

Households' Responsiveness to Government Ban on Polythene Carrier Bags in Uganda

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Abstract

Polythene carrier bags have become common in Uganda largely due to their desirable properties that are considered convenient by consumers. They have, however, turned out to be a big nuisance and threatening the environment due to their non-biodegradable nature amidst improper disposal systems. The government of Uganda thus banned the use of the bags in July 2007. A study was conducted to determine households' willingness to pay for alternative carrier materials, and to determine factors that affect household's willingness to pay for such alternatives. The study sample included households in urban and peri-urban areas from whom information was collected using a pre-tested questionnaire. It was noticed that a large proportion of the respondents were aware of the ban and had positive attitudes towards the ban. Majority of the respondents expressed the need and willingness to stop using polythene bags in favour of alternative materials (durable woven baskets, cloth bags, paper bags and local *kikapu* bags). Factors explaining household willingness to pay for alternative materials included existence of awareness campaigns, availability of garbage collection services, sex of household head and ownership of occupied residence.

Keywords: Ban, household, polythene bag, willingness to pay

1. Introduction

Polythene is one of several products that have flooded the Ugandan markets in recent years, substituting the traditional jute bags as carrier bags. There are two main types of polythene bags used in the retail sector in Uganda; high density polyethylene (HDPE) and low density polyethylene (LDPE). The HDPE are thin, light and usually non-branded. The average weight of the commonly used bag before the ban was estimated at about 4g (Mugisha *et al.*, 2007) as compared to 6g for equivalents used in Australia. The LDPE, on the other hand, are thicker and heavier. They are commonly used for packing products of higher quality and/or weight than what the HDPE package. In the rural areas of Uganda, the bags have substituted banana leaves and fibres which households used to use as packaging materials for meat and other fresh foods from markets to homes, paper and jute bags for most of the dry foods and non-foods, and cloth bags children used to use as carrier bags for their school books. Used polythene carrier bags are virtually found everywhere including in the streets, along the roads and pathways, dumpsites, drainages, ditches, open-fields, roof tops, hanging from trees and overhead cables, floating on ponds, among others. This poses a threat to the quality of the environment in both rural and urban areas. They do not break down easily, taking up to 20-1000 years (Clean Up Australia, 2007; Stevens, 2001). This implies that they have been accumulating in the environment ever since their introduction in 1977 in developed countries, and in more recent years in developing countries. It has been estimated that somewhere between 500 billion and a trillion plastic bags are consumed worldwide each year, of which millions end up in the litter stream outside of landfills (Roach, 2003). They are hazardous to agriculture, health and sanitation, and environment (Virik *et al.*, 2004; VomSaal and Hughes, 2005; Gibson, 2007).

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Improper disposal causes soil degradation because they are impermeable to water (Xie *et al.*, 2006). They reportedly suffocate livestock or block their digestive tract when mistakenly eaten leading to death (Ryan and Rice, 1996). Considering the hazardous effects associated with production and use of polythene, the Government of Uganda banned the production and use of polythene carrier bags of less than 30 microns with effect from September 2007, while a heavy excise duty of 120% was imposed on thicker polythene materials (Ministry of Finance, Planning and Economic Development, 2007). Despite the ban and the high tax imposed on polythene bags, there were still unanswered questions regarding peoples' perceptions on the ban and their willingness to respond to the ban. Effective implementation of the ban requires relevant information regarding the public perception about the intervention. The objectives of the study were, therefore, to determine households' willingness to pay for alternative carrier materials, and to determine factors that affect household's willingness to pay for the alternatives. The study builds on other country studies which have reported mixed reactions to the ban and levies. For instance, Sharma and Kanwar (2007) found that 84 and 100% of rural and urban women in Himachal Pradesh had a favourable attitude towards the ban on polythene use. A study by Work for a Better Bangladesh (2002) also found that 94% of the respondents interviewed in Dhaka supported the government decision to ban polythene bags. In a survey by Cromwell Polythene Ltd (2006), 69% of the respondents thought that a tax or ban on plastic bags would bring a net environmental gain, 19% thought otherwise, while 12% did not know. However, Cromwell Polythene Ltd reported that countries that had carried out serious scientific research had proved that such bans or taxes would instead have serious unintended additional impacts on the environment which far outweigh any perceived advantages. About 79% believed that plastic bags were a major contributor to the litter problem, but Cromwell Polythene Ltd noted that plastic bags of all types were a very small percentage (less than 1%) of the litter problem.

