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DETERMINANTS OF HOUSEHOLDS' ENGAGEMENT IN THE WOODTURNING (SHAZO) BUSINESS IN TASHIYANGTSE, BHUTAN

Tashi Dendup[1], Serki Wangmo[1], Wangmo[2], Jamyang Lhamo[2], Arooj Naz[3]and Sayyed Khawar Abbas[4]*

[1]Department of Sustainable Development, College of Natural Resources, Royal University of Bhutan

[2]BSc. Sustainable Development, College of Natural Resources, Royal University of Bhutan

[3] Lecturer, College of Commerce, Government College University Faisalabad, Pakistan

[4]School of Economics, Business, and Informatics, Corvinus University of Budapest, Hungary

*Corresponding author: tashi.cnr@rub.edu.bt

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Abstract

Woodturning is a popular business in Yangtse Gewog, Tashiyangtse; however, it is not a primary activity for most households.A lack of studies on households' decisions to pursue woodturning business in Bhutan motivated the authors toidentify the determinants of households engaging in the woodturning business (*Shazo*) in Yangtse Gewog, Tashiyangtse, Bhutan. Data were collectedfrom 178 households usingpre-tested structured questionnaires. The results showed that households' experiences of the woodturning business and nonfarm income earned by households were the significant determinants (p = .000), suggestingthat the woodturning business requires skills and initial investments. Therefore, stakeholders concerned shouldprioritizeproviding woodturning skills and financial support to aspiring woodturners.

Introduction

Woodturning is said to be originated around 3rd B.C. in Egypt; however, concrete evidence of woodturning practice was recorded from only about 6th century B.C. (Finnigan, 2014). Today, woodturning is practiced in both developing (Agency for Promotion of Indigenous Crafts [APIC], 2013) and developed countries (Gutierrez and Robinson, 2019). Woodturning is the art of sanding, cutting, knurling, facing, turning, drilling, and deforming woods into different objects using a lathe. The art of woodturning is called the turnery, and the person operating the lathe is called a turner(Designing Buildings Wiki, 2018; Farris et al., 2020).In Bhutan, *Shazo* refers to the

turnery and *Shazopa* to a turner (College of Zorig Chusum, 2020).The woodturning in Bhutan is said to come from Tibet (Wangdi *et al*., 2019);however, Bhutan codified the woodturningonly in the 17th century as one of theThirteen Traditional Arts and Crafts (*ZorigChusum*) (Colorful Bhutan, 2019; APIC, 2013; Wangdi, 2019).In Trashiyangtse, for some families, *Shazo*skills were passed on for generations from father to son. They maintained their livelihoods by selling or exchanging these wooden wares for cash and kinds (APIC, 2013). Hence, the woodturning business is more prevalent in Tashiyangtse than in other districts(Wangdi *et al*., 2019).

There are different woodturning techniques, includingspindle turning,segmented turning, faceplate turning, and bowl turning (Designing Buildings Wiki, 2018; Mannir et al., 2020).Among these woodturning techniques, the bowl (*Dapa*) turning is famous in Bhutan (College of Zorig Chusum, 2020).Smooth Maple (*Acer laevigatum*), Rhododendron (*Rhododendron rboreum*), Wild Avocado (*Persea kurzii*), Yellow Avocado (*Persea glaucescens*), Agarwood (*Aquilaria malaccensis*), Oak (*Quercus griffithii*), and Alder (*Alnus nepalensis*)are commonly used woods by the Bhutanese woodturners (APIC, 2013). Besides these woods mentioned above, Bhutanese woodturners use a tree's highly-priced knot–locally known as *Zaa*(College of Zorig Chusum, 2020). Bhutanese woodturners use leaves of the Sog sog ma plant (*Trema politoria*) tosmoothen the surface of the turned wooden products and substance tapped from fruit, leaves, and stem of Sey shing (*Rhus succedanea L*) to lacquer the turned wooden products (APIC, 2013).

