FARM MACHINERY HIRE SERVICES FOR SMALL FARMS IN KAMPAR REGENCY, RIAU PROVINCE, INDONESIA

U. Paman, S. Inaba, S. Uchida

ABSTRACT. *Small farmers in the Kampar Regency are dependent on farm machinery hire services for their farm operations. This study aims to provide an understanding of the management procedures of hire services groups and to determine the seasonal working areas and custom rates of machinery hire services managed by farmer groups. Twenty groups offering custom hiring services in seven districts of the Kampar Regency were visited during the rainy season in 2012, and group managers, mechanics, and operators were interviewed to collect field data. The results showed that these groups comprised 3-11 farmer groups, which in turn comprised 15-25 farm owners each. Each group had a simple organizational structure and managed one or more farm machines of various manufacturers and types. The number of machines owned by each group was not sufficient to deploy across the entire coverage area owned by the group members. The seasonal working area is small due to the limited number of machines owned, short working days per season, small paddy field areas, and low working capacities. The custom rates varied across groups depending on the type of machine and operation, land conditions, and the distance between the field and the hire services center. Suggestions for improving the operational performance of hire services groups have been proposed.*

Keywords. *Custom rates, Farm machinery, Hire services, Small farms, Working area.*

The agricultural sector in most developing countries is characterized by small-scale farms and poor purchasing power of farmers. Therefore, the majority of small farmers across countries are unable to justify the ownership of farm machinery for exclusive use on their own farms (Gifford, 1992). However, farmers can use such farm machinery without buying them by hiring custom operators. Custom hire services are an option when the farm area is too small to justify the costs of owning the machinery. These services have been availed by a majority of the farmers in Asia (Chancellor, 1986) and are attractive for small-scale farmers with limited investment capital or those with seasonal requirements (Edwards, 2009). Small-scale farmers can also make their cultivation practices more efficient by using custom hire services (Sims et al., 2011) that can fulfill their requirements of farm equipment at a low cost (Chancellor, 1971) or at a cost lower than owning and operating such equipment (Patterson and Painter, 2011). Thus, hiring machines (mostly tractors) is more economical for small farmers (Henderson and Fanash, 1984).

In Riau Province, farm machinery hire services are widely availed by small rice farmers, particularly for tillage (Paman et al., 2010). This system has facilitated the promotion and accelerated development of mechanization of small-scale rice farming in the province during the last decade; however, the level of mechanization is yet below the national average of 30% (Handaka, 2005). Of the 12,612 custom hire services groups in Indonesia in 2010, 707 (5.6%) were located in the Riau Province (Agricultural Department of Indonesia, 2011). Currently, most small farmers in the province are heavily dependent on custom hiring of farm machinery, particularly for performing labor-intensive operations. The custom hiring has also helped them to increase the timely completion of operations, land productivity, and cropping intensity, and reduce drudgery during field work, working hours, and labor costs.

Custom hire service is a farm machinery business that can be managed by either a group or an individual. Custom hire services managed by farmer groups are prevalent in the Kampar Regency. There are 43 hire services groups in 12 of the 21 districts in the regency (Food Crops Service of Kampar Regency, 2012). With the increased number of hire service groups and the high dependence of farmers on machinery hire services, it is very important to manage the groups effectively and keep the machinery working optimally. Finding the appropriate custom rate charge is also very important. Therefore, this study aims to provide an understanding of the management procedures of hire services groups, and to determine the seasonal working

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areas and custom rates of machinery hire services managed by farmer groups in the Kampar Regency. The information reported herein can be useful for planners, local government, and machinery managers to make the required improvements for effective operations and performance management of the machinery hire services. Thus, the method may be adapted to other paddy regions over the province for accelerating mechanization process and creating an alternative business at the farm level. The low mechanization degree in Riau Province [about 21% according to Paman et al. (2012)] also offers a market opportunity for the machinery hire services to develop and generate more income.

