



Economic Performance of Using Combine Harvesters in Rice Cultivation in Northwest Cambodia

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Abstract Labor scarcity is the most common problem for Cambodian farmers during harvesting season since they commonly harvest rice manually. To reduce harvesting loss, expenses and time, a well-designed combine harvester is gaining popularity. This study aims to evaluate the economic performance of using combine harvesters in rice cultivation. Specifically, this study aims to (1) clarify the reasons farmers adopted the use of combine harvesters, and (2) compare the profitability of rice farming between combine harvester owner-farmer and non-owner-farmer. This study was conducted in Banan district, Battambang province, where utilization of combine harvesters is prevalent. A total of 68 respondents who use combine harvesters were randomly selected and interviewed using a questionnaire and further categorized into 34 combine harvester owner-farmers and 34 non-owner-farmers. The study has four main findings. First, most farmers started using combine harvesters in 2010 due to labor shortage and high wages. Combine harvester owner-farmers spent lesser total production cost compared to non-owner-farmers. Second, the total production cost of both farmer types varied mainly on the variable cost since the non-owner-farmers spent more on rice harvesting fee, while combine harvester owner-farmers spent only on the cost of diesel, depreciation, and driver. Third, combine harvester owner-farmers received the higher profitability compared with the other. Fourth, the three main reasons for adopting the use of combine harvester were labor shortage during peak harvesting season, convenient harvesting on time, and opportunity to provide custom service to other farmers.

Keywords combine harvester, custom service, cost and return analysis

INTRODUCTION

Rice is the traditional source of income for rural Cambodian people and the essential staple food of the country and other Asian countries (World Bank, 2014). In general, rice cropping cycle takes about three months to seven months, depending on the geographical and climate conditions, and rice varieties (CARDI, 2013). Harvesting is an important operation to maintain the productivity and quality of rice which require about labor input of 150-200 man-hours/ha (Salassi and Deliberto, 2010). With the advent of industrialization, many agricultural laborers have been moved to industrial and service sectors or migrated to neighboring countries (Chhim et al., 2015; MAFF Cambodia, 2016).

Recently, rice harvesting became a relevant issue for farmers due to labor scarcity. Combine harvesters (CH) have become useful and popular to address the problem of labor shortage in manual harvesting practices. CH can perform several operations such as harvesting, threshing, cleaning, and discharging grain into a bulk wagon or directly into a bag. Paraweewongwuthi et al. (2010) and Samaraweera (2012) mentioned that net profit of CH was about 30.3% higher compared

to manual harvesting and threshing, and there was a significant difference between the average production costs of CH and manual harvesting methods. Although only limited farmers can afford to purchase one, many farmers tend to rent CH from other farmers, districts or provinces.

OBJECTIVE

In order to evaluate the economic performance of using CH in rice cultivation, this study aims to (1) clarify the reasons farmers adopted the use of CHs, and (2) compare the profitability of rice farming between CH owner-farmers and non-owner-farmers.

METHODOLOGY

This study was conducted in Banan district, Battambang province. Located 28 km away from Battambang city, this district is known as the second largest rice-growing area in the province. There is also a significantly large number of farmers using combine harvesters. The total area of the district is 789 sq. km., of which paddy fields occupy about 43,969 ha (approximately 62% of total agricultural land) (Banan District, 2016).

Primary data were collected through farm questionnaire survey of randomly selected 68 farmer-respondents and series of key-informant interviews (e.g. district administrator) in August and September 2017 in three communes of the district. The farmer-respondents were identified to be CH users during the time of field survey. They were further equally categorized into 34 CH owner-farmers and 34 CH non-owner-farmers. Non-owner-farmers refer to those who avail custom service or rent CH.

Simple descriptive methods and cost and return analysis were utilized.

RESULTS AND DISCUSSION

Characteristics of the Farmer-Respondents

Table 1 General characteristics of farmer-respondents

	CH owner-farmers	CH non-owner-farmers
N	34	34
Average family size (persons)	4	4
Average age (year old)	43.6	44.0
Average educational level (years)	7.6	6.2
Average farming experience (years)	16.2	13.5
Average planted land per HH		
Wet season rice (ha)	4.4	2.6
Dry Season rice (ha)	5.9	2.4

Source: Field Survey, 2017

In the study, most farmers mentioned that they have engaged in rice farming since they were young and have made decisions and improvements based on their own experience and knowledge shared by their ancestors. Although average age of both types was 44 years old, the average education level and years of farming experience of CH owner-farmers were higher than CH non-owner-farmers. Moreover, with regards to average planted area, CH owner-farmers had larger size for both wet (4.4 ha) and dry season rice (5.9 ha) than CH non-owner-farmers.