Wooden products were essential utility itemsof the past, but they arenow luxury and decorative items(Business Information and Opportunity Centre [BOIC], 2015).Hence, people are increasingly demanding wooden products(Tshedup, 2018). Besides selling the turned wooden products to local customersand tourists visiting Bhutan,woodturners export their products to Bhutan's neighboring countries,such as China, Nepal, and India(Wangdi, 2016; Wangdi *et al*., 2019).The increasing number of customers motivateswoodturners to produce turned wooden products of various shapes, sizes, and colors (Phuntsho, 2018). Plates, cups, soup bowls, wine cups, and dinner sets are examples of products that evolved in recent times (Bhutantoday, 2008).These products fetch a few hundred to several thousand Bhutanese Ngultrums depending on their shapes, sizes, and colors. For instance, a product from *Zaa*fetches a remarkably higher price than the products from other wood (Bhutantoday, 2008;College of Zorig Chusum, 2020).

The woodturning business employs numerous people (part-time or full time)as raw material collectors, woodturners, and lacquerers (Wangdi, 2016). To organize the increasing number of people engaged in the woodturning business, the APIC–an institution to preserve and promote crafts in Bhutan–formed a woodturning cooperativecalled the Chorten Kora Shazo Cooperative(APIC, 2003).The woodturning is a popular business in Yangtse Gewog, Tashiyangtse(BOIC, 2015); however, it is not a primary activity for most households.There is scarce information on determinants of households' pursual of woodturning business in Bhutan, particularly in

Tashiyangtse. Understanding factors affecting households' decisions to pursue woodturning business will provide valuable insights for relevant stakeholders to promote woodturning business in the country. Therefore, this study identified determinants of households' engagement in the woodturning business in Yangtse Gewog, Tashiyangtse, Bhutan.

Materials and Methods

Study area

The current study was conducted in Tashiyangtsebecause the woodturning business is most popular in the district than in other districts (Wangdi *et al*., 2019). Located in the north-eastern part of Bhutan, Trashiyangtse district (Figure 1) shares its borders with Trashigang and Mongar in the south, Lhuentse in the west, India (Arunachal Pradesh) in the east, and China (Tibet) in the north. Trashiyangtse district has a geographical area ofabout143,496km^{2}ranging from 500-5401meters above sea level (National Statistics Bureau [NSB], 2020a). The district's population is 17,300 (8,719 male and 8,581 female) with population density of 12 persons per km^2(NSB, 2020b).It has eight Gewogs, 41 Chiwogs, and 117 villages(BOIC, 2015).

Yangtse Gewog (Figure 1) is on the District Administration, DistrictTown, and Chorten Kora premises. Settlements are on either side of the Kholongchu river basin.Out of eight Gewogs, Yangtse Gewog is famous for woodturning, and it has the highest woodturners. Yangtse Gewog also hosts the College of Zorig Chusum and the Chorten Kora Shazo Cooperative. The livelihoods of some people in the Gewog depend on the woodturning business besides farming. Most woodturners reside in Baylling, Baney-Bimkhar, and Lichen Chiwog (BOIC, 2015).A preliminary survey of locals via telephone interviews confirmed a few woodturners even in Gangkhar and Rabti Chiwogs;therefore, this study covered all five Chiwogs in Yangtse Gewog.

