Paddy farmers' knowledge, perception, and satisfaction on the use of farm machinery in Nepal

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ABSTRACT: *Agricultural mechanization refers to the use of different power sources as well as enhanced farm tools and equipment to decrease human and draught animal labor, improve cropping intensity, precision, and timeliness of crop input usage, and reduce losses at various phases of crop production. This research tried to assess paddy farmers' knowledge, views, and contentment with the use of agricultural machinery in the districts of Jhapa, Kapilbastu, and Kailali using a multistage purposive sample technique. The survey research method was used for the investigation. Descriptive statistics and properly constructed scales were used to analyze the data. According to the findings, respondents had only a hazy understanding (0.50) of the critical roles of agricultural machinery in rice production. The total amount of machinery on hand is moderate (0.43). The most frequent piece of machinery possessed by respondents was a tractor (0.65), followed by a knapsack sprayer (0.61). Over one fourth of the respondents (0.28) had a good image of agricultural machinery and were satisfied with its use (0.4). While respondents indicated a high amount of restriction (0.7) when it came to utilizing agricultural machinery. As a result, adopting a varied range of farm machinery should be seen positively in order to increase the commercialization of paddy farming. Farmers would be more inclined to use farm machinery if farm machinery information and skills were spread, as well as supported with grants.*

KEYWORDS: knowledge, adoption, perception, satisfaction, paddy, farm machinery, agriculture

INTRODUCTION

This study is about the knowledge, perception, and satisfaction of farm machinery used in paddy farming by farmers in Nepal. Agriculture is the mainstream of the economy of Nepal. Agriculture is the primary source of livelihood and provides employment opportunities to 60% of the Nepalese population and contributes 26.98% to GDP (MoF, 2019). Among various crops grown, major cereal crops like Rice, Wheat, Maize, etc. are dominant. Among various cereal crops, Rice is the most important and dominant in Nepal and has significant role in economic and agricultural development to reduce poverty (IBN, 2016). It alone supplies 40 percent of the food calorie intake and contributes 15.35 percent to the AGDP and 6 percent to the GDP of the country (ABPSD, 2016). Ninety percent of global production is produced and consumed in Asia (CBS, 2015).

According to statistical information on Nepalese agriculture 2019/20, the area, production, and productivity of rice in Nepal are 1,458,915ha, 5,550,878 mt, and 3.37 mt/ha respectively. The growth rate of rice is low (grain yield 2.07 %/yr) as compared to the population growth rate (2.29%/yr). So, it is very important to increase production to match with increased population for food security (MoALD, 2021)

Proper mechanization, interventions, and technical knowledge would enhance the production and productivity of rice in Nepal. Mechanization is one important aspect that can be applied in every stage of rice production (Ayandiji & Olofinsao, 2015). Poor mechanization, small and fragmented land holdings, labor shortage, and youth labor migration are the major drawbacks to better rice production. Paddy farmers only use farm machinery during harvesting and threshing at la ow level but still, there are very poor and no use of farm machinery during other stages of production. Still, farmers are not very much aware of the use of various machinery in various stages of rice production. New machinery like thresher, rotavator, cultivator, combined harvester, transplanter, etc. are very useful for rice production and can be adopted but lack of mechanization facilities and lack of awareness and training for the farmers limit the use of farm mechanization. Most of the farmers lack the required skills for the use of farm machinery and because of the high price most of the farmers neither afford nor hire those implements.

For the commercialization of agriculture, agriculture mechanization plays a significant role. Farm mechanization considers the use of improved farm machinery with power to reduce the drudgery of the human and draught animals to improve the production and productivity of rice. In Nepal, officially from the 1960s the activities and efforts to promote agricultural mechanization were started after the introduction of four-wheel tractors (Joshi et al., 2012). Then after the promulgation of the Agriculture, Mechanization Promotion Policy (2014) with the involvement of public, private, and co-operatives, the promotion of agriculture mechanization had started.

To address the major problems like the higher cost of cultivation, labor shortage, poor commercialization, and traditional practices in rice production, it is very important to imply mechanization in Nepal (Shrestha, 2012). And this also positively enhances the socio-economic conditions of the farmers in the country. Mechanization is very important and significant to increase farm size (Vanden et al., 2007). Although there is more prevalence of small farm sizes in Nepal, the trend of adoption of tractors is increasing (Takeshima and Liu, 2018).

