PADDY HARVEST TECHNOLOGY AND CHANGE IN ECONOMIC SYSTEM OF FARMERS IN INDONESIA

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ABSTRACT

Application of the paddy harvest technology (power thresher) in lowland rice crop systems influenced the economic life of farmers, i.e., unequal income received peasant society. The purpose of the study examines the application of the paddy harvest technology and their effects on the economic life of farmers. Data collection methods used in surveys, interviews and questionnaires. Data were analysed with cross-tabulation and explorative. The study shows that the application of technological changes affects the rice harvest sharing system, manpower recruitment, diversity patterns of division of labour and farmers' livelihoods. Profit-sharing in traditional harvesting systems 8:1, 9:1, 10:1, changed to 7:1 after the system power thresher. Recruitment of manpower in the traditional system is limited to family/kinship, to be unlimited and open to anyone who wants to be involved in harvest activities and there is specialized employment. Due to the application of technology the paddy harvest, farmers' income increased by 44% (rupiahs/year). Variety livelihood of workers harvesting varies; small traders, rickshaw drivers, carpenters/rock, motorcycles and mechanic.

Keywords: Power Thresher, Paddy Field, Harvest System and Sharing System.

INTRODUCTION

Application of power thresher technology in paddy harvesting system, on the one hand, the beneficial owner of the field because of increased production can be achieved, but on the other hand-harvest laborers increasingly unequal income because of the strict system of profit-sharing regulations Ahmed et al., (2010). So even with employment opportunities in rural areas is increasingly limited, particularly in the agricultural sector because labour has been replaced by mechanical devices (Frimawaty et al., 2013) (Ruttan, 2002). Labour that is not absorbed in the agricultural sector, there is no other way to rely on jobs outside the agricultural sector. But this has not been fully guaranteed for education and skills levels, in rural communities is still low. Other effects caused by the presence of power thresher technology are the emergence of economic institutions and the shifting social values that exist in traditional institutions before.

Assessment of the application of technology made the paddy harvest because of the effect it creates Vandevenne et al., (2012), especially on aspects of unequal income received by a layer of farming communities. In Sereang village, one of the rice producers in Sidarap Regency, South Sulawesi, Indonesia. Paddy harvest system changes to the system cause power thresher sharing system (Nath et al., 2017; Tiryakian, 1992), manpower recruitment and division of labour changes (Devkota et al., 2017; Rahardjo, 1986; Throsby, 2001). Sharing system which was originally not strictly be a tight, labour usage harvesters who formerly limited to family/kinship, to be unlimited. This is the implication of technology paddy harvest.

There was some preview study in paddy harvesting technology and economic change. Yunus et al., (2016) did the study in socio-technical and institutional changes in rice farming

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during the post-green revolution in Indonesia. They found the sociotechnical change encourages an increase in agricultural production which creates a gap between groups and the less fortunate in a village and which is included in the social sustainability of rice agribusiness. Sheikh et al., (2003) studied the influence of technology by farmers in the rice. They concluded personal requirements such as education, lease status, attitude to the risks implied in the use of new technology and contact with extension agents are the main factors influencing adoption. The next study was Ito (2002), his research about the transformation of economic and agrarian structure concluded that changes in technology and commodities from rice to shrimp affect women from poor households very intensively, are harmless, and are low paid. Different the preview of the research, the original of the study aimed to know the working system of paddy harvest technology and their effects on farmers' economic system is associated with changes in the paddy harvesting system. It particularly, aimed to find the profit-sharing system, manpower recruitment, division of labour, and patterns of diversity of livelihood of farmers from the introduction of the paddy harvest technology (Tolentino, 1998; Popkin, 1979).

RESEARCH METHOD

Place and Time

The study was conducted in the village of Sereang, District Maritengngae, Sidrap, South Sulawesi, Indonesia. Basic research site selection considerations, among others; Sereang Village is a village where 92.65% of the population are farmers. Cultivated crops are rice, and 70% of paddy has been applying technology in power thresher threshing paddy. Also, the Village Sereang as one of the paddy-producing village in Sidrap. The study lasted for three months from March 2019 until June 2019.

Sample Determination

This study is a survey with 40 people the number of respondents, obtained from 6 cases of group power thresher; in the past have experienced the traditional harvest system (ani-ani and sickle/rock). The sample of 40 persons elected in proportion to the harvest workers, as many as 22% of each group consisting of a total of 181 people. In support of the survey data, research-supported qualitative analysis and selected case studies of three informants who worked on the harvest system power thresher and had experienced the traditional harvest system (ani-ani and sickle/rock).

