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Assessing Preference of Four-Wheel Tractors among Farmers of Parsa District, Nepal

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Abstract

This study aims to examine attributes preferred by farmers of Parsa district for choosing four-wheel tractors. This study presents how farmers perceived their effectiveness based on common attributes of tractors like origin, brand, fuel consumption, horsepower, price, availability of spare parts, and their repair and maintenance. The study is quantitative and based on primary data. A non-probabilistic sampling technique was used with a sample size of 85. Conjoint analysis was applied to estimate part worth utility value, utility range and ranking the attributes of four-wheel tractor. The result show that farmers gave highest preference to fuel consumption with respect to highest utility value following horsepower, origin, price, availability of spare parts and repair and maintenance. Similarly, results show that branded and low-price tractor whose spare parts can be found easily in local market along with assured repair and maintenance facility available from authorised agency is preferred by farmers. Horsepower has been important attributes for tractor selection, where farmers are mostly preferring tractors having horsepower greater than 45 hp. This study findings will provide valuable tools and a basic framework for suppliers and manufacturers for evaluating their market efficiency and preparing strategies for promoting four-wheel tractors.

INTRODUCTION AND STUDY OBJECTIVES

The Agriculture Mechanisation Promotion Policy (2014) has found some of the major obstacles to agriculture mechanisation which include lack of appropriate policy, poor after-services and reliance on imported machinery, fragmented land, geographic difficulties, and weak rural

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infrastructures, low knowledge among farmers, limited structural provisions for agriculture mechanisation, and restrict credit availability. Due to a lack of adequate policy, proper regulatory mechanism, information system, assurance of quality engines, authorised service centres, and irrational and improper distribution of four-wheel tractors, farmers are facing many problems while operating 4-wheel tractors.

Proper selection of four-wheel tractors is essential for managing cost of fuel, and other operating costs and increasing profit. Farmers invest in tractors by considering all the observable factors for self-evaluation that they incurred during their farming experience although the investment decision in tractors is a complex problem for farmers, manufacturers, and suppliers due to many alternatives currently available in the market with diverse brand names along with numerous attributes like origin, brand, fuel efficiency, horsepower, price, etc., that differentiate them (Hua, 2015; Carter et al., 2016).

Conjoint analysis is used by marketing firms to assess qualitative attributes of the products (Louviere et al., 2005), as it is a multivariate technique which estimates the utility of the levels of various attributes or features of an object, as well as the relative importance of the attributes themselves (Sthapit, 2007). Conjoint analysis is derived from Lancaster's theory of demand which suggests that utility an individual gain from consuming a particular product is a function of the characteristics of product (Lancaster, 1971). The objective of conjoint analysis is to estimate part worth for attributes and to show consumer's overall preference for a particular product based on its various attributes (Louviere et al., 2005). Conjoint analysis is used to assess relative importance of different attributes of a product as perceived by consumers (Jabbar & Admaassu, 2009; Green & Rao, 1971; Green & Srinivasan, 1978; Markham et al., 1998). For this study, it was necessary to create tractor profiles composed of selected attributes and attribute levels and ask respondents to rate, rank, or evaluate those product profiles. The attribute of product refers to general characteristics of a product.

There is the dearth of research on attribute aspects of tractors and other agricultural equipment which is considerably importance for farmers. These attributes need to be identified to increase technology adoption and its dissemination. Thus, this study will find effectiveness of four-wheel tractors in terms of horsepower, brand, origin, fuel consumption, and price, availability of spare parts, and repair and maintenance.

Suppliers and dealers of agriculture machinery are free to import and sell agriculture machinery. Since they are not obliged for official testing and certification as a result, farmers face problems regarding quality, price of the machinery, and other post-purchase problems with availability of spare parts and proper repair and maintenance of these products (Adhikari, 2003). There is a lack of knowledge on good quality agriculture machinery among farmers, and traders as well as the spare parts and repair & maintenance of imported agriculture machinery are dif-

ficult to access (AMPP, 2014). Thus, to avoid this problem farmers make investment decisions for agriculture machinery like tractors based on their farming experience and measure their efficacy based on a predetermined set of attributes.