Even the New Constitution of Nepal (2015) mentioned the provision of policy to create a better environment for farm mechanization. There are various strategies mentioned by Agriculture Development Strategy (2015) to promote farm mechanization through awareness, capacity building, taxation, and financing arrangement. Though agriculture mechanization does have positive effects, it still does have some disadvantages. Zhou and Lu (2012) mentioned agricultural mechanization may have negative effects on the environment. There are negative effects on soil compaction and stool damage results in lower yield (Pryor et al., 2017).

There is a need to increase food production to meet the increasing population from shrinking land resources. Better management of inputs and crops is significant to improve production and for that mechanization would be important so that production would be increased despite low labor availability for rice production. And greater mechanization demands high capacity, precision, reliable, and energy-efficient machinery. Because of various limitations especially lack farm labor during a critical time of various stages like transplanting, intercultural operations, harvesting, and threshing justify the mechanization in paddy cultivation. Moreover, paddy cultivation is a laborious task and requires a greater number of laborers during various stages of rice production which requires the use of available farm machinery to a great extent.
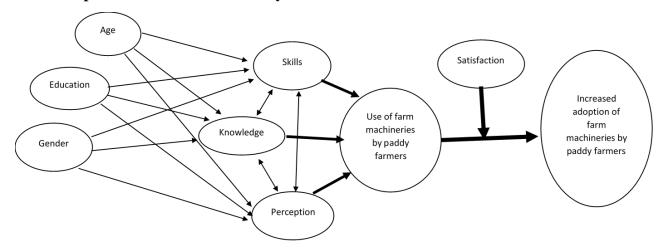
Though the interest and curiosity along with to some extent of use and adoption of farm machinery are increasing it is not gaining its pace because of the increasing trend in small landholdings, expensive machines, and poor availability of maintenance and service centers, non-availability of appropriate implements and machinery for fragmented smallholdings. Even the financial management like getting bank credit, installments, and grants are not well managed which could negatively affect mechanization.

Furthermore, the quality and the reliability of the implements or the farm machinery are not up to mark for all brands or the company and failed to gain the confidence of the farmers and forced them to follow traditional practices.

The use and adoption of farm machinery/implements are too dependent on infrastructures and services available in the rural areas. Singh (2008) revealed that efficient farm mechanization can save seeds 15-20%, fertilizers up to 20-30% time 20-30%, labor 5-20%, and can enhance cropping intensity by 10-15%, productivity by 15-20%. Verma (2008) reported that the increase in cropping intensity has been reported to be 165, 156, and 149 percent for tractor-owning, tractor hiring, and bullock operated farms, respectively.

Enormous energies had been put by various scientists, extension workers, and organizations to achieve higher production and productivity of rice through mechanization. Numerous awareness programs are needed for the farmers at the grass root level. Adequate level of other inputs like knowledge and skill are also important to consider. Keeping all those in consideration, the study has been undertaken which will provide reliable information on the knowledge, adoption level along with attitude and satisfaction of the farmers regarding farm machinery and implements used in paddy production. The findings of this study will facilitate for appropriate decisions and actions by policy makers, professionals and other stakeholders to promote farm mechanization. Therefore, the major objective of present study is to assess knowledge, attitude and satisfaction of the paddy farmers on farm machinery.

The conceptual framework of the study

Fig 1: Conceptual framework of the study

RESEARCH METHODOLOGY

A survey research design was used for the study. The districts namely Jhapa, Kapilbastu and Bardiya were purposively selected as the study site identified by Prime Minister Agricultural Mechanization Project (PMAMP) as super zone for paddy as paddy is considered the most important cereal crop in Nepal. A multistage sampling procedure was followed for the study. Districts and the respective local levels as study

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areas were identified purposively whereas simple random sampling was done for household sampling. Altogether 390 households were sampled, 130 from each district. The household survey, Focussed Group Discussion (FGD) and Key Informants Interview (KII) were the methods, whereas semi-structured pre-tested interview schedules and checklists were the instruments used for the primary data collection. Published articles, journals, and publications of other various sources were used for secondary data. Descriptive statistics and appropriate scaling techniques were used to analyze the collected data after adequately cleaned and managed. Knowledge of ICT tools was measured on yes, no upon the various types of Farm machinery used in paddy. At the same time, the appropriate five-point rating scale was developed for both perception and satisfaction upon various statements asked. Later, index values were calculated to rank the perception and satisfaction of the respondents on farm machinery used in paddy farming.

