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### Status of farm mechanization on rice production: A case study of Banganga municipality, Kapilvastu, Nepal

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#### Abstract

Escalating outmigration of youths for foreign employment has created shortage of labor in agriculture. This situation demands the mechanized agricultural practices. To assess the status of adoption of farm machineries in rice production, a study was carried out in Banganga Municipality of Kapilvastu district in 2018. 70 rice growing households from purposively selected rice zone of this district were randomly surveyed to collect information regarding adoption of farm machinery in different stages of rice production. Household survey, focus group discussion and key informant interview were major primary sources of data collection while secondary data were collected through published reports, books and research papers. It was found from this study that majority of the farmers used rotavator, cultivator, tractor, thresher and combine harvester during cultivation of rice. There is no use of machinery at the stage of nursery preparation, rice transplantation, weeding, and fertilizer application. Farmers use thresher and tractor for threshing purpose. Most of the farmers (65.7 percent) get information related to farm machinery through DADO. Majority of the farmers (52.9 percent) has easy access to farm machinery. Most of the farmers (84.3 percent) are satisfied with the performance of mechanization. 81.4 percent, 15.7 percent and 2.9 percent of farmers asserted loss of time, loss in time, increase in cost of production and lower production in the absence of farm mechanization. PMAMP rice zone and other stakeholders should bring new farm machineries for rice transplanting, weeding and fertilizer application and develop the package of practices of mechanized rice production to increase its productivity, profitability and efficiency.

**Keywords:** outmigration, labor scarcity, machinery, profitability, efficiency

#### Introduction

Agriculture is the pillar of Nepalese economy. It provides employment opportunities to 60% of the total population and contributes about 29.4% in the GDP (MOF, 2018). Rice is the most important staple food of Nepalese people that contributes nearly 20% to the Agriculture Gross Domestic Product (AGDP) and 7% to the GDP (MoAD, 2016) [5]. Kapilvastu is the leading producer of rice in Nepal. In 2017/73, 158230 Mt rice was produced in 70560 ha in Kapilvastu (DADO, 2017) [2].

Rice production involves the physical force requiring activities from land preparation to harvesting. Labor scarcity is one of the serious problems impeding the productivity of rice. Heavy outmigration for foreign employment has almost evacuated the youth forces in rural agricultural settings. On the other hand, employment of labor in rice production is both cost and time ineffective. This situation demands the mechanization of rice production to increase production, profitability and efficiency in of this enterprise.

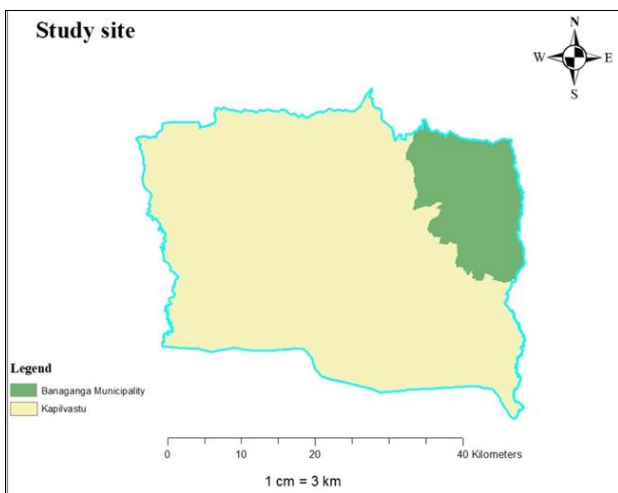
Mechanization is the process of using machinery to simplify the work of agriculture. The proper utilization of time by the farm mechanization prevents the grain loss as well as the farmers with small landholding can use the farm equipment from the custom hiring center (Verma & Tripathi, 2015) [7]. Beside increasing the production, mechanization also encourages the large scale production and sometimes also increases the quality of farm produce (LU, 2009) [4]. Tractor is used for farm operations for the purpose of land preparations, cultivation and harvesting of crops. Rotary power tiller is light duty agricultural equipment used for tilling operation. It is affordable in price when compared with the four wheeled tractors, for the small and medium scale farmers. Other farm equipments used are crop thresher, combine harvester, disc plough, harrow, fertilizer sprayer, Sheller mill etc. Tillage operation is first to be carried which is efficiently carried with disc plough. Disc harrower is used to break the soil into small fine particles. The use of combine harvester and tractor mounted harvester

makes agricultural food production easier, economical and faster. Combined harvester for grain crops is used in three operations-harvesting, threshing or shelling (depending on the type of crop)-winnowing (blowing) and extension bagging of the crops (Folaranmi, 2014)<sup>[3]</sup>.