The study attempted to examine effectiveness and spread of four-wheel tractors among farmers of Parsa district, Nepal. This will help us to know how farmers perceived tractor effectiveness based on horsepower, brand, origin, fuel consumption, and price, availability of spare parts, and repairs and maintenance. This will provide valuable tools and a basic framework to stakeholders especially suppliers and manufacturers for evaluating their market and field level efficiency and policymakers can make necessary planning and implementing strategies in future for promoting four-wheel tractor. Thus, study was carried out with objectives as follows:

- To examine farmer preference towards four-wheel tractors through measuring part-worth utility scores across various attribute levels in Parsa district.
- To identify the best combination choice attributes level of four-wheel tractors by farmers in Parsa District.

LITERATURE REVIEW

There are many variations of the tractors and other foreign technology which offer a range of purchasing options for farmers to invest in tractors. There are generally objective and subjective attributes used for evaluating four-wheel tractors. The business owner provides the objective attributes, also known as quantitative or tangible features. These are evaluated in terms of numbers and reflect the engineering characteristics and costs of the technology under consideration, e.g., initial cost, fuel consumption and cost of maintenance. These kinds of characteristics are typically offered by providers. Subjective attributes, on the other hand, are qualitative or intangible characteristics that are applicable in decision-making and hence need to be included in the evaluation process. These include an opinion of the users or consumers. Farmers have their own opinions about the four-wheel tractor based on their farming experience which explain their preferability (Sun, & Ma, 2015). These preferable subjective attributes of farmers are means of cost reduction and profit maximisation. Thus, farmers usually prefer the subjective attribute for tractor selection because it includes farmer's measurable attributes and determines their utility and satisfaction level.

Economic, strategic, and analytical evaluation methodologies can be used to choose the optimal technological solution (Ilgin, & Battaia, 2015). Economic techniques, such as net present value, internal rate of return, payback, and cost/benefit analysis, are frequently employed in agro-industrial practice. However, they assert not to incorporate qualitative attributes in their assessment and cannot be applied to investment problems or the selection of technologies. Staff members in management frequently employ strategic tactics, which are founded on company's objective and

mission. However, it does not include economic aspects in the evaluation, and the members of the organisational farm structures at lower positions are unable to interpret and comprehend it e.g., scared crow, and technical specifications (Alcaraz et al., 2016).

Compared to other approaches, analytical techniques are less well-known because of their relatively recent industrial application. Their use is strongly advised in circumstances where a sizable number of qualitative and quantitative features need to be reviewed because they also offer the benefit of incorporating other economic, strategic, social, and technological attributes into the evaluation process (Veisi et al., 2016; Braglia et al., 2000; Yue, 2012; Goh, 1996). The Conjoint Analysis model approach is also one of the analytical techniques. Conjoint analysis measures individuals' preferences and predicts their choice based on a set of attributes. Product profiles are created and shown to respondents, who are asked to choose which of these profiles they prefer. In many different fields of research, it is the favoured model for individual preferences and decision-making (Green & Rao, 1971; Louviere & Islam, 2008). Thus, in this study, conjoint analysis has been used to study the farmer's preference for the four-wheel tractor in Parsa district, Nepal.

In micro-production planning, for the decision-makers in agricultural production as farmers, tractor preference appears as a major cost factor, therefore, tractor choosing has become important for different types of farms and arable land (Cankurt & Miran, 2010). Farmer's decision-making for investing in tractors is the process of choosing among alternatives also. It's obvious for farmers to consider after-sales service and parts availability in their purchase decision for a tractor when making a purchase decision to buy a durable good like a tractor. Because farmers have dealer-oriented loyalties and preferences, the quality of distribution and service plays a critical role in tractor sales (Bhatt, 1978). According to Cankurt and Miran (2010), farmers usually prefer price, durability, fuel consumption, dealers' reliability, and brand value attributes for making purchase decisions of four-wheel tractors.