RESULTS AND DISCUSSION

Demographic characteristics of the respondents showed that the average age of the respondents was 47.62 years that ranged from 20 years to 82 years, having standard deviation of 11.79 years. The majority (54.6%) of the respondents were up to 48 years and 45.4% were more than 48 years. (see table 1). Many researchers suggested that age is one of the critical factors that plays an essential role and positively correlated with information dissemination, innovation adoption, and transfer of technologies. Old farmers are more resistant to change than the young farmers, and they hardly accept and adopt innovations quickly, as a result a slower adoption rate (Crusan et al., 1982; Habib et al., 2007).

There were 66.7% male respondents as compared to female respondents who were 33.3%. Findings revealed that 14.6% of the respondents were illiterate whereas 28.2% of the respondents only can read and write, followed by 24.1% of the respondents having education level of SLC and 15.9% of the respondents having education less than SLC, and 10% of the respondents had an intermediate level of education. (see table 1). The overall literacy rate was encouraging. Educated people gave more favourable attitudes towards agricultural skills, knowledge, and information than uneducated ones (Hassan,1991 and Habib et al., 2007). Results revealed that the average landholdings of the respondents were 0.93ha having a standard deviation of 0.76ha and ranged from 0.1ha to 5ha. The majority (82.1%) of the respondents hold 0.17 ha to 1.69ha of the land, followed by the respondents (11%) holding more than 1.69 ha of land, and then 6.9% of the respondents hold less than 0.17ha of the land (see table 1). More landholdings mean more potential to increase productivity and efficiency to adopt modern technologies. The size of land holdings plays an essential role in disseminating and adopting modern agricultural practices among the farming community. Results also showed agriculture only and livestock as the primary occupation in the study area, having 41% and 44.9% of the respondents.

Table 1: Distribution of the respondents by various social characteristics

Characteristics		Frequency	Percentage
Gender	Male	260	66.7
	Female	130	33.3
Age	Min:20yrs, Max: 82yrs	Avg: 47.62 yrs	Std: 11.793 yrs
	Young (below 48yrs)	213	54.6
	Adult	177	45.4
Educational level	Illiterate	57	14.6
	Only read and write	110	28.2
	Less than SLC	62	15.9
	SLC level	94	24.1
	Intermediate level	39	10.0
	More than intermediate	28	7.2
Occupation	Agriculture	160	41.0
	Agriculture and Livestock	175	44.9
	Skilled Occupation	9	2.3
	GO service	18	4.6
	Business	21	5.4
	Wage labor	6	1.5
	Private service	1	0.3
Total land area	Min: 0.1ha, Max: 5ha	Avg: 0.93ha	Std: 0.76ha
	Low (less than 0.17ha)	27	6.9
	Medium (0.17-1.69)	320	82.1
	High (more than 1.69)	43	11

Source: Field Survey, 2020

Results revealed that the knowledge level of farm machinery was not enthusiastic among paddy farmers. Among various machinery on various operations, farmers do have more knowledge on those machinery of field operations and harvesting than the farm machinery of transplanting, fertilizer application, irrigation, weeding and plant protection measures in all study districts. Results reveal that among various machinery all farmers have knowledge on tractor and sickles whereas most of the farmers do have knowledge on power tiller, pump set, knapsack sprayer, paddy thresher, tractor mounted thresher and combined harvester as compared to other machinery. Respondents (98.04) from Kapilbastu district were more knowledgeable than the respondents of Bardiya (72.6) and Jhapa (60.69). Nagaraj et. al., 2013 study revealed that the relationship between knowledge and adoption of farm mechanization practices was found significant. The findings show the majority of the respondents belonged to medium level of knowledge regarding farm mechanization practices in paddy cultivation (see table 2).The availability of farm machinery is positively influencing the productivity of the food grains in India. (Ramana & Kumari, 2020). The use of modern harvesting machines was very few and farmers were not very familiar with the performance of farm machinery (Chandra Nath et al., 2017). The majority of the respondents belonged to medium level of knowledge farm mechanization practices in paddy cultivation (Swamy et al., 2013).