Data Collection

The study was preceded by secondary data collection, documentation of data concerning such areas, population, territory potential, vast paddy fields and farm mechanization equipment, obtained from district offices and related agencies. List the names of members of the 6 (six) groups of power thresher, obtained from the heads of the group.

Primary data collected includes information on a variety of variables to be studied, obtained from interviews with respondents, namely:

1. Use of the paddy harvest technology,
2. Changes in the profit-sharing system, manpower recruitment and division of labour,

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3. The pattern of diversity of livelihood of farmers.

Data collected by two methods, namely:

1. Quantitative data was conducted interviews using structured questionnaires and
2. Qualitative data is the observation (observation), in-depth interviews and life history records.

Data Analysis

Analysis of the data used to see the connection with the use of technology, changes in the paddy harvest sharing system, manpower recruitment and division of labour is a cross-tabulation, where the paddy harvest technology as an independent variable and the change in the profit-sharing system, manpower recruitment and division of labour as a variable affected.

The relationship between the use of the paddy harvest technology with diversity patterns of livelihood of workers harvesting used cross-tabulation analysis. Use of the paddy harvest technology as variables influence patterns of diversity and livelihoods as variable harvest workers affected.

RESULT AND DISCUSSION

Overview of Research Sites

Sereang Village is located in the capital district Maritengngae and +5 km from the city Pangkajene Sidrap, and + 202 km from Makassar city of South Sulawesi province in Indonesia, with an area of 10.85 km. The total population of 2920 people consists of 1291 men and 1629 women. Daily activities of residents 92.65% from farming, the remaining 2.83% of civil servants, craftsmen 0.52%, 2.35% traders, farmers mechanic 1.55% and 0.10%.

Seeing the high percentage of community activities in farming activities, it should be accompanied by the implementation of new technologies in the production process and post-harvest. The main commodities traded food crops are paddy fields with a production of 2655.5 tons per year (a planting of 5650 hectares). Other commodities are 5250 tons of corn, sweet potatoes, and 50 tons, 225 tons of cassava, peanut 37.6 tons and 35 tons of green beans.

Agricultural and industrial machinery consists of paddy milling machine (power thresher) 7 units, 53 units of tractors and machinery processing of agricultural products other 4 units. Agro-processing machines (power thresher) has contributed not a little for farmers. The presence of farm machinery to organize small farmers and harvest workers in a labour organization in the form of a group called the dross, the local term pa'dross. Dross groups can work to move from one location to the location of the next harvest is not limited in Sidrap, but this group is up to the District Palopo to do the work of harvest, depending on the job orders received by employers dross.

Sharing System

Changes in harvest system are changing from harvesting system ani-ani become sickle/slam, and then switch to a system of crop power thresher. Formerly on the traditional harvest system, sharing system is 8: 1 and 9: 1. This harvesting system took place before the year 1981. Year Period 1981 - 1988, ani-ani harvesting system replaced the system with a bunch of

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sickle/slam, profit-sharing system 10:1. The next period of 1989 to the present, sickle harvesting system/rock was replaced by a system of crop power thresher; the results are valid 7:1.

The main factor underlying the transition from brown to blow and power threshers are attributed to the paddy technology in the form of improved varieties, as well as population pressures. Suppress the population growth areas of arable land is limited, then the number of landless workers and farmers with land tenure that is too small for a living, be increased. To guarantee a minimum income for a living, they flocked to rice fields are harvested, not only in his village but also outside the village, as seasonal workers who move around.

System power thresher is an innovation in the paddy harvest system that allows farmers to establish and maintain supervision of harvesting their crops. There is a tendency of decline in wages earned by workers harvesting crops after the use of power thresher. So even with wage equalization increasingly uneven harvest, before the use of power thresher which is on the use of harvesting equipment ani-ani, in local language called "*Massampa*" (traditional harvesting tool), yields obtained wages based on the ability of harvesters to collect the harvest, now changes occur with the use of power thresher, wages generalized to all harvesters harvest, depending on the type of labour activity.

Other changes that occur, namely in the first harvest wage system in the traditional harvest system (ani-ani and sickle/rock) profit-sharing system applicable; 8:1, 9:1, and 10:1, depending on the agreement between the owners of fields and harvesters, after a power thresher sharing system 7:1. Harvest wage is given to the traditional harvesting system (ani-ani and sickle/rock) bond shaped paddy (bacon), in local language "*website/besse*" and grain. At system power thresher, more harvest wages given in the form of cash. If the wage is given in the form of the grain harvest (natural), harvest workers still carrying cash back home, they immediately sell the grain to pa 'Pete-Pete (middlemen who directly purchase grain in the fields or on the edge of the road that passed through harvesters).

