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An Influence of Distance Factor on Expansion of New Agricultural Technologies in Dhankuta District

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Abstract

This study basically tries to analyze the mutual relationship between the distance and the use of new technologies regarding the Dhankuta district of eastern Nepal. In particular, an attempt has been made in the study to identify the differences in the use of new such inputs as the distance increases from major service centers and main highway towards the farm land.Thespecific objectives of this study are to observe the current state of new technologies being used in the agricultural sector and the analysis of relationship of distance factor with various aspects related to the agriculture.

The study uses both primary and secondary data. Mainly, household survey, key informant survey, focus group discussion and observation methods were used for the collection of primary data. Similarly, various journals, books, websites and local governmental and non-governmental bodies were major sources of acquiring secondary data. Krishi Gyan Kendra (Dhankuta and Terrhathum), Agricultural Research Station (ARSP) Pakharibas and Koshi Highway are taken as the major centers of technology diffusion.Nearly, 30 percent farmers who have more than 0.5 hector land either khet or bari are taken as a sample around the 1.5 kilometers of the highway. Chemical fertilizers, improved seeds, plant protection measures (PPM), and Seed treatment (ST) are assumed as major new technologies.Regressionand chi-square test were used in order to make conclusion. Mainly, this study is completed by descriptive, interpretative style by using both quantitative and qualitative data. The major conclusion of the study is that the role of distance factor is more or less effective and also responsible for the diffusion of new technologies in the context of the Dhankuta.

Key words: Diffusion, Chemical Fertilizers, Plant Protection Measures, Improved Seeds and Seed Germination Test

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Introduction

More than 95 percent of the poor people live in rural area and 82 percent of them have agriculture as primary source of livelihood (Bhattarai, 2001)**.** Agriculture is the mainstay of Nepalese economy and more than 74 percent people completely depends on this sector (NPC, 2011). The modernizationanddiversification in agriculture is an indispensable necessity to increase productioninNepal. It has been providing employment opportunity more than 65 percent of economically active population of the country (MOAC, 2004/2005).

Although, the top priority has been giving to the agricultural sector in almost all Five YearsPeriodicPlans of the Nepal at the beginning to till now, the yield of cereal crops as a whole has been declining. Nepal's yield was higher than those of all South Asian countries in early 1960s but it was considerably lower than that of all other countries by early 1990. Deforestation and the land degradation problems are major responsible factors to create that situation (APROSC and JMA, 1995).

Not only now, since the past it has been contributing and becoming the main pillar or source for the formation of foundation of economic growth.Nevertheless the agricultural growth is not satisfactory, due to this fact once food grain exporter country has changed into net food importer. If the continuation of this trend is remaining same, the country will face not only the hunger and malnutrition, but also adverse effect in the Nepalese economy and every aspect of people. So it becomes a hot cake of present study.

Most of the agriculture system of Nepal is still far fromtechnology. The number of framers using tractors and thresher is less than 10 percent in the country. Along with this, the use of such equipmentareconcentratedonly in Tarai. More than 18 percent farmers of Tarai usestractor and 15 percent uses thresher. Moreover, the farmers of hill and mountain area have been practicing more traditional farm inputs till now. And the application of the new technologies is lower in hill and mountain in comparison with the Tarai (CBS, 2004).

The improved practice of cultivation in Nepal is not satisfactory yet. only 25 percent of paddy cultivators use improved seeds and the use of chemical fertilizers is around 67 percent of the total paddy production area. Similarly, a little more than 33 percent of maize cultivators, average 37 percent of vegetable producers and more than 57 percent of wheat growers use Non-organic fertilizer in Nepal. Moreover, thefarmers using pesticides and insecticides is low and the process of us is also unscientific during the National Sample Census of Agriculture, Nepal (2001/2002); period. At

that time, only 20 percent of paddy farmers, 16 percent of vegetable cultivators, 8 percent of wheat growers and only 4 percent of maize producers are practicing pesticides insecticides (CBS, 2006).