A thorough evaluation of the literature was carried out using a variety of national and international research to justify the rationale and context of farmer's preference for four-wheel tractors. The literature analysis addresses key factors pertaining to farmers' preferences based on horsepower, brand, origin, fuel consumption, and price, availability of spare parts, and repair & maintenance of the four-wheel tractors. Farmer's preferences are getting more varied with the expansion of supplier option. It is crucial to comprehend how farmers choose products and services when those choices need trade-offs between different costs and benefits (Yang et al., 2015, Waechter et al., 1991).

The operating cost, fuel consumption, repair & maintenance, spare parts availability, and horsepower are the important attributes to be considered for agricultural tractor selection (Alcaraz et al., 2016; Nelson Tractor, 2020).

The variables like price, brand name, horsepower, maintenance, availability of spare parts, and cost of spare parts are the major attributes considered by farmers for agriculture tractor selection (Sivakumar & Kaliyamoorthy, 2014).

According to Cankurt and Miran (2010), farmers prefer low prices, durability, fuel economy, dealer reliability, and brand value as a criterion for buying decisions for tractors. According to the study done by Alcaraz et al. (2016) during tractor evaluation, farmers give priority to economic factors like the initial cost of the tractors, fuel consumption cost followed by availability of spare parts, availability of the repair and maintenance, horsepower, Brand name. This tractor evaluation is based on the specific needs and preferences of the group of the farmer and these results may vary for another group of farmers in another country. Similarly, According to Sivakumar and Kaliyamoorthy (2014), attributes horsepower, aftersales service, price, and brand name respectively are considered important attributes by the farmers for the purchase of tractors.

According to Grainger (2019), dealership competency and design quality, pre-purchase considerations, deal enhancers, potential future savings, perceived value, dealership concerns, financial implications, mutual benefits, dealer after-sales competency, potential trouble, and the availability of spare parts are the factors that influence farmers' tractor purchases. When purchasing tractors, farmers were affected by subsidies offered for farm equipment, which were followed by horsepower, after-sales service, price, and brand name, in that order (Kumar & Moorty, 2014).

In case of Nepal, many government agencies are involved in providing subsidised four-wheel tractors to farmer. Government sector too consider farmers preference and includes competitive price, horsepower, after sales service and availability of spare parts as an important attribute for providing subsidised four-wheel tractors to farmers.

Farmer's preferences are becoming more diverse with the expansion of agriculture machinery, it is crucial to comprehend how farmers make decisions regarding four-wheel tractors when those selections need them to weigh different costs and benefits (Yang et al., 2015; Waechter et al., 1991). For four-wheel tractors to effectively serve farmers' demands, it is essential to comprehend their preferences and recognise any potential heterogeneity in the way that farmers value these features. Thus, preference study of tractors was conducted to analyse variables related to tractors' attributes that are used for making purchase decisions by farmers in Parsa district. In this regard, based on the above literature and empirical studies, variable employed for the study are horsepower, origin, fuel consumption, brand, price, availability of spare parts, and repair and maintenance.

RESEARCH METHODS

Every farmer in the Parsa district who owns a four-wheel tractor has been included in the study's population. Non-probability

sampling methods have been used to select sample. The sample selected for the study was based on snowball and quota sampling. The method of snowball sampling has been employed in choosing the samples from the identified and suggested individuals by the officials from Agriculture knowledge centre, Parsa districts and agriculture section of local level government. The method of quota sampling has been employed as sample includes those who were interested in buying tractors or were the users of four-wheel tractors. Those individuals have been selected as samples, who are interested to participate, nearby, free, have relationship with researchers.

A survey was conducted among 85 households across Parsa district, Nepal to collect information on ratings of selected profiles developed based on seven attributes horsepower, origin, fuel consumption, brand, price, spare parts, and repair & maintenance. For each of seven attributes, appropriate attribute levels were defined as follows: horsepower (less than 35 hp, 35 to 45 hp, and above 45 hp), origin (India and China), Fuel consumption (less than two and half litres/hours, two and half litres/ hours to four litres/hours and greater than four litres/hours), Brand (company and general), price (less than twelve lakhs, twelve to fifteen lakhs and price above fifteen lakhs), spare parts (spare parts of same company and locally available spare parts) and Repair and maintenance (spare parts of same company and locally available spare parts). A preference rating for a profile was determined using a scale from 1 to 10, with 10 representing the most favoured profile and 1 the least. Because it would be difficult for respondents to rank several profiles from a full factorial design, the orthogonal design of the SPSS conjoint process was used to choose 16 profiles from all potential combinations, plus four holdout cases.