2. Methodology

2.1 Study Area

The study was carried out in urban and peri-urban areas of Kampala City, Masaka Municipality and Iganga Town. Kampala City covers an area of 238 km² and is the capital city of Uganda. It borders the districts of Mukono in the East, Mpigi in the west, Luwero in the North and Lake Victoria on its Southern end. The city centre is mainly commercial while the suburbs are dominated by residential, small scale industries and limited agricultural production. Masaka Municipality is located approximately 130 km southwest of Kampala. Roads connect it with Mbirizi, Lyantonde and Mbarara district. It is a market town and important commercial centre for the surrounding farmers. It has industries for fish, bakery products, footwear and furniture, and urban agriculture is practiced. Iganga town is located 127 km east of Kampala. It is on the main route from Kampala to Kenya and well served with public transport.

2.2 Sampling Technique and Sample Size

The main target for this study was the household. The target was to obtain a sample that contained approximately equal sub samples of urban and peri-urban households. Purposive sampling was used to select the study areas, while random sampling was used to select the households. The peri-urban areas from the three urban centres were selected according to the location with reference to the busy commercial centres of each of the three study areas. In Kampala, places located more than six kilometres away from the city centre were considered peri-urban. In Masaka and Iganga, peri-urban areas were those located about one to two kilometres away from the town centres. Because there was no uniform expansion of the towns in all directions, the distance to the selected peri-urban areas from the urban centres varied depending on which direction of the urban centre. A total of 251 households was sampled; 129 from Kampala City, 56 from Masaka Municipality and 66 from Iganga Town. Variations in sub-sample sizes by district were due to differences in sizes of the population residing in each of the selected study area as reported by the national population census. However, 101 households (40% of the total sample) were located in urban areas enabling allocation comparative analysis.

2.3 Data Collected and Data Analysis

This study used cross-sectional primary data collected using a pre-tested questionnaire which was administered in November 2007-January 2008. Household heads were interviewed. In their absence during the period of data collection, their spouses or de facto household heads were interviewed.

Collected information included socio-economic and demographic characteristics of the households, awareness of the ban on polythene carrier bags and how they were responding to the ban, use and management of polythene in households, and how willing they were to use alternative carrier bags. The willingness to pay and use alternative bags was determined using Contingent Valuation Method (CVM). This method is used in situations where value cannot be established a market process but through simulating a hypothetical market for a good (Tiller *et al.*, 1997). Data analysis used descriptive statistics (means, frequencies, percentages and standard deviations) to assess households' perceptions on the ban on polythene carrier bags. To determine factors that influenced households' willingness to pay for alternative carrier materials, a logit model was used. Willingness refers to the intension to perform or not to perform, which is ones preference with respect to state of the environment as it is affected by human activity. This willingness or lack of it reflects the behaviour of an individual or group of individuals. There has been extensive use of attitude by researchers to predict behaviour. The concept of attitude remains one of the most important behavioural science variables in decision modelling. The Ajzen and Fishbein theory of reasoned action is one of the most systematic and widely used cognitive approaches to attitude conceptualization and measurement in decision making (Malcolm and Klijn, 1998). The theory states that *attitude to the behaviour* is one determinant of intention. Reasoned action theory views a person's intention to perform, or not perform behaviour as the immediate determinant of the action. The state of the environment generates a return in the form of utility or disutility for which people are willing to pay or willing to be compensated for. In this study, it was assumed that household willingness to stop (or not to stop) using polythene; the willingness to separate (or not to separate) polythene from other wastes were an attitudinal behaviour, and were a decision based on the household's expected utility or disutility derived from the action. Thus, the dependent variable for the regression for the factors influencing household's decision to separate polythene was dichotomous, hence a binary choice model such as the binary logit or probit is suitable (Greene, 2000). Two separate generalized binary logit models, taking care of heteroscedasticity, were used to analyze the factors influencing households' willingness to pay (WTP) for alternative materials. The dependent variable was captured as willingness to stop using polythene and pay for the alternative materials (1=willing; and 0=not willing to pay for other materials that could be used as polythene bag substitutes). A logit model was used, which is based on the cumulative statistical function (Mukherjee *et al.*, 1998) specified as:

