



Public perceptions and economic values of source-separated collection of rural solid waste: A pilot study in China



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ABSTRACT

The rapid urbanization progress and the continuous improvement of rural residents' living standard contribute to the increase of rural solid waste (RSW) in China. Based on direct face-to-face interview, a questionnaire survey consisting of 518 valid samples was performed to investigate rural households' behaviors towards RSW treatment and their perceptions in terms of awareness, attitudes on source-separated collection of RSW. Contingent valuation method (CVM) was employed to estimate respondents' willingness to pay (WTP) for RSW separation and management. Results indicated that some rural households had spontaneously separated the recyclable waste and food waste to some extent. The public were aware of the importance of RSW separation through various media. Further, more than half of households were willing to participate in the separation program. The dominant barriers of participation were the lack of awareness of separation, inconvenience and insufficient separation facility (53.7%). In addition, 62.5% of rural households had a positive WTP for RSW separation and management and the mean WTP was estimated to be 26.4 CNY/year. Age, annual household income and location significantly influenced the respondents' WTP. Therefore, we suggest that policy makers implement the pilot programs of RSW separation at source accordingly and devote efforts to providing collection service and improving RSW management by combining government financial budget and rural households' payment.

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1. Introduction

Little attention has been paid to rural solid waste (RSW) in most of the developing countries (Zarate et al., 2008). As a fast-developing country and the largest municipal solid waste (MSW) generator in the world (The World Bank, 2005), China is no exception. In early times, a considerable amount of RSW (especially the organic wastes) were recycled as food for livestock or fertilizer for agriculture (Li et al., 2011). However, the ever accelerating urbanization progress and the continuous improvement of rural residents' living standard resulted in the rocket increase in RSW generation (Zeng et al., 2015). Based on a nationwide survey in 2007, the official estimated that there were nearly 300 million tons RSW generated annually, about 1/3 of which were dumped randomly and seriously polluted the environment (Yang et al., 2012). Nevertheless, Chinese government faces great difficulties in providing RSW management services in rural China (Wang et al., 2014). Generally, for those rural areas in developed regions, RSW was first collected in the village and then transported to transfer stations

situated in town or county for downstream treatment and disposal, while this mode is restricted by the cost of waste transportation in those remote rural areas (He, 2012). Consequently, RSW management has become a challenge to local government.

Worldwide experiences show that source-separated collection of household solid waste is an effective method for the enhancement of waste reduction and recycling (Aphale et al., 2015; Babaei et al., 2015; Boonrod et al., 2015; Huang et al., 2014). It is widely used in developed countries for the purpose of sustainable development (Tai et al., 2011; Vehlow, 1996). In 2000, a pilot program focusing on source-separated collection of MSW was launched in eight major cities throughout China, and some successful experiences have been accumulated (Tai et al., 2011). As a key component of an integrated waste management system, it is necessary for rural households to separate RSW at source. Source-separated collection of RSW can not only save the transport costs, but also contribute to recycling recyclable waste and diverting part of RSW from dumping site. However, it has not been applied in rural China, with merely some demonstration projects in single village reported in case books or newspapers (Chao, 2014; Jiao et al., 2008). With the growing attentions to RSW in China, source-separated collection of RSW is promising in China in the coming 5 years.

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Nevertheless, to date few studies have investigated the feasibility of source-separated collection of RSW. The limited relevant investigations just focused on RSW characterization and treatment (Huang et al., 2013; Liang et al., 2014; Wang et al., 2014). Many previous researches have identified that a broad and sustainable public participation in source-separated collection is a basis for the success of waste management (Chung and Poon, 2001; Dhokhikah et al., 2015; Folz, 1999). Generally, individual is either active or reluctant to participate mainly due to personal environmental beliefs (Barr et al., 2003). Therefore, rural households' awarenesses and attitudes concerning source-separated collection of RSW are vital to the success of the program. It is essential to investigate the public perceptions and subsequently make effort to improve public involvement on RSW source separation in China and similar developing countries.

The contingent valuation method (CVM) has been widely applied for evaluating non-market goods in the fields of culture, health care and transport safety and economics as well as environment (Bateman et al., 2002; Ezebilo, 2013; Mitchell and Carson, 1989). By providing a potential market, the CVM can elicit respondent's willingness to pay (WTP) or willingness to accept (WTA) for changes in non-market goods and establish the benefits (Afroz and Masud, 2011; Ferreira and Marques, 2015). Many literatures have been delivered to investigate public perceptions and economic values on RSW treatment and disposal by using the CVM (Liang et al., 2014; Wang et al., 2014), or source-separated collection of MSW (Sarkhel and Banerjee, 2010; Zhang et al., 2012), while few are available on RSW separation and management.

As the largest developing country with the most population in the world, China faces different situation of RSW management from other developed countries. Meanwhile, the way of source-separated collection of solid waste in rural areas is

different from urban areas in China. Therefore, it is of importance to examine the public perceptions on the source-separated collection of RSW before implementing the RSW separation program. Based on a well-designed questionnaire and face-to-face interview, the contribution of this investigation is fourfold. Firstly, this study investigated rural households' behaviors towards the RSW treatment. Secondly, rural households' perceptions in terms of awareness and attitudes on source-separated collection of RSW were reflected. Specifically, rural households' WTP for source-separated collection and management of RSW was analyzed for a better implementation of the program in future. In the end, recommendations for policy improvements are proposed.

2. Methodology

2.1. Study area

Rural areas account for 90% of mainland China, which consist of town and village, the two smallest administrative levels in China under nation, province, prefecture/municipality and county (Wang et al., 2014). There were 642 million people (about 47.43% of the Chinese population) in rural areas in 2012 (NBSC, 2013). In this study, rural areas were divided into three regions: Eastern, Central and Western, according to the so-called "economic belts" of mainland China (Li et al., 2014). The locations of study area are shown in Fig. 1. The current social and economic backgrounds of the typical rural areas in different cities or provinces varied greatly. It was reported that the per capita net annual income varied from 4506 CNY to 17803 CNY in 2012 (NBSC, 2013). As mentioned, MSW management is only practiced in cities while RSW management is at best only partially established in some developed rural areas.



Fig. 1. Location of the study area.

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