Table 2: Distribution of the respondents by knowledge on farm machinery of paddy farming

SN	Operations	Implements	Knowledge on farm machinery			Total (390)
			Jhapa (130)	Kapilbastu (130)	Bardiya (130)	
1	Field operations	Tractor	130 (100)	130(100)	130(100)	390(100)
		Power tiller	100(76.92)	128(98.46)	95(73.08)	323(82.82)
		Cage wheel	23(17.69)	112(86.15)	47(36.15)	182(46.67)
		Peg puddler	22(16.92)	49(37.69)	16(12.31)	87(22.31)
		MB plough	21(16.15)	125(96.15)	14(10.77)	160(41.03)
		Disc plough	33(25.38)	98(75.38)	39(30)	170(43.59)
		Cultivator	62(47.69)	125(96.15)	82(63.08)	269(68.97)
		Leveler	27(20.77)	123(94.62)	120(92.31)	270(69.23)
		Harrow	42(32.31)	111(85.38)	128(98.46)	281(72.05)
		Spade	72(55.38)	128(98.46)	98(75.38)	298(76.41)
2	Transplanting	Transplanter	17(13.08)	118(90.77)	21(16.15)	156(40)
		Drum seeder	7(5.38)	25(19.23)	16(12.31)	48(12.31)
		Line marker	14(10.77)	22(16.92)	32(24.62)	68(17.44)
3	Fertilizer application	Broadcaster	65(50)	54(41.54)	93(71.54)	212(54.36)
4	Irrigation	Pump set	90(69.23)	130(100)	123(94.62)	343(87.95)
5	Weeding	Sickles	130(100)	130(100)	130(100)	390(100)
		Rotary weeder	50(38.46)	23(17.69)	61(46.92)	134(34.36)
6	Plant protection	Knapsack sprayer	86(66.15)	130(100)	97(7.62	312(80)
		Charger sprayer	22(16.92)	49(37.69)	7(5.38)	78(20)
		Power sprayer	65(50)	28(21.54)	38(29.23)	131(56.41)
7	Harvesting	Sicker	130(100)	130(100)	130(100)	390(100)
		Paddy reaper	61(46.92)	121(93.08)	38(29.23)	220(56.41)
		Paddy thresher	54(41.54)	123(94.62)	118(90.77)	295(75.64)
		Tractor mounted thresher	83(63.85)	119(91.54)	52(40)	254(65.13)
		Combined harvester	42(32.31)	122(93.85)	90(69.23)	254(65.13)
		Mean	**60.69**	**98.04**	**72.6**	**226.72**

Source: Field Survey, 2020   Note: Figures   in   parentheses   indicates percentage

Results showed that the adoption level of farm machinery of the paddy farmers was at moderate level (0.43). There is no specific difference between the adoption level of the farm machinery of the paddy farmers of the different study districts. Among different farm machinery, sickles were adopted by all farmers. Whereas tractors, knapsack sprayers were adopted by the most i.e 0.65 and 0.61 respectively. This was followed by paddy thresher and tractor mounted thresher i.e 0.37 for each (see table 3).

Sahana et al., (2018) results revealed that the characteristics of farmers' age, education, farming experience, family size, land holding, annual income, mass media exposure, extension contact, extension participation and economic motivation had a significant association with the attitude of farmers towards farm mechanization. Ayandiji & Olofinsao (2015) revealed that access to extension agents and access to

machines are the only two factor variables that have significant effect on the adoption of farm mechanization and access to credit by farmers increases the adoption attitude to mechanization.

