Factor Affecting Purchase of Quality Wood: Understanding Perceptions of Wood Workers Using Logistic Regression Model

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Woodworkers purchase wood from farmlands as well as from the timber markets, transport them and later convert them into usable products keeping in mind their profitability and customer relationship. Wood with problems not only devoid woodworkers with profit, in turn, affect customers with low quality products. This research is, therefore, formulated to understand factor affecting wood workers 'choice of quality wood in Multan timber market, Pakistan. A total of 60 respondents were interviewed by administering questionnaire using snow-ball sampling technique. The wealth of information obtained thus analyzed using logistic regression technique to draw meaningful inferences. The results revealed that wood problem related to Insect's pests and diseases (B= .234, Wald 3.687, sig .05), wood defects (B=-.294, Wald 3.833, Sig -.050) and perception of safe transportation (B= 3.833, Wald= 5.479, sig =.019) positively affect wood workers' choice of quality wood purchase. The research concluded that woods available in timber markets should be free from insect pests and defects damage to save woodworkers and customers premiums. This might entail trainings organized by government for consumers and wood workers to identify wood problems and purchase quality woods.

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1. INTRODUCTION

Wood is an important and versatile material [1], being used for numerous products for almost segments of society, hence, it emphasizes to increase its production and utilization sustainability [2].The sawn timber then converted to numerous products meeting the taste of consumers, workers and traders to render quality and profitability [3,4]. Hence, choice of wood and design is dependent upon several factors such as durability, availability, strength and cost in combination [4].

Woodworkers purchase wood from farmlands as well as from the timber markets, transport them and later convert them into usable products. Low-cost wood with less problems in conversion and free from wood problems, viz-a-viz., insect pest infestation and fungal diseases [5,6], physical wood problems such as knots, wane, stains, shakes and cracks are instrumental in generating premiums for woodworker on one quality product to consumer on the other [7-9].

Various studies have reported various factors that govern the quality and purchasing of wood based products in the market. Foremost of them is the standard, it is most important factor as it gives the product consistency and sustainable quality [10]. Standard can only be introduced in a specific market only if the traders, buyers and the consumers have knowledge about any specific standards [11]. The quality of timber product depends upon availability of standards. Another critical factor on which quality depends is the availability of quality materials [11,12]. Pakistan has 4.5 million ha. forest area (5.1 percent of the land area). The per capita forest area of 0.03 hectares is well below the world's average of 1 hectare and this amount is further decreasing with the growth of population [13]. Natural forests are mostly reserved and only defected or fallen trees reach market for consumption. While the most timber is produced from the farms that too in such a number that is not enough for fulfilling the required demands [14].

Logistic regression is a statistical technique first introduced in 1944, that has transformed into various group of techniques that has been used since the mid-1950s [15]. Briefly described, It is a technique that realistically models the attributes that matters most to the consumers [16]. This analysis in this study was selected as a tool for modeling wood workers response to various factors affecting the quality of wood as it permits to determine the importance of various factors that governs the wood product attributes [17]. Despite its prevalent usage in other disciplines, a review of the forest products literature revealed a few researches used the technique. Reddy and Bush [18] and Aguilar et al. [19] utilized it to assess perceptions of wood workers to govern the lumber quality. Bigsby and Ozanne [19] and Cooper et al [20] utilized it to model consumer preferences for CFPs. Both of these studies utilized wood furniture as a hypothetical product.

Besides, woodworkers looking for their benefits and choices regarding wood quality, emphasis should also be given to consumer choice and preferences at large. For instance, purchasing behaviors, properties and choices of customers could reflect from age, education, gender, supply, demand reflected from demographic features [9-11]. To most of the consumers visible, clear finish surface would create positive impression. Hence, in most countries, most of the consumers prefer Wood sorting, classification selection based on technical properties as well as free of any defects and diseases to obtain more solid woodis a guideline for woodworkers and traders to go after [21]. Keeping in view of the preference and parameters affecting wood choice, this research is aimed athow woodworkers perceive factors affecting the purchase ofquality woods.

2. METHODOLOGY

2.1 Location

Present study was conducted in Multan district timber market. Multan is one of the oldest cities in Pakistan. It is surrounded by river Chenab and is famous place for many saints to visit and stay and hence called as "city of saints". The district is also famous to produce Pakistan's best mangoes. Farmlands are filled in with cash crops like cotton, sugarcane, and rice along with trees namely *Vachellianilotica, Mangifera indica, Sygygiumcuminii, Dalbergia sissoo, Albizzia lebbek, Morus alba, Azadirachta indica, Melia azadirach, Eucalyptus camadulensis* etc. Timber market is also oneof the Pakistan's biggest markets carrying both hard and softwoods, local as well as imported from other countries.

