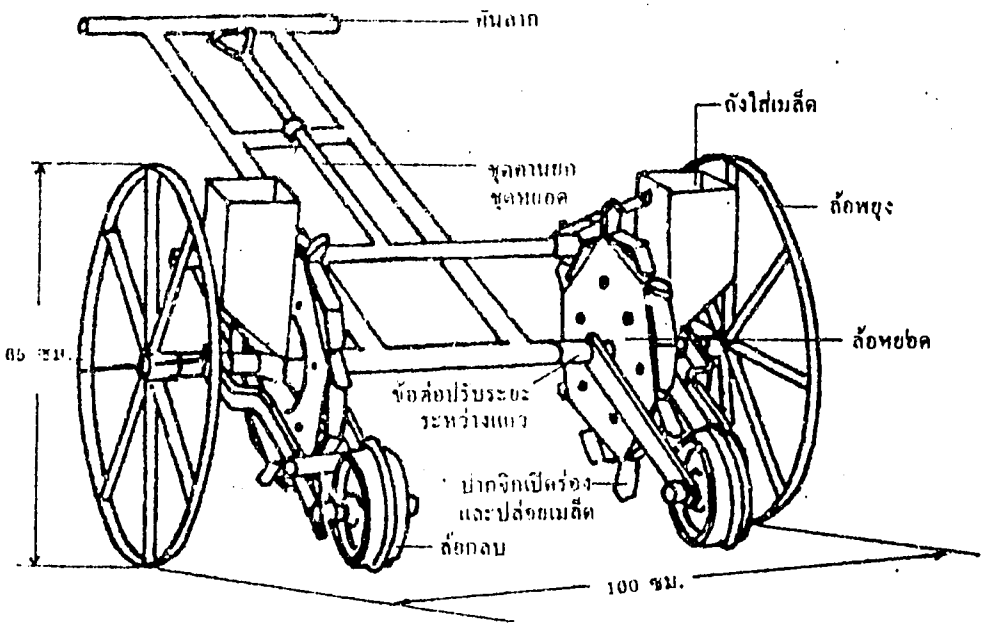
.เครื่องหยอดเมล็ดพืช.

.2 แถว แบบฉุดลาก.

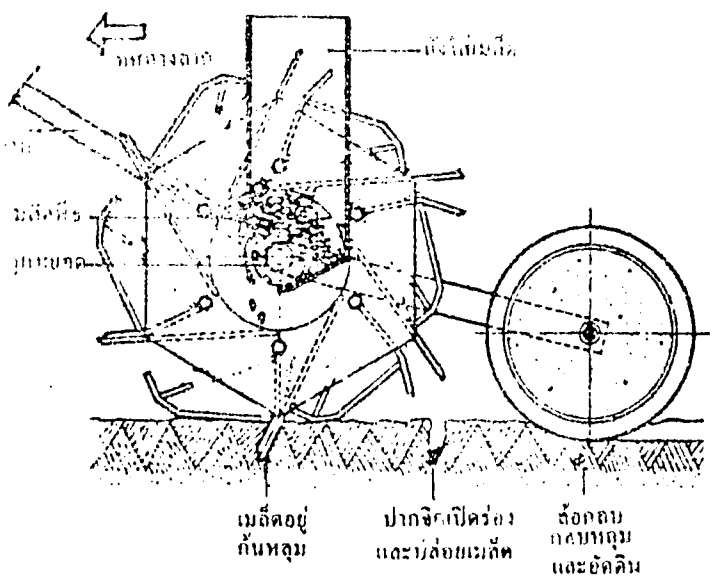


ชนิดของพืช	อัตราการทำงาน	แรงคน
ข้าว, ข้าวโพด,	5-7 ไร่/วัน	1-2 คน
ข้าวฟ่าง, ถั่วทุกชนิด	ปรับระยะระหว่างแถวได้ 20-60 ซม.	