The following action were taken to fulfil the goal of studying farmer preference towards four-wheel tractors by measuring part-worth utility scores across various attribute levels in Parsa district. The first step is to design a questionnaire, i.e., a profile identifying the attributes. The set of random 16 questions was generated from SPSS using the attributes and level used in Table I along with 4 holdout cases based on the concept of conjoint analysis. The questionnaire includes list of 16 questionnaires for rating including the combination of various attributes grouped into seven categories horsepower, origin, fuel consumption, brand, price, spare parts, and repair & maintenance. Statistical analyses were done with SPSS 26@ software and thus we get the result of Table 3 and Table 4. Table 3 shows unstandardised beta coefficient results, unstandardised beta value was solved to obtain the utility value of each level of attributes as shown in Table 4. Attribute utility range of each attribute was obtained by calculating differences between higher utility and lower utility. Similarly, attribute importance was calculated in percentage based on the obtained attribute utility range and finally, rank was determined based on attribute importance.

Conjoint analysis's major objectives are to determine part worth of the attributes and their levels to consumer preferences, and

to achieve these objectives, 'profile utilities' are created to quantify customer decision preferences. Respondents were asked to score or rank the attribute combination for four-wheel tractors using choice-based conjoint analysis. The study showed the relative relevance, or utility, for various degrees of each characteristics. Oppewal and Vriens (2000) state that Ordinary Least Squares (OLS) regression method with dummy variables is used to estimate preference functions in conjoint analysis. Previous research has demonstrated that OLS is often more efficient than more complex techniques like Logit, Mananova, Linmap, and others, but the results are easy to interpret.

The following is an expression of the fundamental conjoint analysis dependence model:

$$U_a = \sum_{e=1}^{e} V_j = V_1 + V_2 + \ldots \ldots + V_e$$

Where U_a indicate overall effect of the e^{th} product and $V_1 + V_2 + V_3 + \ldots + V_e$ indicate the attribute effect value of 1,2, ……., e in product *a*.

Conjoint analysis was used in the field of marketing by Green and Rao (1971) to ascertain the influence of two or more variables on variable ranking. One way to depict the conjoint analytical model is as follows:

$$Y_a = \sum_{e=1}^{e} V_{ef} + \sum_{ee'}^{e} T_{ef} T_{e'f} + T_{1e}\, T_{2e} \ldots T_{ef}$$

Where Y_a indicate attributes of the product, *e* = 1, 2 …E.
F indicate the attribute benchmark of the product, e= 1,2, …. F.
$\sum_{e=1}^{e} V_{ef}$ indicate the main effect of the attribute benchmark of the product.
$\sum_{ee'}^{e} T_{ef} + T_{e'f}$ indicate the interaction effect of two attribute benchmarks of the product: and T_{1e} T_{2e} … T_{ef} indicate interaction effect of multiple attribute benchmarks.
The Statistical Packages for Social Science (SPSS) software version 26.0 was used to create the orthogonal arrays (orthogonal plan) for the investigation. A total of sixteen design cards were created, and farmers were asked to indicate their choices on a 10-point Likert scale (1 being least preferred, and 10 being most preferred). There were 16 stimuli in this study, which was more than the minimal amount (Total number of levels across all attributes - numbers of attributes + 1 = 17-7+1=11) that respondents had to assess in order to guarantee the accuracy of the estimated parameters. The preference score (column Y) can be designated as the dependent variable (Input Y range) by the application of multiple regression analysis. The suggested model for utilising dummy variables in ordinary least square (OLS) regression has the following mathematical expression:

Y (Average Rating) = b_0 + b_1 (less than 35 horsepower range) + b_2 (more than 45 horsepower) + b_3 (China origin) + b_4 (2.5 to 4 litres/hours Fuel Consumption) + b_5 (more than 4 litres/hours fuel consumption) + b_6 (General brand) + b_7 (less than 12 lakhs) + b_8 (price above 15 lakhs) + b_9 (company spare parts) + b_{10} (repairs & maintenance general) + c

In the above-mentioned equation, the reference dummy variable is the first

option offered in each factor which is horsepower between 35 horsepower and 45 horsepower, Indian origin, fuel consumption less than 2.5litres/hours., brand, price between 12 and 15 lakhs, general spare parts others than company and company repairs &maintenance. These dummy variables serve as the reference and comparison indices, from which a regression analysis is used to ascertain farmers' positioning preferences.

Definition and Measurement of Study Variable

Based on the reviewed literature and empirical, tractor attribute variables are described as,

- **Hp:** It refers to horsepower of a tractor produces. This study has used three prominent ranges of horsepower used by farmers i.e., less than 35 hp, 35 to 45 hp and above 45 hp.

- **Origin:** It refers to a tractor produced in a particular country. The study has focused on tractor produced in India and China.

- **Fuel Consumption:** It is measured by amount of fuel used during a specific period. In this study, litres/hours are the units of measurement of fuel consumption. The study has used three ranges of fuel consumption i.e., less than two and a half litres/hours, two and a half litres/hours to four litres/hours, and greater than four litres/hours.

- **Brand:** It describes a specific kind of product marketed under a specific name by a certain company.

- **Price:** It refers to how much product or service costs. This study has used three ranges of price of tractor for study i.e., less than twelve lakhs, twelve to fifteen lakhs, and price above fifteen lakhs.

- **Spare Parts:** It means availability of spare parts of tractor when it needs to change the old ones. Spare parts availability of the same manufacturing company retains the engine longevity than locally available spare parts and affects preference level of farmers. So, two options; spare parts of the same company and locally available spare parts are used for this study.

- **Repair and maintenance:** It means the activities related to routine care to preserve the functionality of engine. Repair and maintenance from same manufacturing company retains engine longevity more than locally available repairs and maintenance services, it too affects the preference level of farmers: spare parts of same company and locally available spare parts.

The Conjoint Design framed on attributes are mentioned in Table 1

DATA ANALYSIS AND DISCUSSION

The multicollinearity test has been performed using the variance inflation factor. According to Gujarati and Porter (2009), a VIF value greater than 10 is regarded as an indicator of severe multicollinearity. The variance inflation factor (VIF) of these factors has been found to range from 1 to 1.125 which is

Table 1
Explanation of Tractor Attributes and Levels

Attribute Name	No. of Item	Explanation of the attributes and levels given to farmers' choices
Hp	3	In this study, there are three prominent horsepower ranges used by farmers i.e., less than 35 hp, 35 to 45 hp, and above 45 hp (Code A1, A2, A3)
Origin	2	Preference of the tractors varies based on their origin: India and China. (Code B1 and B2)
Fuel consumption	3	Fuel consumption by the tractors can be taken for making a purchase decisions: less than two and half litres/hours, two and half litres/hours to four litres/hours, and greater than four litres/hours. (Code C1, C2, C3)
Brand	2	Tractor companies having higher brand utility available in the market: branded company and general (Code D1, D2)
Price	3	Price factors of goods affect preference decision of commodity: less than twelve lakhs, twelve to fifteen lakhs, and price above fifteen lakhs. (Code E1, E2, E3)
Spare Parts	2	Spare Parts availability of same manufacturing company retains engine longevity than locally available spare parts and affects preference level of the farmers: spare parts of the same company and locally available spare parts (Code: F1, F2)
Repair & Maintenance	2	Repair & Maintenance from the same manufacturing company retains the engine longevity than locally available repairs and maintenance service, it affects the preference level of the farmers: spare parts of the same company and locally available spare parts (Code: G1, G2)

Total number of attributes = 7
Note: Minimum Required Stimuli= 17-7+1=11

less than 10. The test shows there is not any severe multicollinearity in variables.