Geographically, three major ecological regions have existed in Nepal. Each region has their own possibility for agricultural production. Among those regions, hilly region has a greater potentiality of growing high valued crops like fruits, vegetables and cereal crops. Along with this, various factors such as geographical location and distance, purchasing capacity of the farmers and the government policy etc. play an important role for the development and expansion of new technologies to make such production possible. In this context, the need of time is to modernize agriculture sector by using new technologies and make the country self-reliant in agricultural production (Wagle, 2019). NPC (2020) has also remarked:

Lack of adequate dissemination of technologies developed from research, inefficient management of scientific manpower, lack of laboratories for research, and other infrastructure have further impeded the modernization, mechanization, commercialization, and industrialization of agriculture. Hence, land and labor productivity are very low. As a result, food imports have not decreased as expected. Uncontrollable and imbalanced use of pesticides, antibiotics, and chemicals in the commercial pocket areas has affected human and environmental health. Due to the lack of awareness and knowledge about food hygiene, sources of nutrients, and appropriate intake of nutrients, behavioral change in favor of healthy foods has been difficult (NPC, 2020 p.156).

Despite this, no analytical studies have been found on the relationship between distance factor and the use of new agricultural technologies. Therefore, the researcher has formulated some questions in a concerned issue and tried to seek the answerthroughthe detail study. Mainly, this study has based on such research questions as what is the role of distance factor to diffuse new technologies in the Dhankuta, what is the current state of development of such technologies in this area andhow it relates to other various components of the agriculture. By focusing on these research questions, this study is centered within the following objectives: to identify the current state of new technologies being used in the agricultural sector, and to observe the relationship of distance factor with various aspects related to agriculture.

Method and Materials

The study is around the 2 km. buffer of the Koshi highway in Dhankuta district. It is known as Mulghat to Basantapur sector ofthe Koshi Highway andextendswithin the 52 km. stretch of the Highway. This area includes three geographically distinct areas namely upper hilly, middle hilly and lower basin areas (Wagle, 2019). The then DADO, Dhankuta has classified this area into three major belts from theAgro-Climatic point of view:loweraltitudebeltor basin (1000‹ masl), middle altitude belt (1000-2000 masl) and upperaltitudebelt (2000 - 3000 masl)(DADO, Dhankuta, 2012).Keeping this classification at the center, three research stationswereformedfrom each altitude belts based on their economic activities, geographical diversities and potentialities including social status of the population.Chemicalfertilizers, improved seeds, plant protection measures (PPM), and Seed treatment test (ST) are assumed as new technologies.

Table 1

Selection of Research Stations and Sample Size

Belts	Research Stations	Administrative Location	Buffer households	Sample Households	
Lower Basin Area	Mulghat, Rudrabari, Guthitar	Dhankuta - 9	100	30	
Middle Hilly Area	Kuwapani, Kagate, Dhankuta Bazar	Dhankuta -1, 3, 6, 4, 7	264	80	
Upper Hilly Area	Jorpati, Sindhuwa, Chitre	Chhathar - 2, 6 Mahalaxmi - 9	184	55	
		Grand Total	**548**	**165**	

Source: Field Survey, January, 2024.

In addition. Only those farmers are incorporate in the researchwho have their more than 0.75-hectare (15Ropani) land and prefer to adopt new technologies in their agricultural works. Besides, 30 percent (165 hhs) buffer farmerswere taken as a sample from eachaltitude belts by using stratifiedsamplingmethod.Among them, more than 78 percent (130hhs) farmers wereusingall technologies included in the study whereas around 22 percent (36hhs) were using only partially. In this situation, the