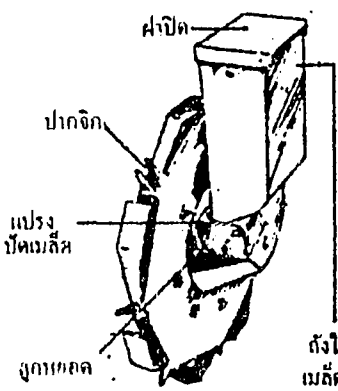
ห้างคุณาศิน
97-103 ถ.ศรีสัชนาลัย อ.สวรรคโลก จ.สุโขทัย
โทร. (055) 642119



รูปที่ 1 เครื่องหยอดเมล็ดพืชแบบล้อจิก 2 แถว



รูปที่ 2 รูปแสดงการทำงานของเครื่องหยอด



รูปที่ 3 ล้อหยอด

IRRI rice transplanter

FEATURES

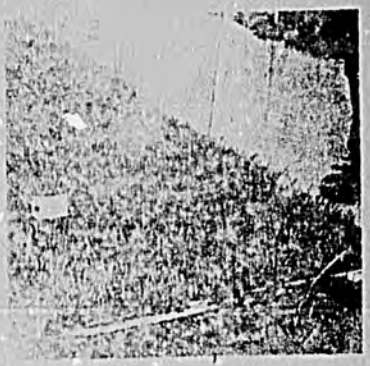
HIGH CAPACITY ..... One-fourth hectare per day.

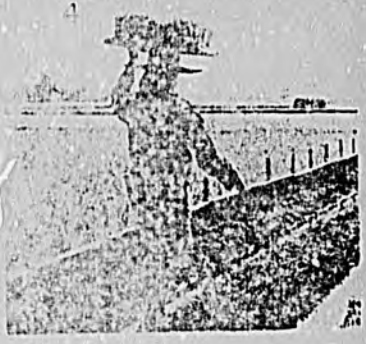
EASY TO OPERATE & MAINTAIN ..... Machine is operated by single push-pull of the handle. Requires few adjustments.

LOW POWER REQUIREMENT ..... Machine is operated by one person.

SIMPLE CONSTRUCTION ..... Can be fabricated by small shops using readily available materials.

HIGHLY MOBILE ..... Can be carried by two persons.





Transplanter in operation

seedling production

Machine specifications

POWER	1 person
FIELD CAPACITY	.25 ha. per day
LABOR REQUIREMENTS (/ha)	
SEEDLING PRODUCTION	30-35 manhours
TRANSPLANTING	30-35 manhours
NUMBER OF ROWS AND SPACING	5 at 20 cm.
PLANTING DEPTH ADJUSTMENT	2 to 5 cm.
FIELD STANDING WATER DEPTH	1 to 10 cm.
SEEDLING AGE	15 to 30 days
WEIGHT	25 kg.
LENGTH	120 cm.
WIDTH	116 cm.
CONSTRUCTION	steel and wood

For further information write: Agricultural Engineering Department
The International Rice Research Institute
P.O. Box 933, Manila, Philippines
Cable: RICEFOUND, MANILA

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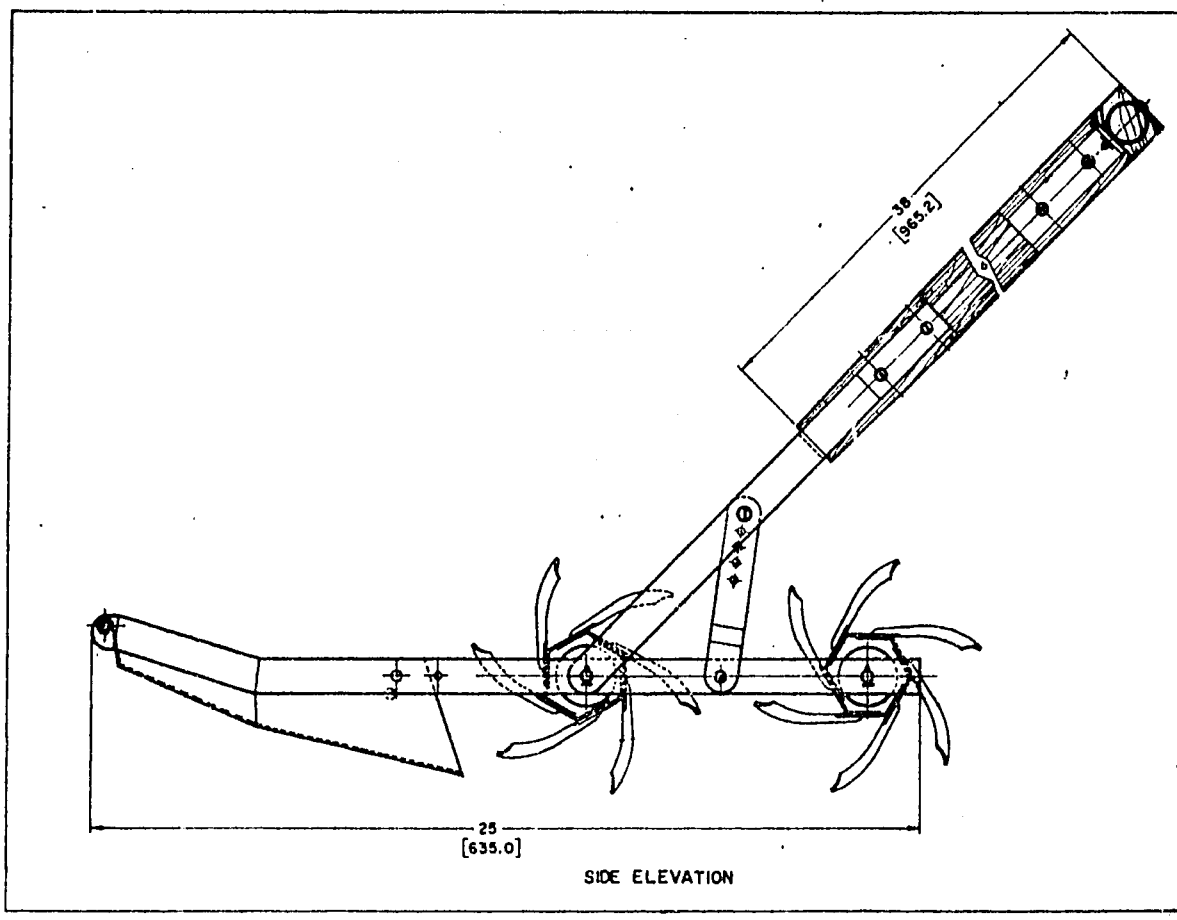
IRRI
Machinery Development Program