The unstandardised coefficient in Table 3 is used to calculate the attribute utility for each attribute. The first step in conjoint analysis is to look at part-worth estimations for every attribute. Conjoint analysis can evaluate each attribute's relativeness, with a larger part worth indicating a greater influence on the proposed model's total utility. Table 3 represents coefficient of the attributes in response to the ranking which is considered as a response variable.

In Table 3, unstandardised beta coefficient is used to determine the regression equation by using major variable from each attribute level as a reference dummy. The horsepower contained attribute level i.e., less than 35 hp range, more than 45 hp, and horsepower between 35 hp and 45 horsepower. In regression equation, horsepower between 35 hp and 45 hp was used as a dummy reference variable to forecast significance of others' level and results revealed that in comparison to tractors with horsepower between 35 hp and 45 hp, farmers prefer tractor having more than 45 hp (Beta = 0.775, $p<0.01$), while farmers of Parsa district are not willing to use tractor having horsepower less than 35 hp (Beta = -0.316, $p<0.1$). Similarly, in the second model for origin, in comparison to China-made (Beta =

Table 2
Variance Inflation Factor of Inputs

S.N.	Attributes variable	VIF
1	hp_30to45	1.125
2	hp_More45	1.125
3	Org_CHN	1.000
4	FC_2.5to4	1.125
5	FC_More4	1.125
6	BR_GN	1.000
7	Pr_12to15Lac	1.125
8	Pr_15LacAb	1.125
9	SP_General	1.000
10	RM_General	1.000

Note. Researchers' calculation based on survey data

-0.864, p<0.01) farmers prefer India-made tractors since beta coefficient is negative and statistically significant to confirm findings so generated in the regression equation. Furthermore, farmers prefer tractors with low fuel consumption rate i.e., fuel consumption of less than 2.5 litres/hour in comparison to tractors consuming fuel between 2.5 litres per hour to 4 litres/hours (Beta = -1.556, p<0.01) and tractors consuming fuel more than 4 litres per hours (Beta = -1.556, p<0.01) since beta coefficient is negative and statistically significant to confirm findings so generated in the regression equation. Similarly, farmers prefer branded tractors rather than tractors with no brand value (Beta = -0.034, p>0.05). Farmers prefer tractors with low prices less than 12 lakhs (Beta = 0.235, p>0.05) rather than tractors with a price range between 12 lakhs to 15 lakhs and tractors having price of more than 15 lakhs (Beta = -0.128, p>0.05). Farmers are flexible to use spare parts available locally rather than going with company spare parts (Beta = -0.109, p>0.05). Lastly, farmers are preferring repairs and maintenance service availability from the respective authorised company rather than locally available repairs and maintenance (Beta = -0.021, p>0.05).

The relative value of each attribute level in relation to the alternatives selected is shown by the utility or part worth, which provides an extent of value for each attribute level. This step comes after orthogonal design preparation and relative profiles of different attributes and their levels. When comparing the total utility to other utilities, the level with higher utility or part worth has a greater influence. After determining the part-worth utilities for each level, the attribute utility range may be computed. The range of utility that each attribute can provide to the overall utility of the product is known as the attribute utility range. The highest range of utility is thought to contribute

Table 3
Unstandardised Beta Coefficients

Model	Unstandardised Beta	t statistics	Sig.
(Constant)	7.221	33.483	0.000***
hp_L35	-0.316	-2.074	0.093*
hp_More45	0.775	4.401	0.007***
Org_CHN	-0.864	-6.937	0.001***
FC_2.5to4	-0.816	-5.352	0.003***
FC_More4	-1.556	-10.205	0.000***
BR_GN	-0.034	-0.271	0.797
Pr_L12Lac	0.235	1.541	0.184
Pr_15LacAb	-0.128	-0.724	0.501
SP_Same	-0.109	-0.873	0.422
RM_General	-0.021	-0.171	0.871

*Note. Researchers' calculation based on survey data. Dependent Variable Rating *** Model significant at 1% level of Significance, ** Model Significant at 5 % Level of Significance, *Model significant at 10 % Level of Significance*

the most to the total utility. The following formula can be used to determine an attribute's relative importance:

The relative importance of attribute= Attribute Utility Range/ Total Utility Range * 100

Table 4 shows the SPSS estimated part-worth utilities of various levels in the selected attributes and their relative importance in the study.