$$[1] P_i = F(Z_i) = F(\alpha + X_i\beta) = \frac{1}{1 + e^{-z}} = \frac{1}{1 + e^{-(\alpha + X_i\beta)}}$$

Such that

$$[2] \ln \frac{P_i}{(1 - P_i)} = (\alpha + X_i\beta)$$

The dependent variable is the natural log of the probability of participating (engaging) in an activity (P), divided by the probability of not participating (1-P). This model was used in the analysis as:

$$[3] \ln \frac{P_i}{(1 - P_i)} = (\alpha + X_i\beta) + \varepsilon_i$$

Where the X_i term represents a vector of exogenous variables affecting the household's decision to separate polythene from other wastes, and their willingness to pay for alternative materials (see Table 1), β is a vector of unknown parameters estimated, and ε_i is a set of error terms. Data were entered in SPSS and analysed using STATA 9.1.

Table 1: Definitions of Explanatory Variables and the Hypothesized Signs

| Variable definition | Expected sign |
|--|---------------|
| Household size (number of people in the household) | +/- |
| Proportion of members who stayed at home most of the time | + |
| Estimated household income | + |
| Nature of neighbourhood (1 if presence of unused space; 0 otherwise) | - |
| Residence ownership (1=household owns the premises of residence; 0 if not) | + |
| Availability of garbage collection services in the area (1=yes; 0=no) | + |
| Existence of awareness campaigns(1=yes; 0=no) | + |
| Gender of household head (1=male; 0=female) | - |
| Number of years in formal education of household head | + |
| Number of years in formal education of spouse | + |
| Marital status of household head (has been married = 1; 0 otherwise) | - |

3. Results and Discussion

3.1 Management of Polythene and Other Wastes

The study results show that 48% of the households dumped wastes in the neighbouring unused spaces, which were not gazetted as waste dumping sites. Very few households (18%) dumped waste in rubbish pits, while others (26%) packed waste in bags before dumping it at the universal city/town council dumping sites (Table 2). The bags used for waste disposal were mostly made of polythene material, which increased the polythene burden to the environment. Improper waste disposal methods especially dumping in non-gazetted places pose a great risk to both human health and the environment either through direct contact or indirectly by contamination of soil, groundwater, surface water and air. They also reportedly cause blockage of drainage and sewerage systems (Kaundal and Sharma, 2007).

Table 2: Waste Disposal and Access to Waste Collection Services

| Characteristic | Overall sample | | Urban households | | Peri-urban households | |
|---|----------------|-------------|------------------|-------------|-----------------------|-------------|
| | Freq. | % | Freq. | % | Freq. | % |
| Nature of household waste disposal site | 251 | | 101 | | 150 | |
| Unused space in the neighbourhood | 120 | 47.8 | 45 | 44.6 | 75 | 50.0 |
| Dug pit | 45 | 17.9 | 14 | 13.9 | 31 | 20.7 |
| Use bags and taken to gazetted dumping site | 65 | 25.9 | 37 | 36.6 | 28 | 18.7 |
| Availability of waste collection services in the area | 132 | 52.6 | 63 | 62.4 | 69 | 46.0 |
| Household has access to waste collection services | 83 | 33.1 | 45 | 44.6 | 38 | 25.3 |
| Waste collectors require you to separate polythene from other waste | 8 | 3.2 | 3 | 3.0 | 5 | 3.3 |
| Reason for lack of access to waste collection services | 168 | | 56 | | 112 | |
| Long distance to town council dumping places | 74 | 44.1 | 34 | 60.7 | 40 | 35.7 |
| garbage collectors take long to collect | 8 | 4.8 | 6 | 10.7 | 2 | 1.8 |
| High collection charges | 3 | 1.8 | 2 | 3.6 | 1 | 0.9 |