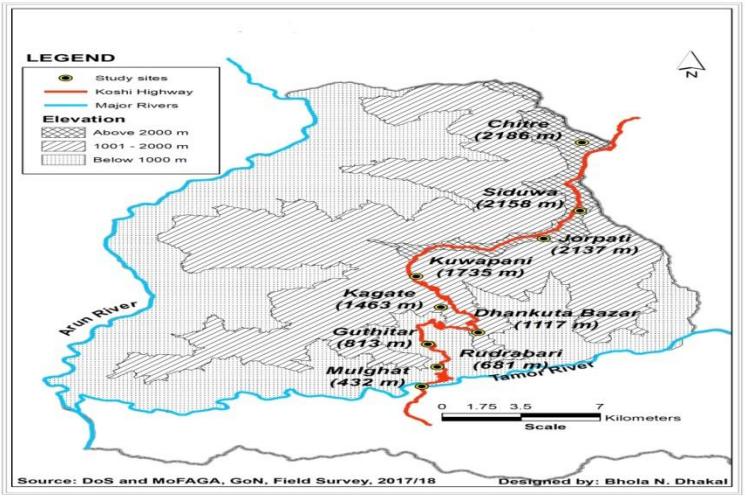
farmers who are using more than two technologies in current days are grouped under 'users' group and remaining are taken as ' non-users' group in the study.

The study based on both primary and secondary data. Mainly, household survey, key informant survey, focus group discussion and observation survey methods were used for the collection of primary data. Similarly, various journals, books, websites and local governmental and non-governmental Authorities were major sources of acquiring secondary data. Krishi Gyan Kendra (Dhankuta and Terrhathum), Agricultural Research Station (ARSP) Pakharibas and Koshi Highway are taken as the major centers of technology diffusion. In addition, regression and chi square test are used in order to make conclusion.

Mainly, this study is completed by descriptive, interpretative style by using both quantitative and qualitative data.

Figure. 1

Location of the Study Area



Source: Adoptedfrom Wagle, 2019

Discussion and Results

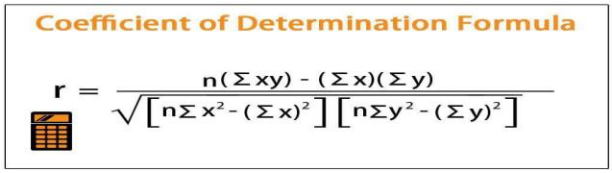
The agricultural achievement depends on various innovativetechniques and ideasof the farmers and influenced by several factorsdepending on local situation. Overall those influential components can be classifiedunder five major groups: personal, agronomic, socio-economic, bio-physical and intuitional factors(Sharma, 1979; Mathema, 1986). The focus of personal variables mainly concentrates onthe

analysis of relationship between the use of new technologies and individual characteristics of the farmers i.e. family size, age, level of education, frequency of contacts with service centers and their social class and castes.Similarly, the comprehensive study of farm size, family labor supply and credit availabilityare included in the social variables(Mathema, 1986; Bhatia, 1970; as cited in Pathak, 2010). While the concern of spatial factors links with spatial phenomena in combination with natural, economic, social and political factors in the case of using new ideas and technologies in agricultural sector(Wagle, 2019). The role ofgeographicalfactorsseems decisive in agricultural development and the adoption technologies and it depends on the location (Chand, 2016). In this context, an attempt has been made to analyze the relation of distance factor in the case using new ideas and technologies in this study.

There is an inverse relationship between the distance from technical and administrative innovative centers and the adoption of changing technologies.Generally, the maximum chances of using new technologies has concentrated around the technical innovation centers and in areas of suitable physical infrastructures. Such opportunities gradually decrease with increasing distance from those centers (Wagle, 2019).In this context, the changes in the technology used by the farmers as the distance increases for the technical and administrative innovative centers (Agriculture Research Station Pakharibas& Krishi Gyan Kendra, Dhankuta and Terrhathum) and major physical infrastructure (Koshi Highway) has analyzed by using mathematical tools in the study.

Agricultural Research Station, (ARSP) and the Situation of TechnologyDiffusion

The mathematical calculation of data acquired from the study area proves that the use of new technology is gradually decreasing in accordance with the increase in distance form the Agriculture Research Station, Pakharibas (ARSP) (Table. 2). An attempt has been made to analyze the relationship between distance from the technical innovation center and the use of new agricultural technologies using the following formula of Karl Pearson'sCorrelationCoefficient:



Source: As cited in Wagle, (2023).

Table 2

Distance from the Agriculture Research Station, Pakharibasand the Situation of Technology Diffusion, 2024.