The correlations between the observed preference scores and the conjoint model estimated preference scores using Kendall's tau for Holdouts and Pearsons' R were estimated to verify the validity and reliability of the results. At the one percent level, the estimated part worth of the chosen tractor attribute appears to be statistically reliable, as indicated by the Pearson's correlation coefficient of 0.640 ($p<0.000$). The study's proposed model appears to be effective in forecasting respondent's preferences for specific qualities related to four-wheel tractors in the Parsa district, as evidenced by the significant correlation coefficient. Kendall's tau for 4 holdout cases with a value of 0.943 ($p<0.05$) at 5 per cent level revealed that variables are strongly monotonously related to each other. The results of correlation among attributes in the study are mentioned in Table 5.

The preference structure and importance given by farmers to seven attributes revealed that highest importance i.e., 38.49 percent is assigned to fuel consumption attribute. Among the different levels for fuel consumption, tractor consuming fuel less than 2.5 litres per hour have highest utility followed by tractor consuming fuel between 2.5 to 4 litres per hour and tractor consuming fuel above 4 litres per hour. The attribute util-

Table 4
Estimated Part Worth Utilities, Attribute, and Relative Importance

Attributes	Attribute Level	Code	Utility Value	Attribute Utility Range	Attribute importance (%)	Rank
Hp	Less 35	a1	-0.469	1.091	27.01163654	II
	35-45	a2	-0.153			
	45 above	a3	0.622			
Origin	India	b1	0.432	0.864	21.39143352	III
	China	b2	-0.432			
Fuel Consumption	less 2.5 l/h	c1	0.79	1.555	38.49962862	I
	2.5to 4 l/hr	c2	-0.025			
	above 4 l/hr	c3	-0.765			
Brand	Brand	d1	0.017	0.034	0.841792523	VI
	General	d2	-0.017			
Price	less 12 l	e1	0.199	0.363	8.987373112	IV
	12-15 lakh	e2	-0.035			
	above 15 lakh	e3	-0.164			
Spare Part	same company	f1	-0.055	0.11	2.723446398	V
	General	f2	0.055			
Repair & Main.	Company mech	g1	0.011	0.022	0.54468928	VII
	Others	g2	-0.011			
				4.039	100	

Note. Researchers' calculation based on survey data.

ity range for fuel consumption attribute is highest i.e., 1.555, which shows farmers are concerned with operation cost of tractors while deciding to purchase tractors. Fuel consumption has been identified as important attribute of a tractor because fuel consumption is single largest variable cost during field operation of the tractor since one-fifth of fuel energy is used for drawing of a plough and the rest of the fuel energy is lost in the engine, transmission, and wheel/soil interface. (Alcaraz et al., 2016; Farias et al., 2017; Darshana et al., 2018). So, farmers have identified fuel consumption as the most important attribute among others.

The second most important attribute is the horsepower of tractors with an importance value of 27.012 percent and range of 1.091. The utility value for tractor having less than 35 horsepower is negative i.e., -0.469, the utility value for tractor between 35 to 45 horsepower is negative i.e., -0.153, and the utility value of tractor whose horsepower is greater than 45 hp is positive i.e., 0.622 which is higher among the other level of horsepower which shows farmers mostly prefers tractors having horsepower greater than 45 hp. Horsepower is an important attribute for tractors to be considered during selection (Nelson

Table 5
Correlation Table

Correlation coefficient	Value	Sig.
Pearson's R	0.64	0.008***
Kendall's tau	0.423	0.039**
Kendall's tau for Holdouts	0.943	0.032**

*Note. Researchers' calculation based on survey data. *** Model Significant at 1 % level of significance, ** Model Significant at 5 % level of significance*

Tractor Co., 2020).