MATERIALS AND METHODS

Kampar Regency, which is located about 60 km south of the capital of Riau Province, Pekanbaru, is one of the rice production centers of the province. Approximately 15% of the 234,940 ha of paddy field areas in Riau are located in the regency. Further, through custom hire services, the use of different types of farm machinery has become popular among farmers across the regency. The rainy season is the main season for rice cultivation in the regency. A total of 20 hire services groups located in seven districts of the regency were visited during the rainy season in 2012 to collect field data. The seven districts included Bangkinang Seberang, Kampar, Kampar Timur, Kampar Utara, Kuok, Salo, and Tambang. The selected groups were actively providing services to their respective group members.

Personal interviews were conducted with group managers and custom operators to collect field data using a pre-structured questionnaire. Some data were compiled from the groups' annual financial reports. However, most data were obtained through direct interviews because few hire services groups had complete annual reports. The data collected included the type and number of machines managed, purchase year, coverage area of the groups, working days per season, daily working hours, seasonal working areas (uses), custom rates, and operator characteristics (education, age, and experience). The data were tabulated and analyzed using simple descriptive techniques including percentage, mean, and graphical methods.

RESULTS AND DISCUSSION

MANAGEMENT PROCEDURES OF HIRE SERVICES GROUPS

The formation of hire services groups was an outcome of the meetings of farmer groups in villages. The purpose of these groups is to provide farm machinery hire services to farmers who are members of the group. Figure 1 shows the operational structure of hire services groups located in the survey area. A hire services group comprised 3-11 farmer groups, and each farmer group comprised 10-25 farmers who are landowners. The groups gave priority to group members in providing services. The total paddy field areas collectively owned by the group members are the coverage area for the group. The total coverage area varied among groups depending on the number of members and the amount of land owned by each of them. The average coverage area for the sample was 139 ha. The largest coverage area was 400 ha for the Tani Maju group, while the smallest was 25 ha for the Karya Indah group. The former was comprised five members and the latter comprised two members.

The organizational structure of hire services groups is simple, but varies slightly across groups depending on how the job tasks are divided, grouped, and coordinated to achieve group goals. Every group is led by a manager who organizes people and jobs in order to achieve organizational goals. Figure 2 illustrates a simple organizational structure of a machinery hire services group commonly seen in the survey area. In this hierarchical structure, the manager gives orders through the vice manager to the operators, mechanics, and group leader regarding the tasks to be performed. The simplicity of this organizational structure made it easy to coordinate the activities of the group. Since there was no middleman, decisions were made quickly and the operations ran smoothly. The secretary and treasurer report to the manager and primarily perform the tasks of administration and annual financial reporting, respectively. The manager, assisted by the secretary, makes

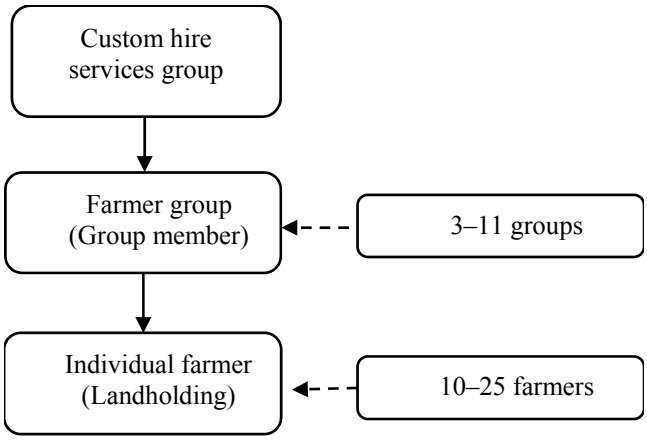

Figure 1. Operational structure of hire services groups.