Households that never accessed waste collection services were mainly limited by the long distance to the dumping sites as reported by 61% of the urban and 36% of the peri-urban households (Table 2). Long distance means high costs of collection. The waste collectors, most of whom were private companies, tended to minimise the collection costs by avoiding places that were either far away from the gazetted dumping sites or which were difficult to access due to poor roads. Other reported constraints included high charges and irregular waste collection by the collecting agencies who took long to collect the waste. All these factors lead to improper waste disposal. The constrained households resorted to disposing wastes in places of convenience including nearby drainage channels, pathways, roadsides, which were not always convenient for the society.

3.2 Public Awareness and Perceptions about Polythene Ban

The government ban on the use of polythene in Uganda has attracted various responses and mixed reactions from the public especially in the urban and peri-urban settings. All the interviewed respondents were aware of the ban, and the majority (68% in urban areas and 67% in peri-urban areas) indicated that they could easily identify the type of the polythene that was banned (Table 3). Most of the interviewed respondents had positive attitude towards the ban. About 83% of the peri-urban and 77% of urban residents indicated that the government made a right decision to control the production and disposal of polythene materials so as to address environmental problems associated with the materials. These findings are comparable to observations by Sharma and Kanwar (2007) that 100% and 80% of urban and peri-urban women in Himachal were, respectively, in favour of the polythene bag ban. Although, the current ban is a good gesture by the government to minimise environmental pollution caused by polythene carrier bags, its effectiveness in addressing the targeted problem remains questionable because it is a partial instrument that is difficult to apply. It excludes polythene bags of over 30microns, yet they are equally hazardous the fact that they have similar properties as far as environmental degradation is concerned. The challenge is enforcing the ban on specific sizes. Whereas policing their manufacturing is easier, controlling their use by the consumer is very difficult as they are visually difficult to differentiate from the non-banned ones, so they can be easily disguised.

Table 3: Awareness and Perceptions about the ban on Polythene

| Awareness and perceptions | Overall sample | | Urban households | | Peri-urban households | |
|--|----------------|-------|------------------|-------|-----------------------|-------|
| | Freq. | % | Freq. | % | Freq. | % |
| Aware of the polythene ban | 251 | 100 | 101 | 100 | 150 | 100 |
| Can easily identify the type of banned polythene | 169 | 67.6 | 68 | 68 | 101 | 67.33 |
| Ban was a right move by the Government | 198 | 80.16 | 75 | 76.53 | 123 | 82.55 |
| Ban will solve environmental problems | 110 | 44.35 | 35 | 34.65 | 75 | 51.02 |
| Strengthening effectiveness of the ban and environmental compliance | | | | | | |
| Promote alternative packaging materials | 241 | 96.4 | 97 | 96.04 | 144 | 96.64 |
| Total ban (all polythene types) | 206 | 83.4 | 79 | 78.22 | 127 | 86.99 |
| Impose a fee for improper use of polythene | 135 | 55.33 | 55 | 56.12 | 80 | 54.79 |
| Enact and enforce laws /specify penalties | 4 | 1.6 | 2 | 2 | 2 | 1.4 |
| Institutions to enforce the ban and fees | | | | | | |
| Local council officials/chairperson | 72 | 53.3 | 29 | 52.7 | 43 | 53.8 |
| Town council | 25 | 18.5 | 11 | 20.0 | 14 | 17.5 |
| Garbage collectors | 16 | 11.9 | 8 | 14.5 | 8 | 10.0 |
| Government officials | 8 | 5.9 | 2 | 3.6 | 6 | 7.5 |
| National Environment Management Authority (NEMA) | 2 | 1.5 | 2 | 3.6 | | |