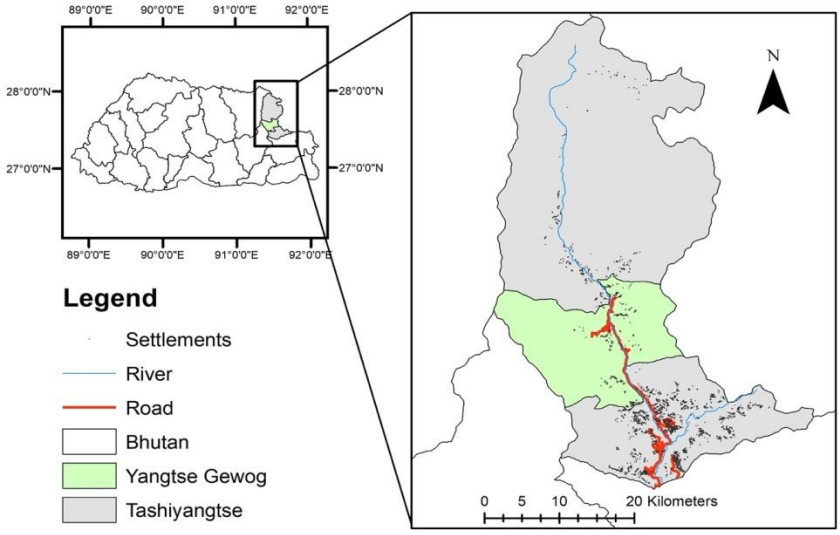

Figure 1: Study area; (A) Bhutan, (B) Trashiyangtse, and (C) Yangtse Gewog

Sample size and sampling

Yangtse Gewog had461 households,excluding 56 *Gungtongs* (emptyhouseholds) during the study (National Statistical Bureau, 2018). Data were collected from 178 households, which covers 34.43% of the 461 target households.Seventy-seven households pursuing the woodturning businesswere selected using the snowball sampling technique.The snowball sampling was most appropriate because it helped identify the households pursuing the woodturning business in the absence of records of households pursuing the woodturning business. In this study, a household engaging in the woodturning businessis defined as having at least one raw material collector, woodturner, or lacquerer. The convenience sampling was employed to select 101 households who are not into the woodturning business; they were chosen from the proximity of those households pursuing woodturning business(convenience sampling) in the same community.

Data collection

Yangtse has a mix of *Kurtoep* and *Yangtsip*(local dialects) speaking people (BOIC, 2015); therefore, enumerators and local translators were hired. Researchers trained enumerators and translators to collect the data using the pre-designed structured questionnaire.The questionnaire was pre-tested on ten households in Yangtse. During the pre-test, respondents could answer most questions without any difficulty, and a few other abstruse questions were corrected to improve the clarity of the questions.Literate respondents self-administeredquestionnaires, whileenumerators filled questionnaires for illiterate respondents. All respondents, however, filledquestionnaires only in the enumerators' presence. Enumerators' presence enabled respondents to clarify their doubts, assured no external disturbances, and completed all questions correctly.Bothpre-tests and actual surveys were conducted in December 2019. Respondents were household heads (who make most decisions in the family).

Approval and consent

The College Research Committee at the College of Natural Resources, Royal University of Bhutan, approved this research. Researchers informed the Trashiyangtse District Administration and the Yangtse Gewog Administration about the study through a formal letter from the College of Natural Resources. Informed consent was also acquired from all respondents prior to interviews.

Data Analysis

Data entry and cleaning were done in Microsoft Excel 2016. After that, data were imported into the Statistical Package for the Social Sciences (SPSS) version 23 for further analysis. Tests of differences in socioeconomic characteristics between households engaged and not engaged in the woodturning business were performed. Tests include two-sample independent t-tests for the continuous data and Chi-square tests of independence for the categorical data. Determinants of households pursuing woodturning business were analyzed using the binary logistic regression

model in SPSS and average marginal effects in R version 4.0.3, as described under the empirical model.

Empirical model

Each household rated 1 if one or more household member is engaged in the woodturning business or0 if no member was engaged in the woodturning business (Table 1). This binary dependent variable necessitated to use of the binary logistic regression model (Nahayo *et al*., 2017) to identify determinants of households' decisions to pursue the woodturning business as shown in equation (1) and (2):

$$\frac{\text{Pro}\,(Y_i = 1)}{\text{Pro}\,(Y_i = 0)} = \frac{P_i}{1 - P_i} = e^{(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \ldots \beta_n X_{ni})} \quad (1)$$

Where: Pi = households' pursuing the woodturning business,
1 - Pi = households' not pursuing the woodturning business, and
e = exponential constant

Computing log on two sides of the equation (1), we get:

$$L = \text{In}\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \ldots \beta_n X_{ni} \quad (2)$$

Where: L = logit model,
β0 = intercept term,
β1 - βk = coefficients of independent variables, and
X1i – X13i = independent variables (see Table 1)

Previous studies on the determinants of households pursuing small-scale businesses guided the selection of independent variables in this study (Table 1). For instance, earlier studies showed profiles of the household's head, such as age, gender, marital status, and education as significant determinants (Karlı*et al*., 2006; Nugussie, 2010; Chagwiza *et al*., 2016; Nahayo *et al*., 2017). Studies have also reported the household's socioeconomic characteristics such as land, family size, livestock, income, and business experience as significant determinants of the households' business pursuit (Karlı *et al*., 2006; Asante *et al*., 2011; Abate *et al*., 2014). Besides, external factors, including credit and extension services, were also reported as significant determinants (Zheng*et al*., 2012; Adong *et al*., 2013; Wossen *et al*., 2017).