System power thresher harvest is considered as an innovation used by the farmer-owners to reduce the wage rate of the harvest to a level equal to the wage rate in the market. Formerly, the traditional harvest system (ani-ani and sickle/rock), when labour is limited to family/kinship and lower paddy yield, the yield of paddy eighth, ninth and tenth in the traditional bawon system may commensurate with the level of wages in the market, close to the marginal labour. However, opening job opportunities for everyone to be involved in harvesting work, whether originating from inside and outside the family/kinship and increasing paddy yield in power thresher, 1/7 from the results that in essence would be larger than the wage rate in the market.

Application of the paddy harvest technology in the Village Sereang brought changes in the form of profit-sharing system paddy farmers. In a system of power thresher, wages harvest is managed by the entrepreneur power thresher Table 1.

Table 1
SHARING SYSTEM OWNER RICE AND EMPLOYERS THRESHER

No.	Description	%	Kg	Rp
1.	Owner Rice	85,71	5.569	13.922.500
2.	Employers Thresher	14,29	928	2.320.000
	Totally	100	6.497	16.242.500

Source: Primary Data, 2019.

a. Owners and entrepreneurs field power thresher 7: 1 (85.71%: 14.29%).

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b. Engine 7.5-powered power thresher PK, with a capacity of 1083 kg / h, the number of hours worked 6 hours/day. The number of workers and operators harvester 40 people. Total production per day = 1083 kg x 6 hours / day = 6498 kg / day.

For the owners of fields and employers' power thresher Table 1, is a profit-sharing system that is used in power thresher 7:1 (85.71:14.29), where the local rice price rupiahs 2.500/Kg. Section 14.29% obtained by the entrepreneur power thresher, then use to finance operations and labour harvesting machine as shown in Table 2.

Table 2
ENTREPRENEURS SHARING SYSTEM THRESHER AND HARVEST LABOUR

No.	Description	%	Kg	Rp
1.	Fuel	5	46	116.000
2.	Employers Thresher	20	186	464.000
3.	Operator (7 org)	5	46	116.000
4.	Harvest Labour (40 org)	70	650	1.624.000
	Totally	100	928	2.320.000

Source: Primary Data, 2019.

For results of service received Table 2 divided by the operator of 7 people involved in harvest work. So even for the results obtained by harvest workers, divided into 40 people involved in the work of harvest per day.

Based on Table 1 and 2 seen sharing systems on the power thresher, paddy field owners and entrepreneurs' power thresher obtain greater revenue, compared to before the application of power thresher. Hand harvest workers into less revenue than before the power thresher, because at the time of traditional systems of harvest workers often earn additional wages from the owners of paddy crop, which is currently not found again in power thresher. Changes in the wage system will further impact on farmers' income, especially labour income yields, shown in Table 3.

Table 3
HARVEST LABOUR BASED REVENUE-SHARING SYSTEM

RH Technology Sharing System	**PT Before (Rp)**	**PT After (Rp)**
SA 1 (n=21)	604.500	870.000
SA 2 (n=19)	547.500	965.000
SS (n=40)	753.000	915.000
Average	635.000	916.667
Notes: *SA 1: Sharing System Ani-ani (8:1); SA 2: Sharing System Ani-ani (9:1); SS: Sharing System Sabit (10:1); RH: Rice Harvest; PT: Power Thresher*		

Source: Primary Data, 2019.

Table 3 shows the status of farmers' income workers harvest increased by 44% if measured in nominal terms (rupiahs/year). When measured from the purchase price of grain (local), the traditional harvest system (ani-ani and sickle/rock) in the past is still more profitable; in the past between 403 to 502 kg/year, after a power thresher 366 kg of grain per year.

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Manpower Recruitment

At harvest system ani-ani, who recruited manpower limited to family/kinship. In sickle harvesting system/slam open the labour recruited to receive harvesters who come from outside the village, but still give priority to family/kinship. At system power thresher, recruitment is open to anyone who came to harvest Table 4.

Tabel 4
RECRUITMENT OF PERMANENT LABOUR

RHTecnology Recruitment TK	PT Before (%)	PT After (%)
Kinship	65	52,5
Neighbour	20	30
Outside Village	15	17,5
Totally	100	100

Source: Primary Data, 2019.

The results shown in Table 4 shows that the recruitment of workers after the application of power thresher harvesters still consider family/kinship, although there is a change but not significant because the changes are only at 12.5%.

