

# Current Situation Survey of Garbage Management in rural areas of Heilongjiang province

Yang Yang<sup>1</sup>, Shuai Wang<sup>1\*</sup>, Yufeng Zhao<sup>2</sup>

<sup>1</sup>School of East University of Heilongjiang, Heilongjiang, China

<sup>2</sup>Environmental protection monitoring station of Jiamusi City, China

\*Corresponding author e-mail: okdashuai@126.com

**Abstract.** This paper makes investigation to 120 administrative villages, count the the output, the distribution characteristics, the composition and the treatment model of the rural garbage at this stage. The research shows that the composition of the rural garbage is very complicated, the total annual output of rural garbage is 5 295 600 tonnes, and the daily output per capital of household garbage is 0.8925 kg. According to the situation of Heilongjiang Province, this paper analyze the main problem during the garbage disposal, some control measures are presented, this research could provide basic data and research for the following treatment. The significant new findings of the research is that the rational governance path of garbage is that ,first classification, second recycling and third harmless treatment.

## 1. Introduction

Increasingly, the urgency of disposing rural garbage is obvious, and the problem of garbage pollution are getting serious and turn to be an important factor as for daily life, production, construction of rural urbanization and sustainable development. The rural areas of Heilongjiang province have also emerged with the changes of the rural environment in China with the emergence of a large variety of waste products, a variety of varieties, declining capacity and the emergence of environmental pollution. One is that the waste composition is complicated. As the change of rural production and life-style, household garbage composition of the former is more complex, and the packaging waste, disposable supplies waste increased significantly. A large proportion of garbage is refractory organic matter[1]. Second, heaping garbage disorderly. There is no fixed garbage dumps and special garbage collection, transportation, landfill treatment unit. More so, the villagers poured the rubbish in the river, field and road at random so that the phenomenon of blocking the river channel, eroding the highway is common.

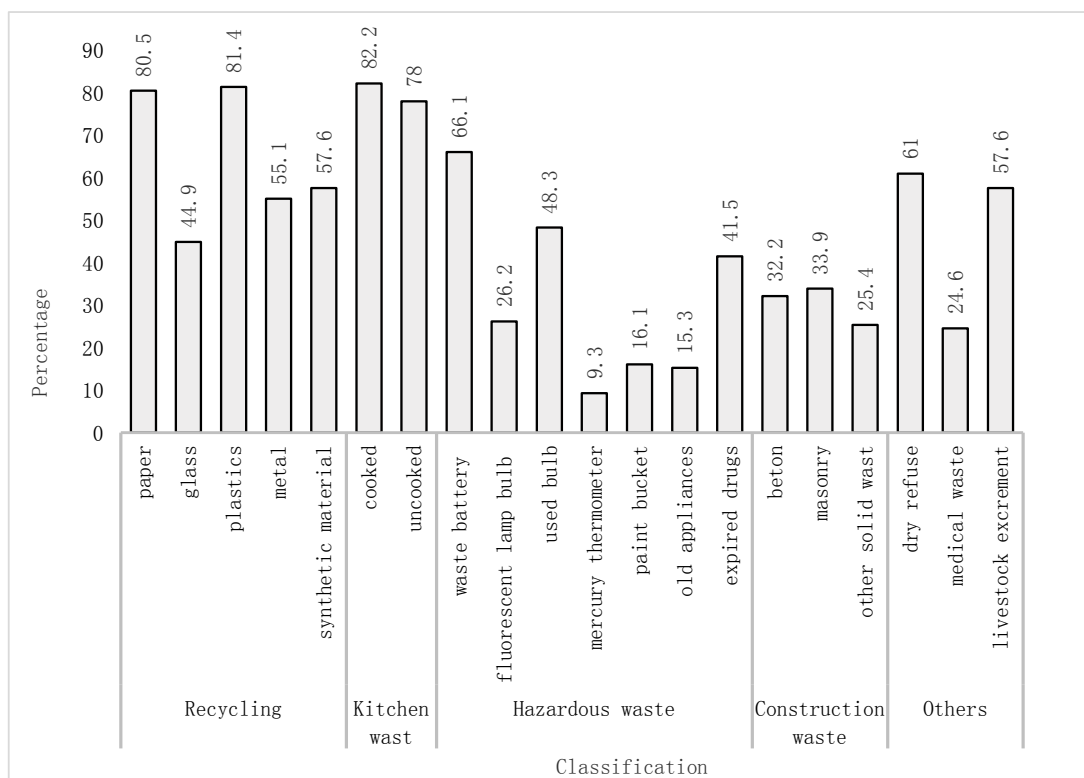
## 2. Composition and characteristics of rural garbage

This research makes investigation to 120 administrative villages about rural garbage of Heilongjiang



province. According to the geographical location and climatic characteristics of our province, the researchers take the research work into two part seasonally, the first investigation is in winter, which is the special season in cold region; the second is in summer.