Table 1. Description of dependent and independent variables

Variable	Type	Description
Dependent		
Woodturning business	Dummy	1 if one or more household member is engaged in woodturning business, 0 otherwise
Household head's profile		
Age	Scale	Age of head of household in years
Gender	Dummy	1 if the head of household is male, 0 otherwise
Marital status	Dummy	1 if the head of household is married, 0 otherwise
Literacy	Dummy	1 if the head of household can read and write, 0 otherwise
Household's structure		
Experience	Scale	1 if any household member engaged in woodturning business, 0 otherwise
Land	Scale	Areas cultivated in acres
Cattle	Scale	Number of cattle reared in the household
Family size	Scale	Number of persons permanently living in the household
Nonfarm income	Dummy	1 if the household earns nonfarm income, 0 otherwise
External factors		
Credit	Scale	Number of loans accessed by the household in the past 12 months
Extension	Scale	Number of times extension official visit the household in the past 12 months

Although odds ratios can interpret binary logistic regression results, researchers in economics fields prefer marginal effects (Williams, 2019). Researchers use any of the three marginal effects: (1) marginal effects at representative values, (2) marginal effects at the mean, and (3) average marginal effects. However, average marginal effects were used to interpret the results in this study because they provide a unified and intuitive way of describing relationships estimated with regressions (Leeper, 2018).

Results and Discussion

Socioeconomic characteristics of households

This section presents the socioeconomic characteristics of households. The household heads' average age was 52.99 ± 13.27 (mean ± standard deviation) years old. Female respondents (53.37%) were higher in number than the male (46.63%). More than 80% of the respondents were married. Illiteracy was higher among respondents with 81.46%. In agreement, a previous study in Trashiyangtse also noted high illiteracy (66.4%) of household heads (Dendup and Dorji, 2020). Bhutan's rural areas have high illiteracy compared to urban areas (NSB, 2017). Most households (73.60%) do not have a history of any family members engaged in the woodturning business. The average cultivated land was 1.86 ± 2.98 acres.On average, households in Yangtse rear 4.52 ± 3.79 number of cattle. The findings are consistent with previous studies that reported livestock as a common practice in Tashiyangtse, besides cropping(BOIC, 2015; Dendup and Dorji, 2020). A family size of 5 ± 2.43 in this study is in close agreement with the national average of 4.4 in rural Bhutan(NSB, 2017).The result also shows that 56.18% of households earnnonfarm income in addition to farm income. The number of loans obtained by the family is 0.85 ± 1.37 times in the past 12 months. The average number of time extension officials visited the household is 1.58 ± 0.88. Table 1 presents the profiles of households in detail.

Out of the 11 socioeconomic characteristics, only two variables yielded significant results (Table 2). Chi-square test reveals a significant

association of families' woodturning experiences in the past and the households' current engagement in the woodturning business, where $\chi 2(1) = 60.524$, $p = 0.000$. A plausible reasonfor the significant result is that the woodturning requires specific skills that often pass from one generation to another in a family. There is also a significant association between earning nonfarm income and household engagement in the woodturning business, where$\chi 2(1) = 87.863$, $p = 0.000$. This finding could be because farming households face trade-offs to participate in nonfarm activities, thereby earning less nonfarm income. Moreover, farming is a secondary occupation for full-time woodturners.