The push-type hand weeder

Simple weeding for lowland rice planted in rows



SIDE ELEVATION

The push-type hand weeder

The weeder is equipped with two spiked wheels rotating in a supporting frame, the front of which forms a skid. When the implement is pushed between rows, the spikes press the weeds under the soil.

The two rotors and the skid are made from light sheet metal and are easily dismantled for cleaning and repair.

The leading skid serves as depth control for the wheels. The unit is provided with a wooden handle for convenience in handling.

The implement is widely used in many Asian countries and is available in different sizes to accommodate various row spacing.

Machine specifications

Power	1 man
Field capacity	35–75 man-hrs/ha
Weight	6.0 kg
Length	70 cm
Width	15 cm
Construction	Wood and steel frame

For additional information write International Rice Research Institute, P. O. Box 933, Manila, Philippines
Cable: RICEFOUND, MANILA

KENAF RETTER

เครื่องลอกปอสดแบบของสถาบัน TROPICAL PRODUCT

ลักษณะทั่วไป มีส่วนประกอบสำคัญดังนี้

1. ตัวโครงทำด้วยเหล็กแผ่นหนา เหล็กฉากและเหล็กรูปตัวยู มีล้อ 2 ล้อ เพื่อช่วยในการเคลื่อนที่สะดวกในการทำงาน
2. เครื่องยนต์ต้นกำลังเบนซิน ขนาด 8 แรงม้า ความเร็วสูงสุด 3,600 รอบ/นาที
3. เพลา (Drum)ติดลูกตี (Leat Bar) 3 ตัว ทำหน้าที่ตีแกนปอให้หักและหลุดออกมาจากกลีบปอสด
4. แผ่นรองรับ ทำหน้าที่รองรับต้นปอขณะป้อนต้นปอเข้าเครื่อง