As suggested by 83% of the interviewed households, the easiest measure to enforce and strengthen effectiveness of the ban would be banning all polythene carrier bags regardless of the thickness (Table 3). This has been done in Rwanda where shops were banned from giving plastic bags to their customers and police stopping plastic-bag users in the streets (Clean Up Australia, 2007), with strict checks at country borders. In South Africa, however, the government proposal to ban all plastic bags thinner than 80 microns caused an outcry among trade unions and business community, and a compromise was reached where a minimum thickness of 30microns was allowed (op cit.). In Bangladeshi, the Department of Environment enforced a number of measures that helped to wipe out thinner polythene bags from the public (Reazuddin, 2007). These included routine checking in the market by the police and market associations, and use of organised mobile courts to punish the illegal traders and users. In order to further strengthen the effectiveness of the polythene ban and environmental compliance, almost all (96%) interviewed households suggested availing and promoting the use of alternative packaging materials such as cloth bags (Table 3). Other suggestions for strengthening the current partial ban included imposing fines on improper use and disposal of polythene bags and enforcing environmental laws regarding polythene production and consumption. Apart from announcing the ban, there has been no policing of the ban-violators, and the public was not aware of the penalties.

As such the banned bags were still being used among some sections of the public especially in small retail shops and markets in areas dominated by low-income households. In South Africa, retailers giving out the banned bags would face a fine of 100,000 Rand (\$17,800) or a 10-year jail sentence. In Germany, stores offered cloth bags or woven plastic bags encouraging shoppers to re-use them. The situation was similar in Denmark where tax on plastic bags was introduced in 1994. Because the tax was paid by retailers, the retailers strongly promoted the use of alternatives to shoppers, which resulted in a 66% drop in plastic bag use (Clean Up Australia, 2007). Results from the interviewed households show that on average, a household would be willing to pay a penalty of 6,792 Uganda shillings for improper disposal of polythene bags. The amount households were willing to pay was comparable between the urban and the peri-urban areas. However, imposing the fines is likely to face a number of challenges the major ones being corruption among the collecting agencies, how the collected money would be utilised, and limited capacity of some households to afford the charges. According to responses from the interviewed households (Table 3), people have more confidence in own elected Local Councils as the right institution to enforce the ban and collect the penalty fees. They believed that if the fees were collected by their Local Leaders, the money would be transparently used for development of their communities including cleaning up the polluted environment. Few households (18%) suggested Town Council as the right institution.

3.4 Households' Willingness to Pay for Alternative to Polythene

The question of stopping the use of polythene carrier bags ultimately comes down to the issue of availability of affordable alternatives as well as peoples' attitude towards those alternatives. If people are willing and able to pay for environmentally-friendly alternatives such as reusable cloth or paper bags, availing the alternatives is expected to decrease the use of polythene bags.

The survey results show that people in Uganda are gradually recognising the need to substitute polythene with environment-friendly materials. Over 96% of the interviewed households expressed the need for alternative carrier bags (Table 4), and turn to alternative materials, which are not only environment-friendly but also durable. These materials include paper bag (though not durable), woven baskets, cloth bags, and woven bags (locally known as *kikapu*). Some of the alternatives especially the woven baskets, cloth bags, and *kikapu* are biodegradable (hence environmentally friendly), durable, and can be used over and over again. Although polythene bags can also be reused, particularly in comparison to paper bags, there are currently limited recycling services in Uganda. Besides, the cost of polythene bags, some of which are given out by sellers at no extra cost to the buyer, is relatively lower. As reported by Oskampo *et al.*, (1991) and Parker *et al.* (2002), a household's decision to re-use the bags is based on the perceived costs and benefits accruing from the re-use.