Table 2. Socioeconomic characteristics of households

Variables	Categories	Total	Households' engagement in the woodturning business		Test [a]
			No	Yes	
Household head's profile					
Age		52.99±13.24	54.07±13.27	51.58±13.14	1.243
Gender	Male	83(46.63)	46(25.84)	37(20.79)	0.110
	Female	95(53.37)	55(30.90)	40(22.47)	
Marital status	Married	144(80.90)	77(43.26)	67(37.64)	3.283
	Single	34(19.10)	24(13.48)	10(5.62)	
Literacy	Illiterate	145(81.46)	84(47.19)	61(34.27)	0.451
	Literate	33(18.54)	17(9.55)	16(8.99)	
Household's structure					
Experience	No	131(73.60)	97(54.49)	34(19.10)	60.524***
	Yes	47(26.40)	4.00(2.25)	43(24.16)	
Land		1.86±2.98	1.97±3.70	1.72±1.63	0.219
Cattle		4.52±3.79	4.68±3.81	4.30±3.78	0.669
Family size		5.00±2.43	4.79±2.34	5.27±2.52	-1.312
Nonfarm income	No	78(43.82)	75(42.13)	3(1.69)	87.863***
	Yes	100(56.18)	26(14.61)	74(41.57)	
External factors					
Credit	No	110(61.80)	67(37.64)	43(24.16)	2.037
	Yes	68(38.20)	34(19.10)	34(19.10)	
Extension		1.58±0.88	1.51±0.83	1.68±0.94	-1.206

Note:
[a] Chi-square test ($\chi 2$) for the categorical variables and two-sample independent t-test (t) for the continuous data
Continuous data presented as mean ± standard deviation
Categorical data presented as frequency (percentage)
***Significant results at $p = .000$

Determinants of households' engagement in the woodturning business

The variance inflation factor (VIF) and tolerance were calculated to checkthe multicollinearity issues among the independent variables (Table 3).The average VIF of 1.18 in this study is desirable (Boweman and O'Connnell,1990). The largest VIF value is less than ten, which is also acceptable (Myers, 1990). Tolerance values in Table 3 are all greater than the threshold of 0.2 (Menard, 1995). Thus, there are no multicollinearity issues among the independent variables.The model Chi-square was significant ($\chi^2(11) = 137.308$, $p = .000$), and the model correctly classified 84.8% of the observations. The Hosmer-Lemeshow testwas not significant as desired, where$\chi^2(8) = 6.947$, $p = .542$.The independent variables explained 72.1% of households' engagement in the woodturning business ($R^2 = 0.721$). Altogether, these statistics confirmedthat the model is good for further interpretation of the results.

Household heads profiles, including age, gender, marital status, and literacy, have no significant influence on households' engagement in the woodturning business (Table 3). Household heads as the decision-maker were expected to influence the households' decisions to pursue the woodturning business. However, the results are against the initial assumptions derived from previous membership and adoption studies (Karlı *et al*., 2006; Nugussie, 2010; Chagwiza *et al*., 2016; Nahayo *et al*., 2017). A plausible reason is that the household head defined in this study –a person recorded as the family head in the census–is not necessarily the household's decision-maker. Land cultivated by households, the number of cattle owned by households, the number of persons in the family are also not significant determinants.Extension officials visiting houses and accessing credits by households also did not significantly influence households' engagement in the woodturning business. It could be because people in Yangtse are smallholders practicing integrated farming (Dendup and Dorji, 2020). They are also similar in many other aspects, such as household size and access to extension services and credits (Table 2).

Table 3. Determinants of households' engagement in the woodturning business

Variables	B	S.E.	EX(B)	AME	Collinearity	
					Tolerance	VIF
Household head						
Age	0.011	0.021	1.011	0.0011	0.766	1.305
Gender	0.025	0.512	0.975	-0.0024	0.900	1.111
Marital status	0.003	0.826	1.003	0.0003	0.778	1.285
Literacy	0.287	0.649	1.333	0.0272	0.843	1.186
Household structure						
Experience	3.155***	0.764	23.448	0.2982***	0.792	1.263
Land	-0.112	0.102	0.894	-0.0106	0.948	1.055
Cattle	0.038	0.065	1.038	0.0036	0.905	1.105
Family size	-0.045	0.119	0.956	-0.0043	0.909	1.100
Nonfarm income	4.449***	0.788	85.517	0.4205***	0.709	1.411
External factors						
Credit	-0.105	0.516	0.900	-0.0100	0.958	1.044
Extension	-0.288	0.307	0.750	-0.0272	0.914	1.094
Constant	-3.940*	1.675	0.019			
-2 Log likelihood =106.207**						
Nagelkerke R^2 = .721						

Note: Significance level: *** .001, ** .01, and * .05
B = Coefficient estimate, S.E = Standard error, EX(B) = Odds ratio, AME = Average marginal effect, and VIF = Variance inflation factor.