Table 3: Respondents' distribution on the basis of adoption of farm machinery

SN	Operations	Implements	Adoption of Farm machinery			Mean Index value
			Jhapa	Kapilbastu	Bardiya	
1	Field operations	Tractor	0.48	0.80	0.67	0.65
		Power tiller	0.15	0.27	0.35	0.26
		Cage wheel	0.07	0.47	0.08	0.21
		Peg puddler	0.01	0.05	0.02	0.03
		MB plough	0.01	0.13	0.02	0.05
		Disc plough	0.13	0.03	0.10	0.09
		Cultivator	0.21	0.63	0.32	0.39
		Leveler	0.03	0.61	0.55	0.40
		Harrow	0.17	0.43	0.77	0.46
		Spade	0.24	0.72	0.62	0.53
2	Transplanting	Transplanter	0.02	0.01	0.02	0.02
		Drum seeder	0.01	0.00	0.02	0.01
		Line marker	0.00	0.00	0.01	0.00
3	Fertilizer application	Broadcaster	0.37	0.12	0.13	0.21
4	Irrigation	Pump set	0.47	0.64	0.40	0.50
5	Weeding	Sickles	1.00	1.00	1.00	1.00
		Rotary weeder	0.33	0.00	0.28	0.20
6	Plant protection	Knapsack sprayer	0.49	0.78	0.57	0.61
		Charger sprayer	0.11	0.12	0.01	0.08
		Power sprayer	0.44	0.02	0.26	0.24
7	Harvesting	Sicker	1.00	1.00	1.00	1.00
		Paddy reaper	0.24	0.13	0.25	0.21
		Paddy thresher	0.37	0.16	0.58	0.37
		Tractor mounted thresher	0.36	0.72	0.04	0.37
		Combined harvester	0.26	0.11	0.23	0.20
		Mean	**0.45**	**0.42**	**0.42**	**0.43**

The study revealed that the awareness level of the farmers regarding the role of farm machinery is moderate (0.43). The awareness of the farmers of Bardiya regarding the role of farming machinery were higher (0.51) as compared to Jhapa (0.43) and Kapilbastu (0.35). Among various roles of farm machinery, farmers were aware that mechanization is the one that deals machinery in agricultural activities along with mechanization demands more skills and it demands more capital and minimizes labor requirement. But they are less aware on the provision of grants in agricultural machinery and it is available for every agricultural activity. Farmers were not still aware on the mechanization aspect that it is possible to any type of land (See table 4).

Table 4: Awareness of the respondents on role of farm machinery

SN	Roles	Awareness on roles of Farm machinery			Mean
		Jhapa	Kapilbastu	Bardiya	
1	Mechanization deals machines in agricultural activities	0.53	0.54	0.54	0.54
2	Mechanization demands more skills	0.46	0.49	0.52	0.49
3	Mechanization demands more capital	0.50	0.46	0.54	0.50
4	Minimizes labor requirement	0.44	0.53	0.57	0.51
5	Problems of low draft animals will be solved	0.42	0.38	0.44	0.41
6	Timely completion of the operations	0.47	0.32	0.56	0.45
7	Mechanization reduces drudgery	0.44	0.29	0.56	0.43
8	Precision in usage of inputs	0.40	0.29	0.57	0.42
9	Available for every agricultural activity	0.26	0.20	0.51	0.32
10	Mechanization is possible to any type of land	0.54	0.19	0.33	0.35
11	Provision of grants in agricultural machinery	0.26	0.20	0.51	0.32
	Mean	**0.43**	**0.35**	**0.51**	**0.43**

Source: Field Survey, 2020

The perception of the paddy farmers on farm machinery was positive but only at moderate level (0.28). Among three different study districts, the respondents from Jhapa (0.41) perceived more positively than any other respondents from Kapilbastu (0.27) and Bardiya (0.17). Respondents perceived that mechanization solves the problems of low draft animals followed by that mechanization also minimizes labor requirement. They also perceived that labor gets more skills in agriculture because of farm mechanization of the paddy farmers. But they were not convinced that machines had affordable price and the technical knowledge in farmers are not enough and they are also not convinced that farm roads are good enough for mechanization (See table 5). Ayandiji & Olofinsao (2015) revealed that access to credit by farmers increases the adoption attitude to mechanization since they can afford to pay for their services and thereby increase their output on continuous bases.

Kumar et al., (2017) revealed that majority of small farmers were found to possess unfavourable attitude towards agricultural implements and machinery. Bite et al., (2015) conducted a study in Akola district of Maharashtra on attitude of farmers towards farm mechanization and observed that a majority of farmers had favourable attitude towards farm mechanization. It was observed that credit sources, sources of information, risk preferences, scientific orientation and extension contact were positively and significantly correlated with the attitude towards farm mechanization.