This study is designed to assess the status of adoption of farm machineries in rice production in rice zone Kapilvastu district. The results of this study are helpful to the policy makers to know the situation of adoption and formulate the policies to increase adoption of farm machineries in different stage of rice production to increase productivity, profitability and efficiency in rice production.

**Methodology**

The study was conducted in purposively selected Banganga Municipality which is located at northern part from Taulihawa (headquarter of Kapilvastu). According to zone profile, there were 2000 HHs member are involved in rice farming. The commercial farmers were categorized as the farmers who grew rice on the landholdings of greater than a bigha and these farmers were taken as the sampling frame. Total population commercial rice growing farmers were 500 HHs. Out of 500HHs, 70 households were selected with non-replacement simple random sampling techniques. Primary data were obtained through household survey, focus group discussion and key informant interview. Secondary information were obtained by reviewing reports from different government and non-government organization, university publication, journals and theses. Information collected from household survey, key informants interview and FGD was coded first and entered in Ms-Excel. Data entry was done by using statistical package for social science (SPSS, version 16.0) and Microsoft Excel. Descriptive statistics was used to explain the results.



**Fig 1:** Map of the study site

**Results and Discussion**

**Socioeconomic characteristics**

Table 1. represents the socio-economic characteristics of the respondents surveyed. Majority of the respondents (68.6 percent) were male. 85.7 percent of them were of

economically active age group. Majority of the respondents (70 percent) had attained school level education, few had higher level education (12.9 percent) and 17.1 percent of the respondents were illiterate. Most of the respondents (58.6 percent) live in joint family.

**Table 1:** Socioeconomic characteristics of the respondents in the study area (2018)

Socioeconomic characteristics	Frequency	Percentage
<b>Gender</b>		
Male	48	68.6
Female	22	31.4
<b>Age (in years)</b>		
<15	1	1.4
15-60	60	85.7
>60	9	12.9
<b>Education</b>		
Illiterate	12	17.1
Upto school	49	70.0
Above school	9	12.9
<b>Family type</b>		
Nuclear	29	41.4
Joint	41	58.6
Total	70	100

**Status of farm mechanization**

**Method of tillage**

It was found from the study that 72.9 per cent of the respondent use modern method of tillage and rest of the farmers used both the traditional and modern methods of tillage (Table 2).

**Table 2:** Distribution of respondents on the basis of method of tillage practices followed in the study area (2018)

Method of tillage	Frequency	Percent
Modern	51	72.9
Modern and traditional	19	27.1
Total	70	100.0

**Farm machineries used at different stages**

**Tillage**

For land preparation all the farmers used rotavator (100 percent) and cultivator (100percent). Out of 70 respondents 30 percent used spade, 21.42 percent used MB plough, 11.42 percent used tractor drawn MB plough and 4.28 percent used leveler respectively.

**Table 3:** List of equipment used during tillage operation at Banganga Municipality (2018)

Equipment in tillage	Number of farmers	Percentage
Spade	21	30.0
MB plough	15	21.4
Rotavator	70	100.0
Tractor drawn MB plough	8	11.4
Cultivator	70	100.0
Leveler	3	4.3
Total	70	100.00

The use of different farm equipments at different stages of crops in the study area is summarized in Table 4.

**Table 4:** Use of farm machineries at different crop stage in the study area (2018)

Activities	Machineries used
Nursery preparation	100% of the farmers use labor for the nursery bed preparation. There is no use of machinery at this stage of cultivation practices.
Transplantation	All the respondents transplant the rice manually. There is no use of machinery at this stage.
Weeding	Majority of the respondents (77.1 percent) did weeding manually while the remaining 22.9 percent used pesticide.
Fertilizer application	All the farmers apply the fertilizer manually.
Irrigation	67.1 percent of respondents irrigate the field by canal while 32.9 percent of respondents use boring for irrigation.
Rice processing	All the farmers use seller mill for the processing of rice at the study area.
Threshing	Majority of respondents use thresher (82.85 percent) for threshing while some of them use tractor (17.14%). Thresher is efficient and faster than that of tractor

**Institutional assistance in technology transfer  
Facilitators of farm mechanization**

65.7% of farmers got farm mechanization facilities from

neighbor while remaining others were facilitated from DADO (24.3%), PMAMP (5.7%) and NGOs and INGOs (4.3%) respectively.