Research Stations	AverageDistance (km.)	Users	Percent	Non-users	Percent	Total	
Chitre	30	11	91`.67	1	8.33	12	
Sindhuwa	17	28	100	0	0	28	
Jorpati	15	10	66.67	5	33.33	15	
Kuwapani	7	13	52	12	48	25	
Kagate	12	23	88.46	2	11.54	26	
Bazar	17	21	72.41	8	27.59	29	
Guthitar	24	9	90	1	10	10	
Rudrabari	26	12	100	0	0	12	
Mulghat	34	3	37.50	5	62.50	8	
		130	**78.31**	**35**	**21.69**	**165**	

Source: Field Survey, January, 2024.

The observed value of correlation coefficient by using the formula of Karl Pearson coefficient is r = - 0.5710. Itmeansthecurrent trend of using newtechnologies seems to decreasing in accordance with the increase in distance from Agriculture Research Station, Pakharibas (ARSP). This result seems to be consistent with the result of the study done by Pathak (2010) regarding the Dhading district of Nepal.The research stations selected for the study are located at a minimum distance of 7 kilometres and maximum distance of 34 kilometres from the Agricultural Research Station, Pakharibas (ARSP). In this context, the conclusion of focus group discussion clears that the following reasons are responsible to create this situation:

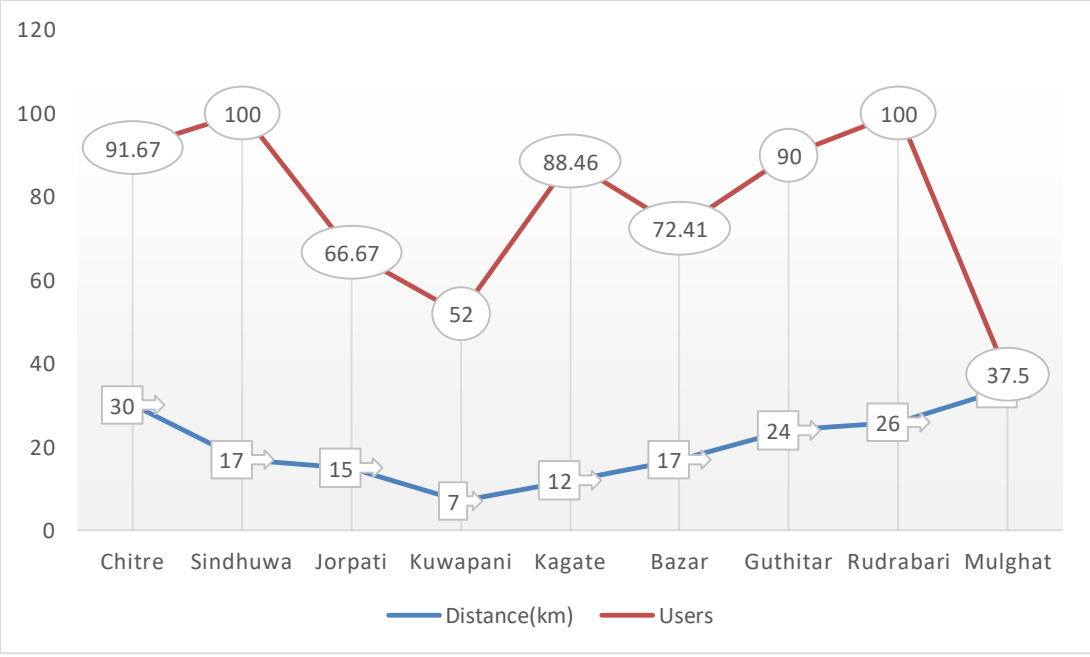
- Creation of convenient environment for the farmers living around the research centre to receive necessary information and technical services as well as other services provided by the research centre due to the constant proximity to the research centre.

- It is easier for the research centre to provide services and facilities to the nearby farmers.
- The farmers who lives closer to the research centre are more familiars with experts, technicians and administrative personals of the research centre in comparison with far away.

In conclusion, it seems that the use of new technologies in the agricultural sector is gradually decreasing as the distance increases from the research Centre.

Figure 2

Agriculture Research Station, Pakharibas&The Situation of Technology Diffusion



Source: Field Survey, January 2024.