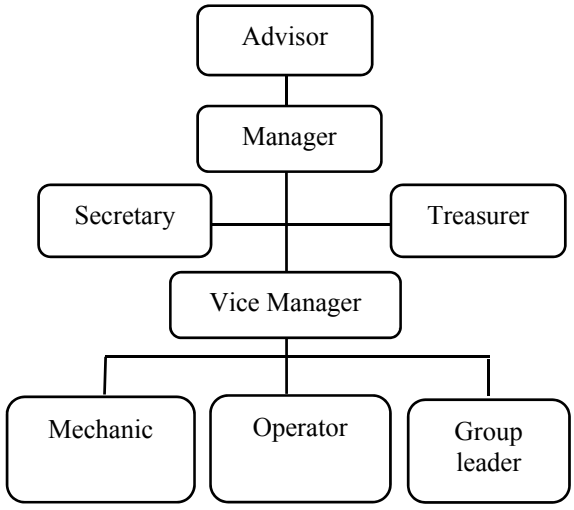

Figure 2. Organizational structure of hire services groups.

decisions regarding allocation of job orders proposed by group members every season. Important and strategic decisions such as determining custom rates and new machinery additions are usually made after discussions with the advisor who is also the local village chief.

The operator plays a vital role in running the group's operations. The number of operators required for each type of machine is different. In general, tillage machines like rotary tillers, moldboard plows, and hydro tillers were operated by two operators, cultivators, and water pumps by one operator, power threshers by 1-2 operators, and rice milling units (RMUs) by two operators. A few operators were also managers of the hire services groups. Approximately 49% of the operators received short training courses from the local workshop center as well as the Yanmar Training Center in Depok, West Java. There is a very important point made here that the untrained operators (51%) clearly need more training in order to improve the technical knowledge and skills that are required to correctly operate and maintain the farm machines and eventually increase field working capacity. The operators who received training from the Yanmar Training Center were assigned as mechanics. A mechanic was given the task of repairing the machines of his group as well as of the other groups.

The operators had an average age of 38 years. They had relatively short work experience (average of 4 years) and low education levels (average of 9 years). The group leader calculated the number of hectares that would be worked for each member during the season and then proposed the same to the manager. Proposals were executed in the order of priority suggested by the group leader.

FARM MACHINERY AVAILABILITY AND SEASONAL WORK

Hire services groups owned one or more farm machines of various manufacturers and types. The most popular manufacturer was Yanmar, follow by Honda, Agrindo, and Dongpeng. The number of the machines per group ranged from 1 to 14 units. The machines consisted of rotary tillers, moldboard plows, hydro tillers, cultivators, water pumps, power threshers, and RMUs. They were distributed unequally among the groups of hire services as presented in table 1. Twenty-two rotary tillers, for instance, were distributed and owned by 16 hire services groups. All the machines were obtained through government aid via a mechanization development program that was funded by the regency, provincial, or national annual budgets.

Some hire services groups managed more than one machine of the same type; however, none of the groups owned more than one RMU. The Pulau Lestari group owned the highest number of machines, including two rotary tillers, four hydro tillers, two moldboard plows, two cultivators, one water pump, two power threshers, and one rice milling unit with the total of 14 machines. The age of the machines ranged from 1 to 6 years and the average age for each machine type is presented in table 1. Most of the machines had an economic life of five years, which is considered as a reasonable life span for the machines in the survey area.

The availability of a limited number and type of machines was a major obstacle in offering full-fledged services to the group members. Accordingly, the operational services that could be offered to farmers included only tillage, pumping, threshing, and rice milling operations. Since the priority was to serve group members, non-members could not be offered any services except milling. Although there are a few farmers in the survey area who own tillage machines and provide the same service, the number of such machines is also limited. Consequently, the availability of such machines had no effect on the demand for farm machines owned by hire services groups.