2.2 Research Design and Sampling

The research made use of survey methodology to administer questionnaire on study respondents. The interview schedule consists of structured and semi structured questions finding how woodworkers perceive factors affecting their wood preferences. Information contained in the

questionnaire were obtained based on initial meetings with traders, wood workers, workshop owners and after thorough discussions questions were formulated applicable to local area. Moreover, a pre-test was also performed on 10 respondents which later were not made part of study to remove any ambiguities. Respondents' selection followed snow-ball sampling process wherein basic information was obtained from the timber dealers in Multan timber markets. Later, upon visiting a woodworker workshop, information for the next interview was obtained, like wise respondents were approached and made up a total sample of 60 woodworkers.

2.3 Data Collection Instrument and Procedures

Respondents when approached, they were clearly informed about the purpose of the study and all contents of questionnaire were shared and clarify any ambiguity raised by the respondents. Attention was given to free time of woodworkers and by doing so, some of the respondents were paid several visits. Face to face interviews were carried out and questions were translated in local dialect for ease of understanding by the respondents. The wealth of information, thus collected, summarized, and later analyzed to draw meaningful inference.

2.4 Statistical Analysis

The data were analyzed using SPSS software. Logistic regression technique was employed to understand woodworkers' perceptions to purchased quality wood.Logit regression model tells existence of relation among variables. Binary Logit Regression (BLR) model applied here to elaborate how independent, or response variable is influenced and correlates by dependent variables. Chi square with maximum likelihood evaluation function, applied here is a standard method that is commonly employed since model results are accordant, asymptomatically efficient, and sufficiently distributed. Total number of seven variables were employed in the binary logit regression model; and out of these seven, four variables turned out depicting significant contribution in the model. Age, defects, insect pests and diseases and safe transport are the variables that proved to be significant. Results depicted wood workers had ample know-how regarding defects, insect pests and diseases along with the fact that younger aged ones had more information regarding this.

Logit Model (pi) = Log (pi/1-pi)

Where, pi denotes the probability of yes and (1-pi) is the probability of number. Where odds for dependent variable (that showed significant contribution) and independent variables are:

The empirical model that had been derived for the recent research is:

Log (pi/ 1 − pi) =0+ Insect pests and diseases$_+$ defects+ safe transport to carry wood and products

Where age had levels (1= 10-30, 2=31-45, 3=46-60, 4= above 60), insect pest and diseases had 2 levels (1=termite attacks, other insects), defects had 5 levels (1= breakage, 2=shrinkage and occurrence of shakes, 3= twist and breakage, 4=swelling, 5=tweak sound and 6=No opinion) and safe transport to carry wooden furniture/doors/windows had following 6 levels (1= truck/mini truck, 2= train, 3= trailer, 4= container, 5= cart, 6= *carry dala*).Whereas independent variable had 2 levels (1=yes, 2=no)

3. RESULTS

3.1 Logit Model

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Formula: Logit Model (pi) = Log (pi/1-pi)

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Log (pi/ 1 − pi) =0+ Insect pests and diseases$_+$ defects+ safe transport to carry wood and products.

Table 1. Logit regression model

Variables in the Equation						
	B	S.E.	Wald	Df	Sig.	Exp(B)
Age	-.921	.452	4.152	1	.042	.398
Education	.437	.426	1.051	1	.305	1.548
Profession	-.263	.314	.697	1	.404	.769
Insect pests and diseases	.234	.122	3.687	1	.055	1.263
Wood defects	-.294	.150	3.833	1	.050	.745
Factors effecting purchase	-.250	.207	1.449	1	.229	.779
safe transport to carry wooden items	.592	.253	5.479	1	.019	1.807
Constant	4.700	3.262	2.075	1	.150	109.913

B = Beta, S.E = Standard Error, Wald = Wald Chi Square, Df = Degrees of Freedom, Sig = Significant p ≤ 0.005

Where age had levels (1= 10-30, 2=31-45, 3=46-60, 4= above 60), insect pest and diseases had 2 levels (1=termite attacks, other insects), defects had 5 levels (1= breakage, 2=shrinkage and occurrence of shakes, 3= twist and breakage, 4=swelling, 5=tweak sound and 6=No opinion) and safe transport to carry wooden furniture/doors/windows had following 6 levels (1= truck/mini truck, 2= train, 3= trailer, 4= container, 5= cart, 6= carry dala).