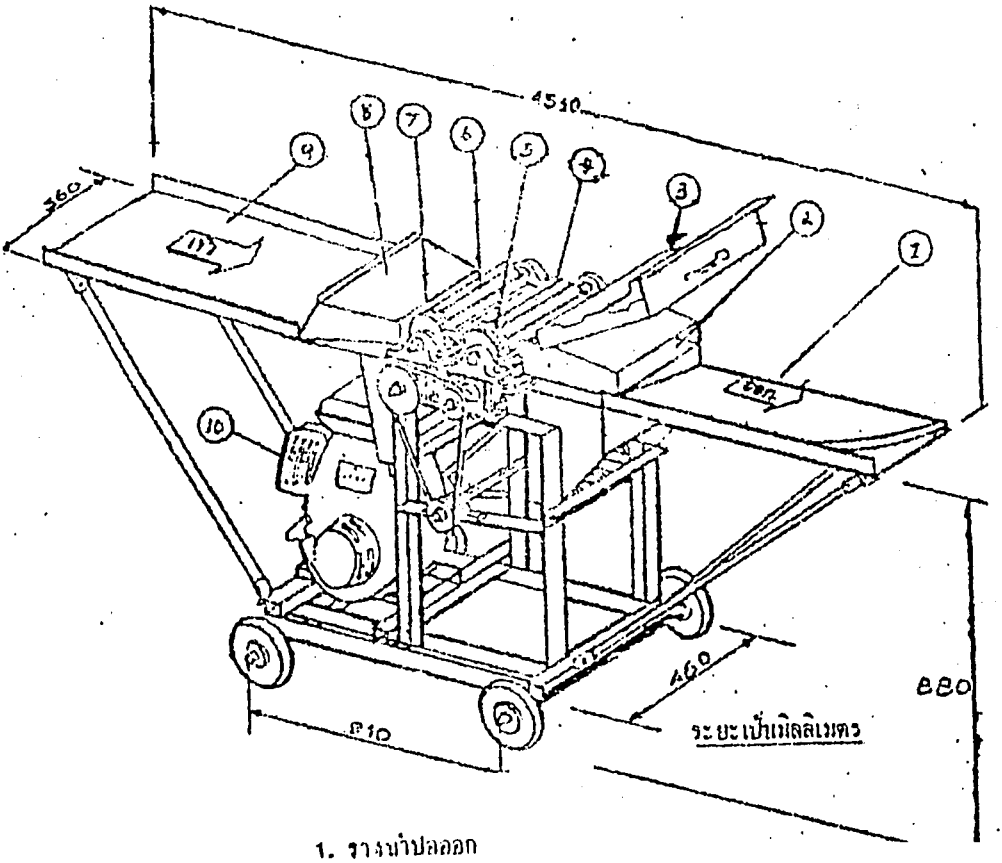
หลักการทำงาน ป้อนต้นปอทั้งต้นเข้าเครื่องทางช่องป้อน ลูกตีจะตีลำต้นปอให้แกนหักและหลุดออกจากกลีบและหมุนหากลีบปอสดออกจากเครื่อง จากนั้นคนงานจะต้องสบัดแกนปอที่ติดอยู่ออกให้หมดและนำไปแช่น้ำต่อไป

แรงงานที่ใช้ ใช้แรงงานจำนวน 3 คน ในการป้อนปอและรับกลีบปอสด ไม่รวมถึงแรงงานที่ตัดต้นปอ 5-6 คน

ความสามารถการทำงาน สามารถลอกปอสดได้ประมาณ 400-800 กิโลกรัม/ชั่วโมง (ชั่งสดทั้งต้น)

ราคาซื้อ เครื่องมือมีราคาประมาณ 10,000 บาท ไม่รวมเครื่องยนต์ต้นกำลัง

KENAF RETTER



1. รางน้ำปลอกออก
2. ช่องทางปอออก
3. ฝาครอบชุดลูกบีบปอ
4. ชุดบูทบีบและดึงแถบต้นปอ
5. ชุดเฟืองส่งกำลังชุดที่สอง
6. ชุดลูกบีบต้นปอให้หัก
7. ชุดเฟืองส่งกำลังชุดแรก
8. ช่องป้อนปอเข้า
9. รางน้ำป้อนปอ
10. เครื่องยนต์ขนาด 7-10 แรงม้า

เครื่องปอกปอสด - 1

APPENDIX

The following NERADICS Working Papers are available on request from the Project Director:

NERADICS PROBLEM DEFINITION SERIES:

P1 Effects of Paddy-bund-planted Eucalyptus Trees on the Performance of Paddy Field Crops. Craig, I.A. and Wasunan, S., 1987. (English)

P2 Overview of Rainfed Agriculture in Northeast Thailand. Craig, I.A. and Pisone, U., 1987. (English)

P3 The Upper Paddies in Northeast Thailand: The Current Situation and Implications for Development. Craig, I.A., and Baker, G.P., 1986. (English)

P4 Current Pest Management Problems Facing Farmers in Northeast Thailand: Key Research and Development Priorities. Katanyakul, W., Amaritsut, W., Keerati-Kasikorn, M. and Craig, I.A., 1987. (English)

P5 Problems and Opportunities for Farming System Based Annual Crop Development in Northeast Thailand. Craig, I.A., 1987. (English)

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