Tillage operations are labor-intensive and, therefore, majority of the farmers are heavily dependent on farm machines to perform these operations. Understandably, majority of the farm machines owned by hire services groups were tillage machines (table 1). Of the 98 machines managed by the 20 hire services groups surveyed, about 68% were tillage machines and the rest were stationary machines. Most of the tillage machines were hydro tillers (27.6%), followed by rotary tillers (22.4%), moldboard plows (11.2%), and cultivators (7.1%). Given the local field conditions, both hydro and rotary tillers were suitable for tillage operations. Primary and secondary tillage can be done simultaneously using machines, while tillage using a moldboard plow is done in stages. As compared to the other tillage machines, the working capacity of hydro and rotary tillers was higher at about 0.053 and 0.048 ha/h, respectively (table 2). Moreover, hydro tillers (also called floating/turtle power tillers) that work even in waterlogged fields were the most economical tillers in Philippines (Villaruz, 1985). The stationary machines largely comprised power threshers (13.3%), followed by RMUs (8.2%) and water pumps (10.2%). They were owned by ten (50%), eight (40%), and seven (40%) groups, respectively.

Figure 3 illustrates that the number of farm machines per 100 ha varied across the hire services groups. In the case of tillage machines, Karya Indah topped the list at about 8 tillers/100 ha, while Tani Bersama at 0.4 tillers/100 ha came at the bottom. The average for the sample was

Table 1. Machinery ownership by hire services groups and average age for various machine types.

Machine Type	No. of Groups	Percentage[a]	No. of Machines	Percentage	Avg. Machine Age
Rotary tiller	16	80.0	22	22.4	3.2
Moldboard plow	8	40.0	11	11.2	3.7
Hydro tiller	13	65.0	27	27.6	2.8
Cultivator	6	30.0	7	7.1	2.5
Water pump	7	40.0	10	10.2	3.7
Power thresher	10	50.0	13	13.3	3.2
Rice milling unit	8	40.0	8	8.2	3.1
Total			98	100.00	

[a] Percentage of the total of 20 hire services groups owning this type of machine.

Table 2. Machine-wise seasonal working time, working capacity, and volume of seasonal work.

Machine Type	Working Days per Season	Working Hours per Day	Working Capacity (Ha/h)	Working Capacity (Kg/h)	Volume of Seasonal Work (Ha)	Volume of Seasonal Work (Mg)[a]
Rotary tiller	22.82	7.50	0.048	-	10.14	-
Moldboard plow	20.45	7.55	0.043	-	8.32	-
Hydro tiller	19.67	7.59	0.053	-	8.15	-
Cultivator	20.00	7.86	0.027	-	1.86	-
Water pump	20.20	7.80	0.040	-	5.50	-
Power thresher	16.70	7.10	-	542	16.22	64.88
RMU	All days	3.62	-	550	5.56	22.25

[a] Metric ton.

2.8 tillers/100 ha. According to Herdt (1983), this indicated that the region has not reached the level of complete mechanization at about 10 tillers/100 ha. All the groups were below this level and about 45% of them were at less than 2 tillers/100 ha. This level, in our view, corresponds to the take-off stage. For other machines such as water pumps, power threshers, and RMUs, the threshold levels have yet not been reached. These results suggest that additions to farm machinery need to be made based on the demand from group members.

Most paddy fields in the survey area are rain-fed and, therefore, suffer from water shortage during the dry season. The few irrigated paddy fields also face the same problem during the dry season due to poor irrigation facilities. Consequently, the rainy season has become the main season for rice cultivation because of the relatively sufficient supply of water. It is possible that cultivation levels in the rice planting areas may be close to 100% during the rainy season. Thus, most farm machines are required during the main growing season from September to February and, hence, the demand for machinery hire services is higher during the rainy season.

The volume of seasonal work done by the various types of machines managed by hire services groups is presented in table 2. The size of the working area varied across machines during the season. Rotary tillers topped the list at 10.14 ha, followed by moldboard plows (8.32 ha), and hydro tillers (8.15 ha). The sizes of these working areas were lower than the national range of 20 to 30 ha. The working areas for cultivators and water pumps during the season were about 1.86 ha and 5.5 ha, respectively. There was low demand for cultivators that are specifically used to plow dry land for vegetable cultivation because only about 20% of group members owned dry land for vegetable crops. Further, the working area for power threshers during the season was 16.22 ha (equivalent to 64.88 Mg), which is lower than the national average of 33 ha with 25 working days per season. The seasonal working area (owned by group members) for RMUs was 5.56 ha (equivalent to 22.25 Mg). A complete record of the area worked on for non-members was not available.