Thakur and Sharma (2016) studied the attitude of farmers towards modern farm machinery/tools and implements in Himanchal Pradesh. A majority of them had neutral attitude i.e. neither favourable nor unfavourable towards modern farm mechanization though they had good scientific orientation and economic motivation. Bautista et al., (2017) study concluded that farmers perceived farm mechanization in a positive way as mechanization will develop more effective farming. Majority of the farmer recognized that farm mechanization will make farming easier. Ani et al., (2018) study different factors affecting farmers' perception of utilizing agricultural machines and they concluded that the larger the farm size, the more training provided by the government extension office, and the longer farming experience, the lesser the negative perception on the use of transplanters and combine harvesters. Majority of the respondents had neutral attitude towards modern farm mechanization despite having good economic and scientific orientation

and there is the role of extension functionaries to transform the neutral attitude into favorable one by adopting farm mechanization (Thakur & Sharma, 2016). Majority of the farmers are having positive attitude towards mechanization, and further assistance is necessary for the farmers to adopt mechanization (Sahana et al., 2017). Farmers have good perception about farm machinery as well as they have a positive attitude towards farm machinery (Wahyuningsih et al., 2021).

Table 5: Perceptions of respondents about farm machinery

SN	Statement	Level of agreement				
		Jhapa	Kapilbastu	Bardiya	Mean	Rank
		Index value	Index value	Index value		
1	Minimizes labor requirement	0.68	0.54	0.72	0.65	II
2	Problems of low draft animals will be solved	0.74	0.52	0.73	0.66	I
3	Timely completion of the operations	0.56	0.63	0.40	0.53	IV
4	Affordable price for machines	-0.04	-0.11	-0.52	-0.22	XVII
5	Technical knowledge in farmers are enough	-0.54	-0.05	-0.57	-0.39	XVIII
6	Farm roads are good enough for mechanization	0.13	0.10	-0.23	0.00	XVI
7	Increase yield by mechanical power	0.56	0.19	0.35	0.37	VI
8	mechanization lowers cost of production	0.44	0.20	0.11	0.25	XIII
9	Every bit of farm operation can be mechanized	0.48	0.09	0.51	0.36	VII
10	Labor get skills in agriculture	0.70	0.46	0.50	0.55	III
11	Commercialization will be enhanced	0.49	0.48	0.44	0.47	V
12	Respect for the farmers will be enhanced	0.40	0.36	0.24	0.33	IX
13	Mechanization reduces drudgery	0.40	0.57	0.06	0.34	VIII
14	Easy adaptability of the machines	0.40	0.02	-0.18	0.08	XV
15	Availability of the subsidies	0.57	0.41	-0.11	0.29	XI
16	Profit maximization	0.56	0.16	0.27	0.33	IX
17	Precision in usage of inputs	0.36	0.23	0.23	0.27	XII
18	Peer group influence	0.47	0.08	0.19	0.25	XIII
	Mean	**0.41**	**0.27**	**0.17**	**0.28**	

Source: Field Survey, 2020

The study results showed that farmers were moderately satisfied (0.39) with the use of ICT tools because of low labor requirement followed by labor reduced and time saving. But farmers were not satisfied with the notion that mechanization is suitable for all types of farm. And they were also not satisfied with the suitability of the farm machinery for all types of farm machinery. While they were also not satisfied with the view that machinery did have proper maintenance and they were also not satisfied with the simplicity of the farm machinery and implements. Among various important barriers to adoption of new technologies, perception and satisfaction plays the crucial role (Thi& Chi, 2008). The larger the farm size, the more training provided by the government extension office, and the longer farming experience and satisfaction lessens the negative perception on the use of transplanters and combine harvesters (Ani et al., 2018).Farm mechanization displaced manual and draught power remarkably resulted lesser time for farm work. (Verma, 2005). Farm mechanization increased agricultural production and profitability. Farm mechanization led to increase in inputs, higher average cropping intensity and larger area and increased productivity of farm labor (Amare &Endalew, 2016)

Table 6: Satisfaction of the respondents regarding farm machinery

SN	Statements	Level of satisfaction				
		Jhapa	Kapilbastu	Bardiya	Mean	Rank
1	The technology is simple	0.34	0.02	-0.11	0.08	XII
2	Production enhanced	0.66	0.11	0.65	0.47	VI
3	Labor reduced	0.67	0.58	0.64	0.63	II
4	Enhance technical knowledge	0.47	0.41	0.51	0.46	VII
5	Cultural management will be easier	0.67	0.41	0.61	0.56	IV
6	Varieties of machines	0.66	0.44	0.36	0.49	V
7	Suitable for large farms	0.45	0.50	0.41	0.45	VIII
8	Low labor requirement	0.72	0.60	0.78	0.70	I
9	Time saving	0.73	0.62	0.53	0.63	II
10	Suits to all types of farms	0.10	-0.09	0.00	0.00	XIV
11	Increase infrastructure	0.62	0.39	0.35	0.45	VIII
12	Increase commercialization	0.55	0.35	0.45	0.45	VIII
13	Proper maintenance	-0.02	0.20	0.10	0.09	XI
14	Suitable for all farm operations	0.09	-0.05	0.08	0.04	XIII
	Mean	**0.48**	**0.32**	**0.38**	**0.39**	