Whereas independent variable had 2 levels (1=yes, 2=no).

The odds for age (B = -.921, Wald 4.152, sig 0.042) is negatively correlated with independent variable (i.e. can wood workers judge quality of furniture), negative sign indicates youngers with more perceiving capability and judgement skills regarding inspecting quality of wooden furniture/ doors/ windows. The odds for Insect's pests and diseases (B= .234, Wald 3.687, sig .055) shows positive correlation with independent variable and positive sign with beta depicts that wood workers inhabit enormous information regarding insect attacks comparatively. Negative sign with beta regarding odds of defects (B=-.294, Wald 3.833, Sig -.050), vividly clarifies that breakage and shakes were more evident as compared to other defects such as swelling and twist. Regarding safe transport (B= 3.833, Wald= 5.479, sig =.019) illustrate that consumers preferred "trucks/mini trucks" as compared to other vehicles.

4. DISCUSSION

Regression logit model was applied using Chi square test for finding correlation between independent or response variable and dependent variables. Maximum likelihood application is a standard method that is often used to evaluate probability functions. Out of seven dependent variables, 4 variables turned out to be significant. Independent variable i.e. perception on judgement quality furniture while dependent variables age, education, income, insect pests and diseases, wood defects (breakage, crack etc.), factors effecting purchase, safe transport to carry wooden furniture/windows/doors were set. Among 7 independent variables, age, insect pests and diseases, wood defects (breakage crack etc.) and safe transport to carry wooden furniture/windows/doors proved to be significant. Test's results showed that younger aged wood workers were actively responding and had sufficient information regarding quality judgement. Similar, research conducted in US turned out opposite and contrary outcomes as in US, it illustrated that senior citizens had more information and judgmental skills as compared to younger ones [22]. This might be due to more involvement of young workers in purchase and work of wood business as explained by the model (Table 1) than senior citizens as in the US. It is evident from results that huge percentage noticed diseases and insect pests in their wooden furniture. Odds depicts that wood workers perceived 'insect pests and diseases' in their wooden furniture greater than 'termite attacks'. Results for defects vividly entitles it a severe issue wherein negative value for beta clarified that breakage and shakes were more dominant as compared to other defects. Bowe et al. [23] narrated in the same line that in Tumulus, Turkey, coffins and other wooden furniture were damaged to a huge extent.

Since, woodworkers are often concerned with their profitability while purchasing different woods and converting them into products, wood defects are very carefully evaluated as it has direct effect on product quality and in turn effect woodworkers' premiums. For instance, important concern to purchase woods mainly dependent

upon wood grains, color, weight etc. under shadow of skills and know-how. Blanchette [24] discussed same scenario concluding mechanical testing being very effective in determining quality of the timber.Assessment of furniture quality was elaborated by respondents owning to their experience and knowledge. Replies covered material or wood type, finishing, weight and color etc. Ratnawali et al [25] described in the similar reference, branding as key indicator assisted in quality judgement of furniture. Another factor, durability and quality being directly proportional to each other, so observing wood type for assessing furniture quality is fundamental. Wood has been suffering from imperfections since long. These imperfections come forward in various forms such as shakes, cracks, insect pests, termite attacks, fungal attacks, twists, stains, decay etc. Ghofarni et al. [26] declared growth stresses also known as self-stresses as the great cause of "heart shakes" and were caused in consequence of cutting methods. Saw cut results in transverse stress imbalance, consequently "transverse shakes" are formed. Gillis and Burden [27] conferred same approach while assorted relating problems into two categories; repairable blemishes included breakage, pinholes, discoloration and wooden heart whereas the wooden knots, cracks, black spot and decay being non-repairable. Utama and Hanafi [28] reported fact referring woods feature to worsens itself in nearly13 years, this deterioration span could be extended by chemical treatments and finishing applications.

5. CONCLUSION

Upon availability of various woods in the market, woodworkers' obvious choice is to purchase wood that is free from defects and diseases, however, there is nexus between price and wood quality that in turn reflected from price of products made from such woods. Local woods are easy to buy yet endorse numerous defects due to absence of market information system and wood certification process. These two could lead to wider availability of numerous woods at affordable costs. Nevertheless, regular mass media programmes on printed and electronic media as well as social media to get people aware about various woods, identification of defects while purchasing quality woods. Moreover, there is needed to arrange trainings for wood workers/ traders for wood problem identification, use of preservatives to safeguard quality woods.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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