According to figure 4, the coverage area of each group worked by tillage machines varied from 6% for Tani Bersama to 100% for Karya Indah; the average for the

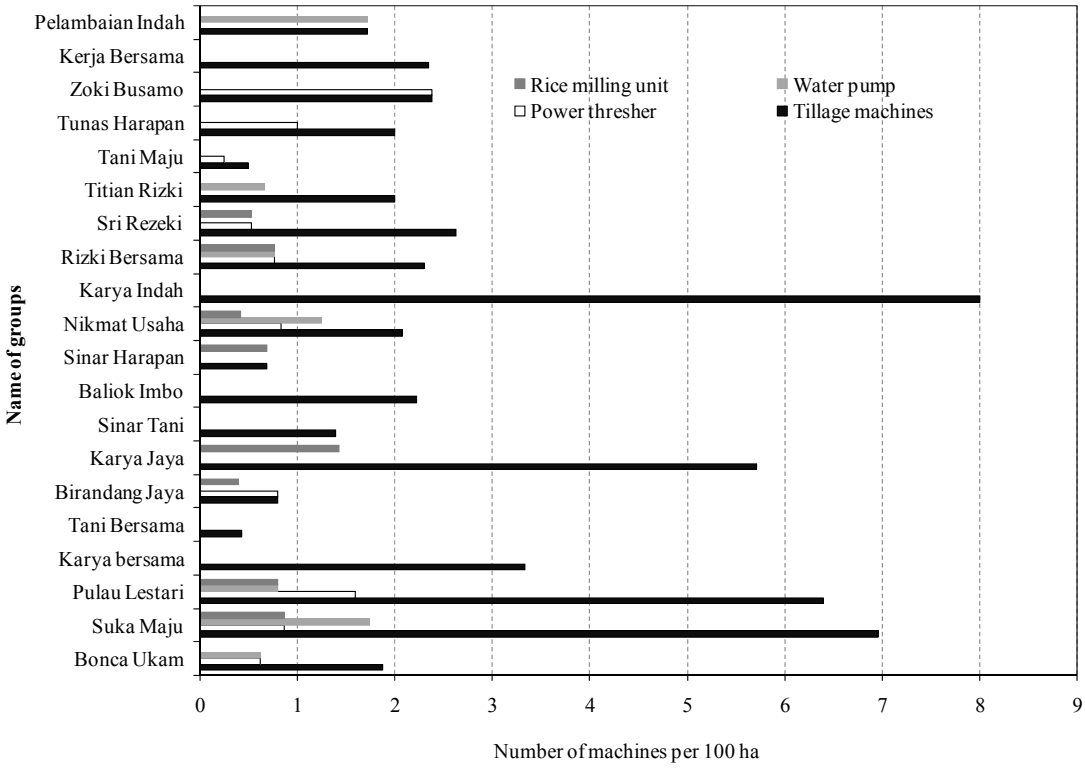

Figure 3. Estimated number of farm machines per 100 ha of group coverage area.