Krishi Gyan Kendra, Dhankutaand Terrhathum (KGYDT) and the Situation of Technology Diffusion

Similarly, the relationship between Krishi Gyan Kendra, Dhankuta and Terrhathum (KGYDT) and the technology diffusion isobserved by following same formula and procedure (Table. 3). The result observed by using Karl Pearson correlation coefficient is r = - 0.1464. It indicates that there is very weak but negative relationship between the distance from the Krishi Gyan Kendra and the use new agricultural innovations in the study area. It means that

the number of the new technologies' users seem to be decreasing slightly as the distance increases from the Centre.

While analyzing this context, the information as informed by a key informant are arranged in the following points:

- Most of the farmers are unaware about the services and facilities available from this office. In addition, most of the farmers complain that they have to complete a very lengthy process to receive any services from the government offices.
- This centre also lacks the capacity to provide the new agricultural technologies and other services as compare to the Agricultural Research Centre, Pakharibas (ARSP).
- The service delivery system of this centre seems more focused on the administrative sector than on technological diffusion.

Table 3

Distance from the Krishi Gyan Kendra, Dhankuta& the Situation of Technology Diffusion, 2024

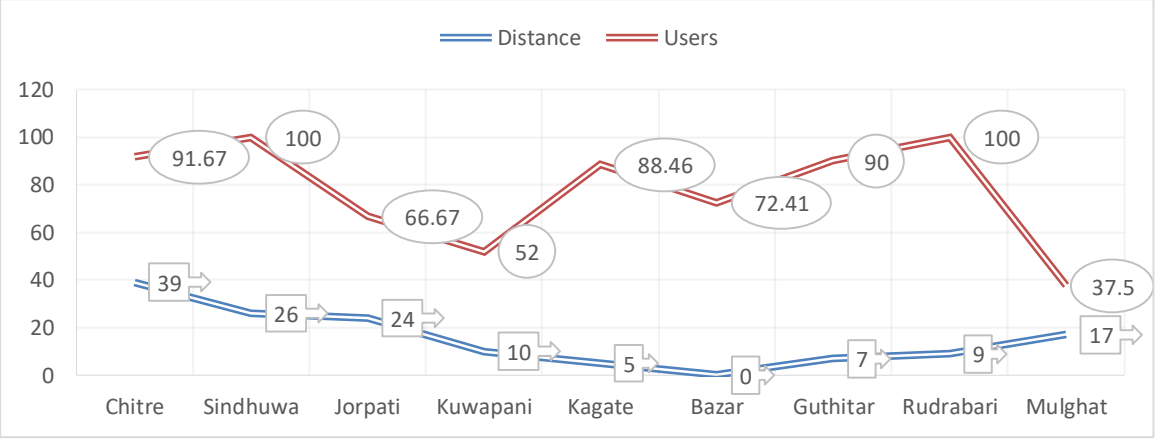
Research Stations	**Average Distance (km.)**	**Users**	***Percent***	**Non-users**	**Percent**	**Total**	
Chitre	39	11	91`.67	1	8.33	12	
Sindhuwa	26	28	100	0	0	28	
Jorpati	24	10	66.67	5	33.33	15	
Kuwapani	10	13	52	12	48	25	
Kagate	5	23	88.46	2	11.54	26	
Bazar	0	21	72.41	8	27.59	29	
Guthitar	7	9	90	1	10	10	
Rudrabari	9	12	100	0	0	12	
Mulghat	17	3	37.50	5	62.50	8	
		130	**78.31**	**35**	**21.69**	**165**	

Source: Field Survey, January, 2024.

The result shows that most of the farmers consider it as an administrative office rather than a technical one. In addition, this situation also reflects that the service provided by the government of is not so effective.

Figure 3

Distance from Krishi Gyan Kendra (Dhankuta&Terrhathum) and the Situation of Technology Diffusion



Source: Field Survey, January, 2024.