**Table 5:** List of Facilitators of farm mechanization in the study area (2018)

Facilitators of farm mechanization	Frequency	Percentage
DADO	17	24.3
NGOS AND INGOs	3	4.3
PMAMP	4	5.7
Neighbor	46	65.7
Total	70	100.0

**Informants of mechanization**

Most of the farmers got the information regarding mechanization from DADO (65.7 percent) followed by agriculture service centers (24.3 percent), PMAMP (5.7 percent) and NGOs and INGOs (4.3 percent). This is supported by Carkle (2000) [1] that the essential material and equipment needed in the hill region of Nepal are promoted by government organizations, INGOs and NGOs of Nepal that help to boost the commercial agriculture through the implementation of mechanization in proper way.

**Table 6:** Informants of mechanization in the study area (2018)

Informants of mechanization	Frequency	Percent
Agriculture service centers	17	24.3
NGOS AND INGOs	3	4.3
PMAMP	4	5.7
DADO	46	65.7
Total	70	100.0

**Technical service providers**

Majority of farmers chose leading farmers (42.9%) for the technical services while 17.1% farmers seek information from DADO. Remaining others visited agriculture service center (15.7%), agro-input suppliers (12.9%), technical expert (10%) and zone (PMAMP) (1.4%) respectively.

**Table 7:** Proportion of population providing technical support to the farmers in the study area (2018)

Technical service providers	Frequency	Percent
Agro-input suppliers	9	12.9
Agriculture service center	11	15.7
leading farmers	30	42.9
technical expert	7	10.0
Zone(PMAMP)	1	1.4
DADO	12	17.1
Total	70	100.0

**Problems faced in the absence of mechanization**

Increase in the time during the production practices was the major problem (81.4 percent) followed by increase in cost of production (15.7 percent). The result showed that 2.9 percent of the farmers faced the problems of field dryness due to the lack of mechanization.

**Table 8:** List of problems of respondents in the absence of mechanization in the study area (2018)

Problems in absence of mechanization	Frequency	Percent
Loss of time	57	81.4
increase in cost	11	15.7
Low production	2	2.9
Total	70	100.0

**Access to machinery**

Majority of the respondents (52.9 percent) had easy access to machinery while other (47.1 percent) had the problem of machinery shortage in the production period.

**Table 9:** Proportion of respondents having easy access to mechanization in the study area (2018)

Availability of machineries	Frequency	Percent
Easy access	37	52.9
Difficult access	33	47.1
Total	70	100.0

**Satisfaction with the performance of mechanization**

Majority (84.3 percent) of the farmers were satisfied with the performance of different farm machinery during production practices while 15.7 percent of respondents were unsatisfied with these machineries.

**Table 10:** Satisfaction of respondents on performance of farm mechanization at the study area (2018)

Satisfaction from mechanization	Frequency	Percent
Yes	59	84.3
No	11	15.7
Total	70	100.0

**Conclusion**

It can be concluded from the findings of the study that mechanization has played the great role in rice farming in the context of labor shortage. Majority of the farmers used rotavator, cultivator, tractor, thresher and combine harvester during cultivation of rice. Thresher and tractor are used for threshing purpose. However, there is no use of machinery at the stage of nursery preparation, rice transplantation, weeding, and fertilizer application. Some of the machineries like seed driller, trans-planter reaper, mini tiller, power tiller were not introduced in Banganga municipality. Most of the farmers are satisfied with the performance of mechanization and most of the population are moderately satisfied with rice production. PMAMP rice zone and other stakeholders should bring new farm machineries for rice transplanting, weeding and fertilizer application and develop the package of practices of mechanized rice production to increase its productivity, profitability and efficiency.

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