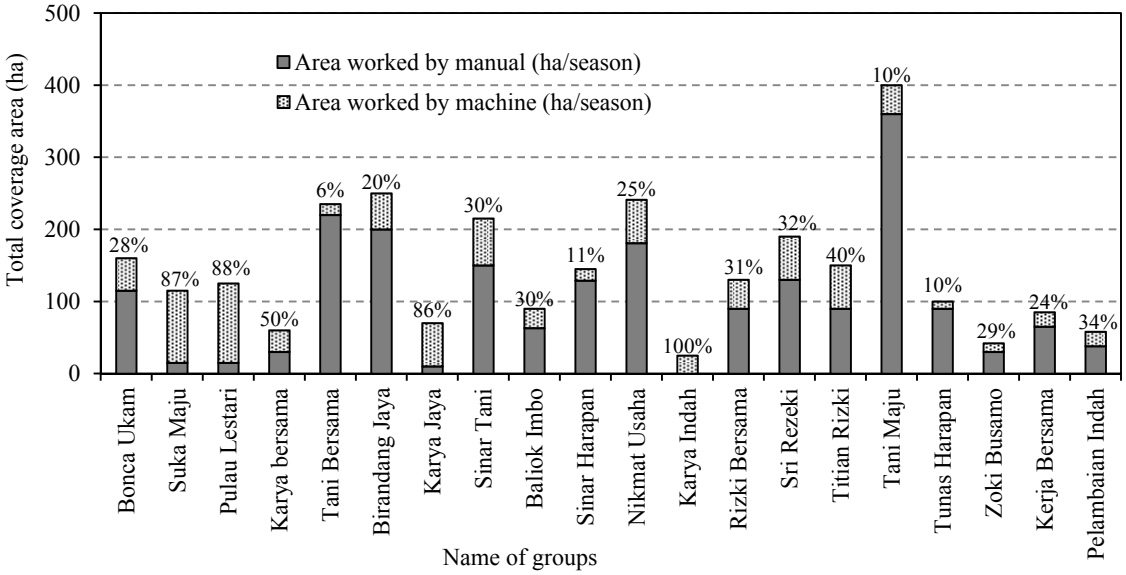

Figure 4. Group-wise coverage area worked by tillage machines.

sample was 39%. The coverage area worked by other machines such as water pumps, power threshers, and RMUs was much smaller, as illustrated in figures 5, 6, and 7. In the case of tillage machines, the small working area was a result of short working days per season, limited number of machines owned by the group, small size of the paddy fields, and low working capacity. The working days for the farm machines ranged from 15 to 25 days per season, except in the case of RMUs. Although the RMUs were available throughout the season, their utilization remained low at 3.63 h/day. The average seasonal working days and daily working hours of the various machine types are presented in table 2. The seasonal working days of the group machines were lower than the national working days per season at 50 to 60 days for two-wheel tractors, 50 days for water pumps, and 25 days for power threshers. One of the important reasons for the short working days was the delay in the rice growing season. The late rain fall (a result of climate change) caused many farmers to frequently postpone the growing season.

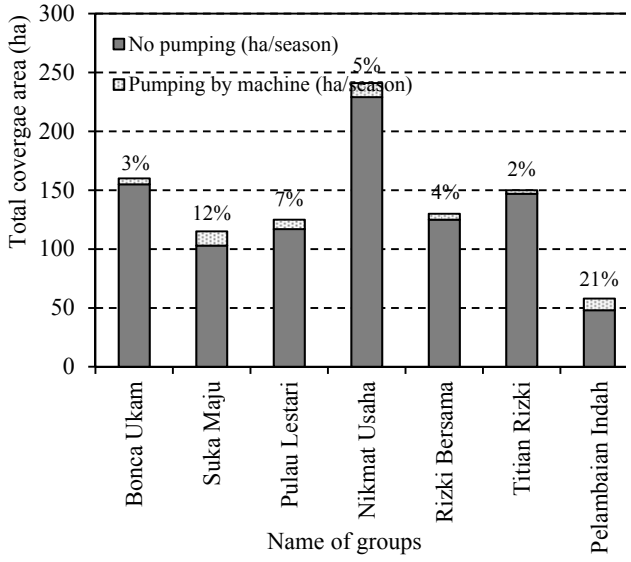

Figure 5. Group-wise coverage area pumped by water pumps.

Water pumps were used by operators when the supply of water from the irrigation canals was not sufficient for tillage operations. Tillage operations require adequate soil water to facilitate tillage. Therefore, a pump will not be required if the water supply is sufficient. As per figure 5, the coverage area worked by the available water pumps was low, ranging from 2% for Titian Rizki to 21% for Pelambaian Indah; the average for the sample was about 8%. Discussions with operators revealed that the demand for water pump hire services was low during the rainy season.