Woodturning by family members in the past determined the households' engagement in the woodturning business (p= .000).Woodturning originally came to Bhutan from Tibet and formalized it around the 17th century in Bhutan (APIC, 2013; Colorful Bhutan, 2019; Wangdi, 2019).However, Bhutanese woodturnersstillpracticethe traditional woodturning whichneeds physical laborers and done manually with limited modern woodturning technologies (APIC, 2013).Absence of a standard manual for woodturning in Bhutan further demands experiences and skills. For instance, the raw material collector should identify suitable raw materials as only selected wood species are used for the woodturning (APIC, 2013; BOIC, 2015). Aspiring individuals also should know the

harvesting techniques; otherwise, an in-experienced collector damages the raw materials (Wangdi, 2019). The raw material collection is also physically challenging as collectors have to travel far into the forest, searching for useable woods (Wangchen, 2018; 2019).In production, woodturnersare vulnerable tophysical injuries from accidents and wildlife attack. Besides, experienced woodturners also receive complaints about defects in their products.Preparing and applying lacquer is another activity requiring skills (Wangdi, 2019).These challenges show the need for specialized skills, which parents (woodtruners) passed down to their children (APIC, 2013).Thus, a family history of woodturning influences households' current engagement in the woodturning business. Although the College of Zorig Chusum (previously known as the Institute of Zorig Chusum) trains aspiring woodturners, it takes two years to complete a woodturning certificate course. However, it requires more than two years to master the art of woodturning. Therefore, the woodturning in Yangtse remains apatriarchal family linage, confirming the household's experience of woodturning in the past as a significant determinant of its present engagement in the business.

Households earning nonfarm income determined their engagement in the woodturning business significantly (p= .000).This result implies that families are more likely to engage in the woodturning business if they earn nonfarm incomes because the households pursuing nonfarm activities do not face trade-offs like full-time farmers.The woodturning cycle starting from collecting raw material, turning wood, and lacquering the finished products, takes about a year (BOIC, 2015, Wangdi *et al*., 2019). Woodturners make substantial investments starting the raw material collection stage, and they could sell only at the end of a year. However, as households depending on their livelihoods on farming face high opportunity costs to start the woodturning business, they prefer to continue farming.Smallholder farmers in Yangtse (BOIC, 2015; Dendup and Dorji, 2020) experience inconsistent production (due to seasonal factors such as weather, pest, and disease) and earn less income (due to limited surplus for sale). Hence, farmers cannot participate in the woodturning business because they often cannot pay the upfront investment required for starting such a business. In Yangtse Gewog, people earning nonfarm income includes civil servants, shopkeepers, and people in the woodturning business. These groups of people earn regular income adequate to invest the year following.

Conclusion

Woodturning is a traditional art of Bhutan, mostly practiced by people of the Tashiyangtse district. This study determined factors affecting households' decision to pursue the woodturning business in Yangtse Gewog, Tashiyangtse, Bhutan. The results showed two factors: woodturning business experience (first) and nonfarm income earned by the household (second), significantly determined households' engagement in the woodturning business. The result of the woodturning business experience suggests that parents (*Shazo*) transfer thewoodturning skills mostly to their children.This finding implies that training is a must for transferring skills to aspiring woodturners, other than family members, to promote woodturning in the country. Therefore, authorities concerned, including the APIC and the college of Zorig Chusum, should designed programs to attract and train all aspiring woodturning.The result of nonfarm income revealed that woodturning is a business for those households with a regular flow of nonfarm income. The finding suggeststhe importance of helping aspiring woodturners with the required initial investments. Therefore, stakeholders concerned should prioritize providing woodturning skills and improving aspiring woodturners' financial access to promote the woodturning business in the country. However, the results in this study are based on self-reported data by the respondents.

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