Source: Field Survey, 2020

CONCLUSION AND RECOMMENDATIONS

The overall conclusion of the findings is that the paddy farmers were aware of the farm machinery and implements but they needed more information and knowledge to use farm machinery in all study districts. Comparatively, farmers from Kapilbastu were more knowledgeable than Bardiya and Jhapa. The adoption or use of farm machinery by the respondents was at a moderate level and that was the same in the case of all study districts. The awareness of the respondents on the roles of the farm machinery was at a moderate level. Among all the study districts, the respondents from Bardiya were more aware of the roles of farm machinery as compared to other study districts. Results showed a moderate level of positive perception towards farm machinery. Among the study districts, respondents from Jhapa perceived farm machinery more positively than the respondents from Kapilbastu and Bardiya. Even respondents were satisfied but the intensity was not high. The satisfaction level of the respondents from Jhapa was higher as compared to other study districts. So, quality of improving awareness and adoption of farm machinery leads to a positive influence on paddy farming and leads to higher production and productivity. Thus, this study supports the positive aspect of farm mechanization in paddy farming.

References:

ABPSD. 2016/2017. Statistical Information on Nepalese Agriculture. Kathmandu,Nepal: Ministry Of Agriculture and Cooperatives.

Agriculture Development Strategy., 2015. Government of Nepal. Ministry of Agricultue and Development. Kathmandu: Singha Durbar. http://www.doanepal.gov.np/downloadfile/ADS_-FINAL_1542883806.pdf

Amare, D., &Endalew, W. (2016). Agricultural Mechanization: Assessment of Mechanization Impact Experiences on the Rural Population and the Implications for Ethiopian Smallholders. Engineering and Applied Sciences, 1(2), 39. https://doi.org/10.11648/j.eas.20160102.15

Ani, P., Eka, R. A., Yati, A., & Akira, I. (2018). Factors affecting paddy farmers perception of utilizing agricultural machines in Indonesia. Journal of Agricultural Extension and Rural Development, 10(8), 150–157. https://doi.org/10.5897/jaerd2018.0963

Ayandiji A, &Olofinsao OT. (2015). Socio Economic Factors affecting Adoption of Farm Mechanization by Cassava Farmers in OndoState, Nigeria. *IOSR Journal of Environmental Science Ver. I*, *9*(3), 2319–2399. https://doi.org/10.9790/2402-09313945

Bautista, E. G., Kim, J., Kim, Y., & Panganiban, M. E. (2017). Farmer's Perception on Farm mechanization and Land reformation in the Philippines. Journal of the Korean Society of International Agricultue, 29(3), 242–250. https://doi.org/10.12719/ksia.2017.29.3.242

Bite, R.K., Lambe, S.P., &Mankar, D. M. (2015). Attitude of farmers towards farm mechanization. International Journal of Tropical Agriculture 33(4): 3413-3416.

CBS. 2015. Statistical Year Book Nepal,2015. . Central Bureau of Statistics (CBS), National Planning Commission Secretariat, Government of Nepal.

Chandra N. B., Nam, Y.-S., Durrul H. M., Rahman, M. M., Ali, P., & Paul, S. (2017). Status and Constrain for Mechanization of Rice Harvesting System in Bangladesh. Agricultural Sciences, 08(06), 492–506. https://doi.org/10.4236/as.2017.86037

Constitution of Nepal., 2015. Constituent Assembly Secretariat, Kathmandu: Singha Durbar.http://extwprlegs1.fao.org/docs/pdf/nep155698b.pdf.

Government of Nepal. (2015). The Constitution of Nepal 2015 (Unofficial tranlation). *Nepal Gazette*, *2015*(February), Art. 58. http://extwprlegs1.fao.org/docs/pdf/nep155698b.pdf

IBN. 2016. Agriculture Sector Profile. New Baneshwor, Kathmandu: Investment Board Nepal.