Koshi Highway and the Situation of Technology Diffusion

Wagle (2019) argues that marketing of agricultural production depends on the development of road networks which makes transportation of goods easy and cheap. It may be taken as a helpfulcomponentto promote new technologies in agricultural sector in Nepalese context. The availability of the agricultural inputs and innovations like chemical fertilizers, pesticides, insecticides, seed treatment and improved seed are also affected by the connectivity of road networks. Moreover, the new technologies and inputs can easily be disseminated from the experts, businessmen and extension agents through the help of all year-round road. Apart from, farmers alsosell their surplus production in the market with reasonable price by paying reasonable transportation cost (Wagle, 2019)the current situation of the study area is shown in the table (Table. 4).

Table 4

Koshi Highway &the Situation of Technology Diffusion

Residing within 500 Meters						Residing more than 500 Meters					
Users	Percent	Non-users	Percent	Total	Percent	Users	Percent	Non-users	Percent	Total	Percent
44	77.19	13	22.81	57	100	86	78.90	23	21.10	109	100

Source: Field Survey, January, 2024.

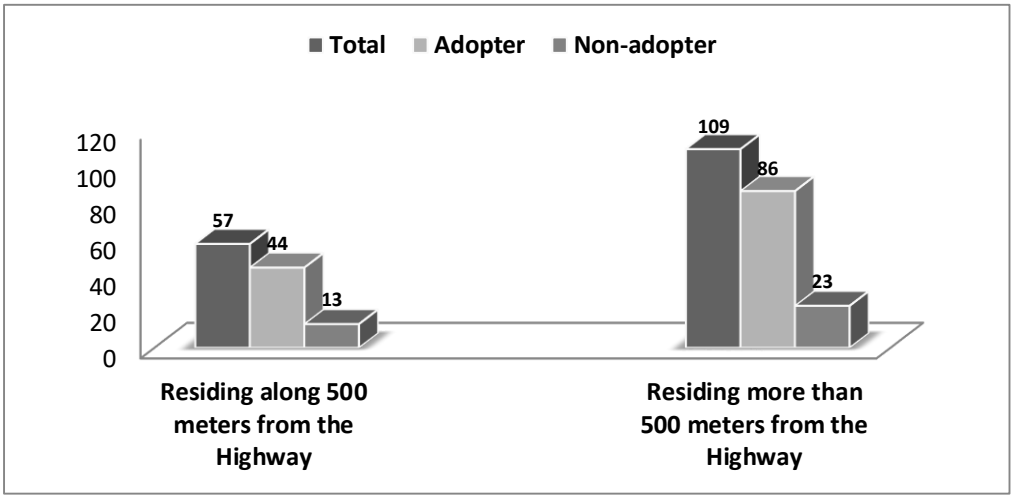
The result obtain from this study is to be somewhat difference from other previous conclusions. The field survey data do not show significant role of distance from the Koshi Highway on changes in agricultural technologies. The result of the study done by Pathak (2010) is completely different with this conclusion. He found that the users of new agricultural technologies decreased as the distance increased from the road. Moreover, chi-square test has done to identify the relationship between the two components. The computed chi-square value 0.067 is less than the table value 3.84 for one degree of freedom at 5 percent confidence level. It indicates there no significant relationship between them

Besides, the opinion of local agricultural experts and pioneer farmers behind this of situation are listed in the points:

- The development of local subsidiary road networks (Seasonal, agricultural, and gravel) which contributed the diffusion of agricultural technologies easily.
- Due to the development and expansion of educational opportunities, the farmers have become aware and oriented towards using new technologies that make maximum profit.
- The role of research centres and other agencies seems more effective to diffuse new ideas in this area including the main highway and other subsidiary roads.

Figure 4

Distance from Highway &the Use of New Technologies



Source: Field survey, January. 2024.

Conclusion

In conclusion, the role of distance factor seems effective and responsible for the use and diffusion of new technologies in the context of the Koshi Hills. The significant change can be found in the diffusion of these techniques according to the distance increased from the Agricultural Research Station Pakharibas (ARSP) but it seems less effective in relation to Krishi Gyan Kendra, Dhankuta and Terrhathum (known as both administrative and technology diffusion Centre) and Koshi Highway towards the farm area. However, it cannot be denied that the joint effort of these three components has made significant contribution to develop the agriculture in the Koshi hills.

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