The third most important attribute of tractor is the origin of tractor with an importance value of 21.39 percent. The utility value for Indian origin tractor is positive i.e., 0.432 and the utility value for Chinese origin tractor is negative i.e., -0.432 which shows farmers prefer Indian-origin tractor over Chinese-origin tractor. The attribute utility range for the origin is third highest among seven attributes with the range of 0.864, thereby ranked third in the importance list by farmers towards their final decision-making process.

The fourth most important attribute of a tractor is the price range of tractor with an importance value of 8.98 percent and a utility range of 0.363. The utility value for a tractor having a price less than twelve lakhs is positive i.e., 0.199, the utility value for tractor having a price range between twelve to fifteen lakhs is -0.035 and the utility value for a tractor having a price more than fifteen lakhs is negative i.e., -0.164 which shows farmers prefer low price tractor.

The fifth, sixth, and seventh-ranked attributes for the tractor is spare parts availability, brand of tractor, and repairs & maintenance of tractor with an importance value of 2.7 percent, 0.84 percent, and 0.54 percent respectively. The utility value for the spare parts available from the same company is negative i.e., -0.055, and the utility value for spare parts which is locally made and available is positive i.e., 0.055 which shows farmers are uninterested in going with the company made spare parts and interested to use locally available spare parts for the tractors which may be due to higher cost of company made spare parts. The attribute utility range for spare parts is fifth highest among the seven attributes with attribute utility range of 0.11, thereby ranked fifth in the importance list by farmers towards their final decision-making process. Similarly, the utility value of branded tractor is positive i.e., 0.017 and utility value for unbranded tractors is negative i.e., -0.017 which shows farmers are conscious about branded tractors for making investment decisions and for preference ranking. The attribute utility range for branded tractor is sixth highest among seven attributes with attribute utility range is 0.034, thereby ranked sixth in the importance list by farmers towards their final decision-making process.

Lastly, utility value for repairs and maintenance provided from company showroom is positive i.e., 0.011 and repairs and maintenance service which is locally available is negative i.e., -0.011 which shows farmers prefer repairs and maintenance facilities from the authorised company. The attribute utility range for repair & maintenance is 0.022, thereby ranked seventh in importance list by farmers towards their final decision-making process. Customers choose what they want to buy with every purchase they make. It deals with everything from making a purchase to assessing it afterward, therefore market research on the variables affecting the choice to buy is required. For this reason, the study focuses on the tractor purchases made by farmers in the Parsa district.

CONCLUSION AND IMPLICATIONS

This study aims to examine most preferred attribute for selection of the four-wheel tractors by farmers of Parsa district. A questionnaire was designed based on the techniques of conjoint analysis and was responded to by 85 respondents belonging to Parsa districts of Nepal. The study reveals that while choosing four-wheel tractors, farmers gave highest preference to fuel consumption in terms of highest utility value and range. Among different fuel consumption levels, farmers preferred tractors consuming less fuel which shows farmers are concerned with the cost of using agriculture implements. Fuel consumption cost is highest among the other variable cost during field operation. So, famers should be aware about fuel consumption rate of the tractor while making purchase decision. Similarly, result showed branded and low-price tractor whose spare parts can be found easily in local market along with assured repair & maintenance facility available from authorised agency is preferred by the farmer. Horsepower has been important attributes for tractor, where farmers are mostly preferring tractors having horsepower greater than 45 hp. Tractor with higher horsepower is easy to operate with heavy attachment during field operation.

There are other technical and engineering specifications needs to be considered for tractors, but the farmers only go through the morphological features they could understand based on their farming experience. Farmers are unsure about quality and standard of tractor and other agriculture machinery available in market as a result they are unwilling to make purchase decision on costlier machinery. Testing and validation of imported agriculture machinery should be compulsion by the government agencies which assures quality and standard of agricultural machinery available in market. On-farm demonstration of new tractors is suggested as an experimental marketing strategy for suppliers and increasing preferential impact among farmers. Suppliers should pay special attention to location of dealers and after-sales service they provide. Thus, this study will provide valuable tools and a basic framework to all the stakeholders especially suppliers and manufacturers

for evaluating their market efficiency and to formulate necessary planning and implementing strategies for promoting four-wheel tractors.

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