Joshi, K. D., Conroy, C., &Witcombe, J. R. (2012). Agriculture, seed, and innovation in Nepal: Industry and policy issues for the future. *International Food Policy Research Institute*, *December*, 1–60.

Kumar, M. S., Vasantha, R., Sailaja, A., &Supriya, K. (2017). Attitude of paddy and irrigated dry crop growers towards the use of agricultural implements and machinery Attitude of paddy and irrigated dry crop growers towards the use of agricultural implements and machinery. International Journal of Farm Sciences, 4(December 2018), 107–109.

MOAD. (2015). Agriculture Development Strategy (ADS) 2015 to 2035. *Ministry of Agricultural Development*, 20.

MoALD, 2021. Statistical information on Nepalese Agriculture (2019/20). Ministry of Agriculture and Livestock Development, Government of Nepal

Nagaraj, Swamy, P. S., Madhushree, A., &Vidyadhara, B. (2013). A Study on Knowledge and Adoption of Farm Mechanization by Paddy Grower in Tungabhadra Project Area , Karnataka. 4(4), 385–390.

Pryor, S. W., Smithers, J, Lyne, P and Van, A. R., 2017. Impact of agricultural practices on energy use and greenhouse gas emissions for South African sugarcane production. Journal of Cleaner Production,14(1),137-145.

Ramana, C., & Kumari, P. L. (2020). Farmers ' perception and usage of farm machinery in Southern Zone of Andhra Pradesh. 8(5), 751–759.

S R Verma, (2008), Impact of Agricultural Mechanization on production, productivity, cropping intensity income generation and employment of labour, *College of Agril. Engg. Punjab Agric. Univ.,* Ludhiana.

Sahana, S., P, K. N., &Arunkumar, P. (2017). Research Article ADOPTION AND ATTITUDE OF THE FARMERS ON MECHANIZATION OF PADDY IN COMMAND AREAS OF KARNATAKA. 9(29), 4382–4384.

Sahana, S., Shashikiran, A. C., & Gayathri, G. N. (2018). ATTITUDE AND FACTORS AFFECTING THE ATTITUDE OF FARMERS TOWARDS. Journal in Science, Agriculture & Engineering, VIII(April).

Shrestha, S. (2012). Status of agricultural mechanization in Nepal. United Nations Asian and Pacific Center for Agricultural Engineering and Machinery. http://www.unapcaem.org/activities%20files/a1112rt/np.pdf

Surendra sing (2008), Farm mechanization Scenario in India, *First machinery manufactures meet Karnataka* pp.25-28.

Swamy, P. S. D., Madhushree, A., &Vidyadhara, B. (2013). A Study on Knowledge and Adoption of Farm Mechanization by Paddy Grower in Tungabhadra Project Area , Karnataka. 4(4), 385–390.

Takeshima, H., & Liu, Y. (2018). *The role of plant-breeding R&D in tractor adoptions among smallholders in Asia: Insights from Nepal Terai. April.* http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132416

Thakur, P., & Sharma, D. D. (2016). Farmer ' S Attitude Towards Modern Farm Mechanization. 158–164.

Thi, T., & Chi, N. (2008). Factors affecting technology adoption among rice farmers in the mekong delta through the lens of the local authorial managers: An analysis of qualitative data.

Vanden, B., Hengsdijk, H., Wolf, J., Van Ittersum, M. K., Guanghuo, W and Roetter, R. P. (2007). The impact of increasing farm size and mechanization on rural income and rice production in Zhejiang province, China.

Verma, S. R. (2005). Impact of Agricultural Mechanization on Production , Productivity , Cropping Intensity Income Generation and Employment of Labour. Status of Farm Mechanization in India Indian Agricultural Statistics Research Institute, 133–153.

Wahyuningsih, P., Susilo, A., &Wisnujati, N. S. (2021). Farmers' Attitude and Rice Added Value Based on Agricultural Mechanization in East Java of Indonesia. Russian Journal of Agricultural and Socio-Economic Sciences, 112(4), 110–120. https://doi.org/10.18551/rjoas.2021-04.13

Zhou, Y. L and Lu, B. F.,2012. Study on agricultural mechanization in rural population and environment impact. https://www.scientific.net/AMR.524-527.3451.