Table 4: Households' Willingness to use Alternative Carrier Bags

| Response | Overall sample | | Urban households | | Peri-urban households | |
|---|----------------|------|------------------|------|-----------------------|------|
| | Freq. | % | Freq. | % | Freq. | % |
| Readiness to stop using polythene bag | | | | | | |
| Willing to pay for alternative materials | 237 | 95.2 | 94 | 94 | 143 | 96.0 |
| Need for alternatives for polythene | 241 | 96.4 | 97 | 96.0 | 144 | 96.6 |
| Stopped buying/accepting polythene from shops | 52 | 20.7 | 25 | 24.8 | 27 | 18 |
| Alternative to polythene carrier bags | | | | | | |
| Use paper bags | 47 | 18.7 | 21 | 20.8 | 26 | 17.3 |
| Carry container/bag for shopping | 45 | 17.9 | 9 | 8.9 | 36 | 24.0 |

At least 36% of the interviewed households had reportedly replaced polythene for paper bags and other durable containers. About 20% had stopped buying and/or accepting the freely given polythene bags when shopping, with the majority (over 95%) expressing willingness to pay for alternative carrier materials (Table 4). The reported estimates households were willing to pay for the different alternatives were 68 to 88 Uganda shillings for paper bags, 880 to 2041 for woven baskets, 851 to 1706 for cloth bag, and 856 to 1705 for *kikapu* (Table 5). It is not clear why the estimates were higher among the peri-urban households compared to the urban households. But it relates to study findings by Vining *et al.* (1992) and Gamba and Oskamp (1994) who observed that households in crowded urban areas were less willing to adopt good waste management practices because of space constraint.

Table 5: Average Amount in Uganda Shillings Households Were willing to pay for Alternatives to Polythene

| Type of carrier bag | Overall sample | | Urban households | | Peri-urban households | |
|---------------------|----------------|---------|------------------|---------|-----------------------|---------|
| | Min | Max | Min | Max | Min | Max |
| Paper bag | 67.5 | 87.6 | 52.2 | 87.0 | 77.7 | 88.1 |
| Woven basket | 880.0 | 2,041.5 | 627.8 | 1,583.3 | 1,086.4 | 2,400.0 |
| Cloth bag | 851.4 | 1,705.9 | 700.0 | 1,566.7 | 978.9 | 1,815.8 |
| <i>Kikapu</i> bag | 855.9 | 1,805.5 | 822.9 | 1,618.2 | 884.1 | 1,960.0 |

However, the use of the alternative shopping bags faces some challenges. Some of these materials especially the paper bags are not waterproof and tear easily. The others are bulk and therefore not convenient to carry. For instance, it might be difficult for one to carry a basket, say to the workplace, for shopping on their way back home. In the Himachal Pradesh State, India, a survey on homemakers' perceptions on the ban of polythene reported strong concerns about the leakage from lunch box, mixing of grocery items, and they felt shopping would not be possible if one forgot to carry a bag from home (Sharma and Kanwar, 2007).

3.5 Factors Affecting Households' Willingness to Pay for Polythene Alternatives

Several substitutes to polythene carrier bags have been suggested as a means of reducing the adverse effects of polythene materials on the environment. A logit model was used to analyze the critical factors that influenced household's willingness to pay for the alternative materials. Results of the model show awareness campaigns, availability of garbage collection services, sex of household head and ownership of residence as the significant factors (Table 6).

Table 6: Regression Estimates for Factors that Influence Willingness to pay for Alternative Materials to Polythene

| Explanatory variable | Coefficient | Std. Err | t | P> t |
|---|-------------|----------|---------|--------|
| Size of household | 0.038 | 0.037 | 1.020 | 0.313 |
| Presence of awareness campaigns in the area | 0.116 | 0.059 | 1.980 | 0.052 |
| Availability of garbage collection services | 0.096 | 0.050 | 1.950 | 0.056 |
| Location of residence (1=urban; 0=peri-urban) | -0.081 | 0.039 | -2.050 | 0.044 |
| Sex of household head (1=male head) | -0.107 | 0.048 | -2.220 | 0.029 |
| Marital status (1=single) | -0.052 | 0.067 | -0.770 | 0.442 |
| Ownership of residence (1=owned) | -0.087 | 0.041 | -2.130 | 0.037 |
| Constant | -1.350 | 0.070 | -19.250 | 0.000 |
| No. of observations (n) | 82 | | | 0.0083 |
| F- value | 2.86 | | | |
| R-squared | 0.239 | | | |