The power thresher has become more important than the pedal thresher for the farmers in the survey area. The number of power threshers in the group was not adequate enough to thresh the entire coverage area of the group members. As per figure 6, the working area worked by available power threshers varied from 3% for Tani Maju to 38% for Zoki Busamo and is based on the assumption of local rice yield of 4 Mg/ha. Around 16% of the coverage area was worked by power threshers and the remaining 84% was worked by pedal threshers or other manual tools. Besides the limited number of machines owned, the use of pedal threshers and traditional methods by farmers was also the reason for the low coverage area. Although pedal threshers and traditional methods (e.g., beating a bunch of panicles against a wooden board) are becoming increasingly unpopular among farmers, many farmers still own such equipment and use it for threshing rice. Even though it was considered impractical to use such equipment due to their high energy consumption, the farmers deemed them the most economical.

The number of RMUs managed by hire services groups was very limited, with only one machine per group. The

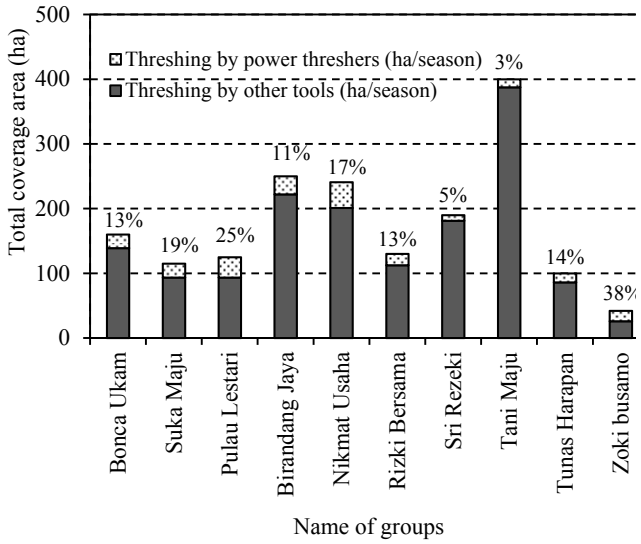

Figure 6. Group-wise coverage area worked by power threshers.

machines were small (less than 25 hp), with capacity of 550 kg/h on average (table 2). Yet, most of the machines remained under-utilized (less than the machine capacity). Based on the earlier assumption for rice yield, the coverage area worked by RMUs ranged from 2% for Sri Rezeki and Nikmat Usaha to 21% for Karya Jaya. Thus, the coverage area remained low even though the machines were available for making services throughout the season (fig. 7). Only about 4% (5.56 ha) of the coverage area of the group was worked by owned machines and the remaining 96% (133.44 ha) was worked by other individual machine hire services. The reason for this is that it is traditional to stock paddy and mill it for immediate consumption. In addition, the presence of some private RMUs/hullers that offered the same service in the area influenced the demand for milling services from the hire services groups.

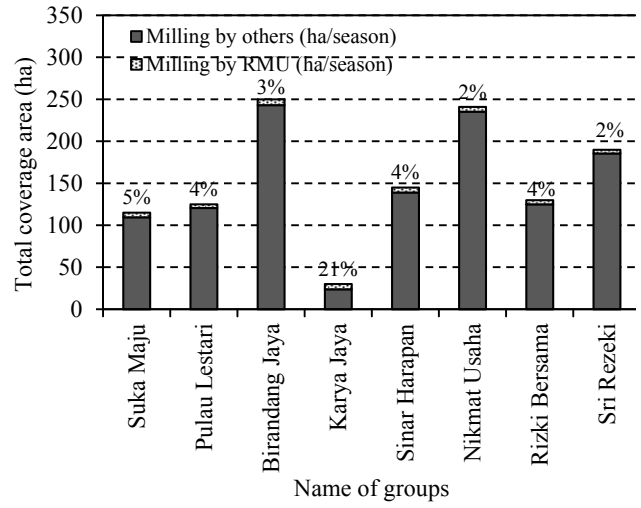

Figure 7. Group-wise coverage area worked by RMUs.