At system power thresher, the shape dependence of harvest labour for landowners will not take place as in the traditional harvesting system (ani-ani and sickle/rock), where the landowner (patron) who have power over land and credit sources to give protection to workers harvest (clients) of economic uncertainty. This is because the system of crop power thresher, which became the patron, is a businessman crop power thresher and workers rarely or even never again associated with wetland owners who become their patrons first.

Entrepreneur power thresher (patron) and harvest workers (clients) interact with each other is limited to work in the rice harvest, except for workers who still have ties harvest family/kinship with entrepreneur's power thresher, the interaction can continue beyond the harvest work. Due to limited relationship only when the work of harvest, the harvest workers who do not have family ties/kinship with power thresher entrepreneurs find it difficult to get protection from patrons. For them, the presence of power thresher makes their position worse and did not give a significant advantage, both in terms of economic and social.

For owners of the fields, presence in the Village of power thresher Sereang makes his position improved. Families who have landed in the amount of more than subsistence needs have a surplus that allows them to take advantage of commercial opportunity and engaged in activities such as transportation, brokering yields, and lease engine power thresher.

Division of Labour

System power thresher requires the division of labour of the people involved in harvest work. Working system of technological power thresher is a group, in a group of members 30 to 40 people, equipped with 4 to 7 people who control the machine operator.

Changes in the workings of the system affect the income of farmers harvesting the paddy fields, particularly for harvest workers. In the traditional harvest system (ani-ani and sickle/rock), harvesters work individually have not encountered any labour specialization of labour to harvest. Another case after power thresher, specialized work of the harvesters has seen, harvest work done in groups; there who became head of the group, machine parts and labour. Chairman of the group assigned to find the location of harvest and is responsible for the implementation of the

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harvest. Duty engine parts start the engine, put the paddy and stir it into the machine, holding a sack and put the grain into a sack. Labour of scythe mowing only limited duty.

Chairman of the group and when the mowing machine parts, they also participated mowing, they get extra fees from an additional job as head of the group and part machine. As a result, there are differences in the level of income of harvesters that have a special duty and the harvesters are only mowing only. Income differences can be seen from two sides of the revenue earned prior to harvest laborers is on the system power thresher harvest sickle/rock, and incomes of workers after a power thresher harvests Table 5.

Table 5
REVENUE BASED ON DIVISION OF LABOUR

RH Technology Division of Employment	PT Before (Rp)	PT After (Rp)
Ket. Group (n=1)	960.000	1.267.500
Operator (n=4)	1.012.500	1.227.500
Labor of scythe (n=35)	718.500	867.500
Average	897.000	1.120.833

Source: Primary Data, 2019.

The results in Table 5 shows an increase in harvest labour income by 25% if measured from the nominal (count rupiahs/year). When measured from the local grain purchase price, the traditional harvest system in the past is still more profitable; in the past (the harvest scythe/rock) 502 kg of grain per year, after a power thresher 366 kg grain/year.

Institutional Changes in Society

Changes in technology, the paddy harvest in the village of Sereang, not only reflects the desire of farmers to enhance their gain but also a consequence of government policy in the implementation program to improve food crop production to reduce yield losses to a minimum and social interaction in rural communities. Finally, more and more evident that what determines the level of these developments is the "*willingness*" and "*ability*" of farmers? The willingness of farmers is determined by profit considerations in the selection of harvesting systems, while the ability of farmers depend on income derived from the electoral system as a whole harvest. The second interaction creates a "*willingness*" of farmers to use it into the farming system. A system was chosen not only because the system is economically beneficial to individual farmers, but also because the system was received to social and institutional rural communities.

Institutional change is the change in value due to the change of behaviour (patterns of relationships) in the harvest work. Institutional changes associated with harvesting systems such as profit-sharing system, manpower recruitment and division of labour changes. Institutional changes in harvest substantially remodel the old order that has been established in the village. This is due in addition to the entry of new technologies, as well as the development needs of the population and forced the abandonment of old ways. This fact is following that proposed by Hayami & Kikuchi (1987), that changes in the provision of resources and technology thus has led to tremendous pressure on rural institutions that have been formed in a state that is relatively fixed. Also, farmers see that with the application of new technologies that remodel the old institutions will provide greater benefits than the old order.

In the village Sereang, the presence of the paddy harvest technology as a solution to save the paddy production. Before applying power thresher, almost in every season of planting harvesting overwhelmed workers to harvest, which occurs later when the rainy season arrives,

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many broken paddies. This is because underwater and not dry. Technology power thresher was introduced in the Village Sereang 1994, and immediately at that time that his landowners, especially farmers are interested in using technology broad power thresher. As a result, the blow or the location of the study is known as sickle/slam (massampa) gradually abandoned by the owners of the fields, and 70% of paddy cultivation, harvest handling is done with a power thresher.