The location of residence (being in urban) exhibited a negative and significant relationship (at 5%) with the willingness to pay, suggesting that peri-urban households were more likely to pay compared to their urban counterparts. In a similar study, Ekereet *al.* (2009) found that the likelihood of waste re-use was higher among peri-urban residents than the urban counterparts. Creation of mass awareness on environmental management exhibited a positive and significant effect (at 10%) on households' willingness to pay for alternative carrier bags to polythene. Effective publicity about waste management could result in higher residential participation and better quality outcomes. Elsewhere, similar studies (Evison and Read, 2001; Eceberger, 2006) indicated that education, publicity and promotion were essential ingredients for the success of proper waste management systems. Long-term publicity campaigns and communications are required to change beliefs which involve the use of frequent repetition and exposure to well-planned and integrated communications (Evison and Read, 2001). There is need for an effective awareness drive with convictions that environmental conservation is a collective good, which can only be achieved with the participation of all the concerned parties. Informative TV programs and documentaries, radio programs, leaflets and posters depicting adverse impacts of polythene in public life as well as in the environment are some of the avenues that can cover a wide audience in Uganda. Communication channels such as TV stations, radio stations, newspapers, schools, church congregations and rallies can be used for effective communication. The awareness campaigns on environmental management should, however, be accompanied by garbage collection services which are easily accessed by households. Study results (Table 6) show that availability of these services increased the likelihood (at 10% level) of households to use alternative carrier bags. The alternative carrier bags are more bulky than polythene bags necessitating the presence and easy to access waste collection services.

Further, the results revealed that households that lived in own residential premises were less likely (at 5% level of significance) to pay for alternative carrier bags compared to those who rented the premises. The possible explanation is that households that own residential property may have no incentive to undertake interventions that minimize the use of polythene since they illicitly dispose garbage in their land. The results are, however, contrary to the study expectations, and findings by Ekereet *al.* (2009) who got a positive relationship between ownership of a residential house and separation of waste as a waste management practice. Finally, sex of the household head exhibited a negative and significant relationship (at 5%) with the willingness to pay. The results suggest that male headed households were less likely to pay for alternative carrier bags. The observed results could be explained by the differences in the roles played by the male and female individuals in management of waste at home. It is usually the female members who play an active role in management of household refuse. As a result they are likely to appreciate the environmental problems associated with the use of polythene and hence have an incentive to undertake interventions to minimize their use. This is in line with the study by Van Liere and Dunlap (1980) and Hayes (2001) who found that women were more likely to be more environmentally friendly than men. Saphoreset *al.* (2006) also found that it were the women who more readily got engaged in pro-environment behaviours and hence were much more willing to take e-waste to drop-off recycling centres. Eceberger (2006) reported that the participants in the Sarvodaya sustainable management project in Sri Lanka were only women, who despite their busy schedules with family maintenance and other work, actively participated in the project.

4. Conclusions and Recommendations

Most of the interviewed respondents expressed the need and willing to stop using polythene bags in favour of alternative materials. The preferred substitutes included durable woven baskets, cloth bags, paper bags and local *kikapu* bags. Factors including public awareness on polythene management, presence of garbage collection services, sex of household head and ownership of residence significantly influenced the willingness to pay for alternatives. The peri-urban residents were more likely to pay for alternative materials compared to their urban counterparts. There is therefore an urgent need for the government and other development organizations to raise awareness and education on polythene management, and make garbage collection services available to households particularly the urban dwellers. Specifically environmental awareness should be integrated into the foundational structures of the community development process. It is clear that adoption of environmentally friendly substitutes for polythene can reduce the environmental pollution caused by polythene materials. However, substitutes need to be readily available and affordable.

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