The Reasons for Using Combine Harvester in the Study Area

In relation to CH adoption, field survey revealed that farmers started using CH in 2010 due to labor shortages during the harvesting period. Moreover, around 90% of the 34 CH owner-farmers purchased Kubota brand because of its light-weight body, suitability for harvesting rice in both wet

and dry seasons, and affordability. In addition, roughly 25% of CH owner-farmers owned two or three machines depending on their land size and budget.

Table 2 Main reasons for using combine harvesters

Reason of using CH	CH owner-farmer (n=34)	CH non-owner- farmer (n=34)	Total
Have difficulty in securing hired labor	9	10	19
Conveniently harvest on time	7	11	18
Can provide custom service	10	2	12
Have large farm area	5	3	8
Used by many farmers	2	4	6
Millers do not buy rice harvested by hand	1	4	5
Total	34	34	68

Source: Field Survey, 2017

Table 2 shows the reasons for using CH. The following three main reasons were identified: (1) have difficulty in securing hired labor during peak harvesting season, (2) conveniently harvest on time, and (3) can provide custom service to other farms. Furthermore, according to interviewed farmers, family factor highly influenced their decision to purchase or use combine harvesters. The level of living condition of farmers in rural areas and educational attainment of farmers were low. Thus, many young people tend to move from rural to urban areas and work in garment factories and/or other industries or migrate to other countries. Only elderly farmers were left to farm. CH owner-farmers added that CH was preferred for reducing harvest losses and maintaining rice quality and quantity. In general, both group farmers showed satisfaction in CH usage.

Rice Production Cost of Studied Farmers in Wet and Dry Seasons

Table 3 Rice production cost of selected farmers in wet season

Items	Wet season (early maturity, 2016)							
	CH owner-farmers				CH non-owner-farmers			
Land size	Small	Medium	Large	Extra-large	Small	Medium	Large	Extra-large
Number of HH	2	5	6	5	10	5	4	2
Equipment ⁽¹⁾	17.97	12.81	12.25	11.60	17.52	11.73	12.13	12.16
Hand tractor	66.00	40.32	38.34	33.70	104.52	80.93	66.49	65.53
Tractor	0.00	69.11	63.29	61.28	0.00	58.96	53.07	48.08
Pumping pipe	11.91	5.82	4.12	3.08	12.49	8.85	6.96	6.67
Tractor trailer	0.00	16.39	14.22	13.64	0	0	0	0
Combine harvester	62.67	48.02	45.30	39.73	0	0	0	0
Total fixed cost	158.55	192.47	177.52	163.03	134.53	160.47	138.66	132.44
Cost of seed	39.36	44.95	49.09	49.46	44.45	44.55	48.14	49.01
Fertilizing	85.27	90.54	97.96	106.53	88.70	90.10	100.73	107.98
Herbicide	9.90	11.14	12.38	13.86	10.80	13.61	12.38	12.38
Pesticide	9.90	10.02	11.21	12.45	9.41	9.90	10.56	12.38
Land preparation fee	27.23	0.00	0.00	0.00	25.68	0.00	0.00	0.00
Land preparation (fuel)	4.97	20.36	17.15	15.89	4.84	24.36	23.17	21.13
Material input cost ⁽²⁾	7.02	8.61	9.60	10.94	5.29	8.94	10.94	13.95
Harvesting cost ⁽³⁾	20.38	19.84	19.58	19.46	100.98	103.34	102.10	100.56
Family labor cost	37.13	24.94	18.54	13.71	30.40	21.66	19.59	17.82
Hired labor cost	15.10	31.19	43.49	57.10	25.12	34.90	47.65	52.54
Total variable cost	256.26	261.60	279.00	299.40	345.67	351.36	375.26	387.74
Total production cost	414.81	454.07	456.52	462.43	480.20	511.83	513.92	520.18

Source: Field Survey, 2017

Unit = USD/ha

Note 1) Equipment included blue-sheet, sprayer, sickle and sack.

2) Material input cost included cost of pumping water and transportation.

3) Harvesting cost refer to fuel cost of CH owner; harvesting fee of CH non-owner-farmer.