Thus the harvest workers are loyal to the system sickle/slam (massampa) slowly began to move into the harvest labour-power thresher to identify himself or herself into the group called "*group of dross*" or "*group of power thresher*." Displacement of workers harvesting of sickle/slam into the dross causes a pattern of patronage of the automatic switching of harvest workers was the owner of a rice field to the owner/entrepreneur power thresher.

Diversity patterns Livelihoods

Effect of paddy crop technology on the pattern of livelihood diversity can be seen with the increase in other types of livelihood outside of harvest workers such as petty traders, carpenters, masons, rickshaw drivers, motorcycle taxi drivers and mechanics. Unlike the traditional harvest system, the limited livelihood of workers and farmers harvest Table 6.

Table 6
HARVEST WORKERS LIVELIHOOD PATTERN

RH Technology The Pattern of MP	PT Before (%)	PT After (%)
LH	27,5	25
LH + 1 LV	72,5	50
LH + 2 LV	-	25
Total	100	100

LH: Labour Harvest, LV: Livelihoods, RH: Rice Harvest, PT: Power Thresher

Source: Data Primer, 2019.

On the status of harvest, workers have diverse livelihood patterns, i.e. 50% of adding one type of livelihood and 25% of adding two types of off-farm livelihoods. Livelihoods of the targeted workers outside the agricultural harvest include carpentry, mechanic, and motorcycle taxis.

Village residents Sereang dependence on livelihoods as farmers and farmworkers in traditional harvesting systems illustrate that local people used to keep the life of the farming and wage earners in the land of others. This is because the livelihoods of those it regarded as a secure livelihood for them and provide a minimum income to meet the needs of family life. Also, opportunities and employment opportunities outside agriculture is relatively small and does not ensure the survival of members of the community in general. For farmer's rice grower who always found himself dependent on the mercy of nature such as rain-fed areas of high risk, and then it will work more cautious and not jeopardize their livelihoods.

For farmers with a very large income, land area, crops are plentiful and job opportunities outside agriculture lots, to the above, are not a constraint. But for subsistence farmers and farm workers with very low incomes, little land, large families, crops of small, off-farm employment opportunities are limited, this is a constraint. Thus, routine work that they do subsistence can provide adequate results for the fulfillment of their basic needs of the family.

Small farmers and farm workers still working on the land will choose someone else or become wage workers (farmworkers), compared to off-farm work that provides a high income,

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but do not give a guarantee for long-term survival. This is because there is no guarantee of economic and social, in other words, a living minimum level guaranteed by the landlord (patron). However, this situation became untenable due to the presence of power thresher, although off-farm employment opportunities are limited and cannot provide assurance of life in the long run, the small farmers and farm workers are still trying to provide additional revenue for the results obtained from working on other people land jobs and wage earners (workers harvest) is insufficient for the needs of family life. Thus, it means jobs in agriculture are a basic job and off-farm employment is additional work for them.

Finally, there are many networks and institutions outside the family environment that can and often serves as a shock absorber during economic crises in the lives of farmers. A client will be assisted by relatives and other relatives, to overcome a difficult period due to falling sickness or crop failure, as well as the urgent needs of the community members who need it.

Relatives are usually obliged to help a close relative who was in difficulties. This is still part of the intimate world of the peasantry in which shared values and social controls to strengthen the spirit of cooperation. The bond between the patron and the client is a form of social insurance that is ubiquitous among farmers.

CONCLUSIONS AND SUGGESTIONS

Application of the rice harvest technology on paddy harvest systems bring substantial benefits in terms of manpower and time effectiveness and increased revenue by 44%, if measured in nominal terms (rupiahs/year) with profit sharing system 7:1. Economically, the wages system is no more beneficial than the traditional harvesting system for harvesting wages received in-kind 502 kg/year, compared to the system power thresher 366 kg/year. Due to the application of the paddy harvest technology, workers' livelihoods harvest varies, becoming; small traders, rickshaw drivers, carpenters, masons, motorcycle taxi drivers and mechanics.

Sharing system power thresher 7: 1 should be revised, aiming for the real wage received by workers harvest exceeds the wages earned in the traditional harvest system. The calculation of the profit-sharing system 5:1 should be considered because the relative harvest will not harm workers. Also, there needs to be a policy to formalize the system for results and creating other employment opportunities that have high economic value.

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