Table 3. Average custom rate of hire services for various types of farm machines.

Machine Type	Measurement Unit	Custom Rates (Thousand) IDR	Custom Rates (Thousand) USD[a]
Rotary tillers	Ha	1,123	0.118
Moldboard plows	Ha	1,082	0.114
Hydro tillers	Ha	1,050	0.111
Cultivators	Ha	1,186	0.125
Water pumps	Ha	200	0.021
Power threshers	Mg	223	0.023
RMUs	Mg	259	0.027

[a] USD 1 is equivalent to about IDR 9,500 based on the average exchange rate in 2012.

CUSTOM RATES

The custom rates prevailing in the survey area are presented in table 3. These rates varied across hire services groups depending on the machine and operation type. The rates for tillage operations were on a per-hectare basis, while those for threshing and milling operations were on a per-metric ton (Mg) basis. Among the tillage machines, the rates for the cultivator were the highest, while those for the hydro tiller were the lowest. The rates were collectively determined by the manager, the group leader, and the village chief who represented the local government. Fuel and spare part costs and operator wages became the basic considerations for determining custom rates. Thus, most farmers approve of and can afford the custom rates.

The custom rates for tillage operations varied from IDR 900-1,500 thousand/ha (USD 95-158); the average rate for the sample was IDR 1,110 thousand/ha (USD 117). The largest rate for tillage operations was cultivators of about IDR 1,186 thousand/ha (USD 125) and the lowest one was hydro tillers of about IDR 1,082 thousand/ha (USD 111). The rates for pumping operations were the lowest at about IDR 200 thousand/ha (USD 21). The rates for threshing and milling operations were about IDR 223 thousand/Mg (USD 23) and IDR 259 thousand/Mg (USD 27), respectively. The custom rates varied due to differences not only in the type of machine and operation, but also the land conditions (weed and water supply conditions) and the distance between the field and the hire services center. Therefore, the rates will likely be higher in some cases and lower in others. For instance, the rates were higher for heavy weed and dry soils. In addition, rates were also higher for long distances (usually more than one kilometer) between the field location and the hire service center.

The service charge according to the above custom rate is paid by farmer users in two parts - 50% in advance (first payment) and 50% post job completion (second payment) The first payment is made for purchasing fuel, lubricants, and spare parts replacement (if any). In some cases, farmers delayed the second payment until harvest was complete due to limited cash flow. There was no fine for delayed payments, but this delay led to financial problems for the operational hire services groups. Hence, it is important that the group manager set aside a part of the operational profit as a cash reserve fund in anticipation of delayed payments. As a final note, the custom rates reported here can be used by machinery managers and also custom operators as a guide for financial planning and budgeting in order to

achieve goals. Farmers who purchase farm machines and want to offer custom work to others can use these rates as a guide as well.

CONCLUSIONS

Hire services groups comprised 3 to 11 farmer groups, and each farmer group comprised around 10 to 25 farm owners. The hire services group had a simple organizational structure and managed one or more machines of various manufacturers and types. The machines included rotary tillers, moldboard plows, hydro tillers, cultivators, water pumps, power threshers, and RMUs. Among these, the ownership of tillage machines was dominant. The available machines could not cater to the entire coverage area owned by the group members. The average coverage area worked by tillage machines was about 38%, by water pumps was 8%, by power threshers was 16%, and by RMUs was 6%. The overall seasonal work of the machines appears to be low due to short working days per season, limited number of machines, low working capacities, and small size of paddy fields. The custom rates were a function of the machine and operation type, the land conditions, and the distance between the field and the hire service center.

Based on these results, the following suggestions are proposed:

1. All operators must be trained in order to improve the technical knowledge and skills that are required for correctly operating and maintaining the machines.
2. The working days per season must be increased in order to cover more seasonal working areas.
3. More machines are required per group in order to work the entire paddy field area owned by the group members.
4. The group managers must maintain a reserve fund to finance machines for the next operational season.

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