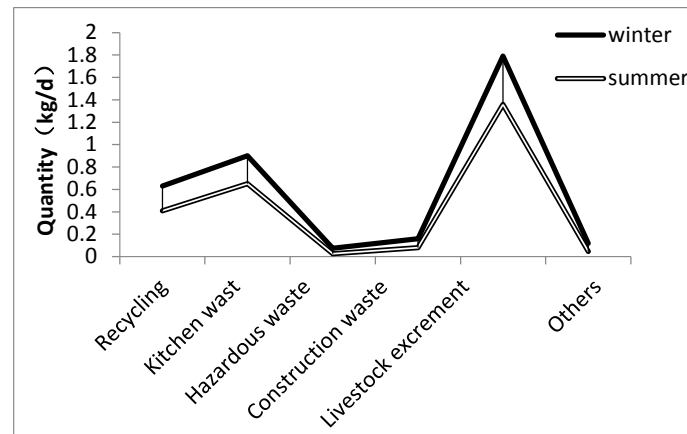
In the research process, according to the difference in the use of raw materials before the rural waste production the rural garbage is divided into two categories—household garbage and production waste in countryside. Household waste includes recyclable garbage, kitchen waste, toxic and hazardous waste, construction waste, livestock and poultry droppings, and any others[2]. Production waste include pesticide, fertilizer and other discarded packaging bags, crop straw waste, land film, steel and other wastes.



**Figure 1.** The frequency of rural garbage in Heilongjiang province.

During the winter and summer, we find that the output of household garbage is higher in winter than in summer. In addition, there are six kinds of rural household garbage, and the average yield of these is arranged as livestock and poultry manure > kitchen waste > recycling > construction waste > other waste > harmful waste. In the recyclable waste, only paper can be used as combustion materials in the farmers, and the utilization rate of winter is higher than that in summer, which coincide with the needing of the heat energy in cold region. The utilization rate of kitchen waste is outstanding in summer, while kitchen waste can be used as the raw material for compost, but temperature is the limiting factor of composting technology in the northeast. On the other hand, the temperature also affects the utilization rate of cooked food waste in raising livestock so that the utilization rate of kitchen waste is significantly lower than that in summer. The changes in hazardous waste, construction waste and other wastes in different seasons are not obvious. In winter and summer, livestock and poultry waste of the net average daily production of garbage are accounted for 48.68 percent in winter

and 52.86 percent in summer.



**Figure 2.** The quantity of rural garbage in Heilongjiang province in winter and summer.

### 2.1 . Household garbage

By the end of 2016, the rural population of Heilongjiang province reached 1 575 000, which account for 41.20% of the total population in the province. The research shows that the daily output per capital of household garbage is 0.8925 kg, and the annual output of household garbage is 5 116 100 tonnes. The concrete data as follows:

**Table 1.** The daily average output of six kinds of household garbage in winter and summer.

	winter		summer	
	yield/ (kg d <sup>-1</sup> )	percentage/%	yield/ (kg d <sup>-1</sup> )	percentage/%
Recycling	0.63	17.13	0.41	15.93
Kitchen garbage	0.902	24.54	0.65	25.26
Hazardous waste	0.075	2.04	0.026	1.01
Construction Waste	0.16	4.35	0.08	3.11
Others	0.12	3.26	0.047	1.83
Livestock wast	1.79	48.68	1.36	52.86
Total	3.677	100	2.573	100

$$m_1 = \frac{m_2 - m_3}{b} \quad (1)$$

$m_1$ :The output per capital of household garbage per day,kg cap.d<sup>-1</sup>;

$m_2$ :The output of rural household garbage per day,kg;

$m_3$ :The utilization amount of rural household garbage per day,kg;

$b$ : the average number of per family.

In the total amount of garbage, the proportion of livestock and poultry droppings in summer and winter is the largest. 2015 international composting conference and 10th national composting technology and engineering seminar shows that the use of fertilizer is increasing year by year, because of the higher requirements of composting environment, the adoption of livestock and poultry manure compost in rural areas is decreasing, and the rate of nutrient returning of livestock and poultry manure is less than 50%. The effective use of livestock and poultry manure is important. One side, this method is to reduce the amount of fertilizer and pesticide, even reduce environmental pollution Heilongjiang province. On the other side, it also can reduce the production of rural household waste. Last, using livestock and poultry manure could reduce agricultural production costs[3].

In winter and summer, recyclable refuse and kitchen waste can be used to reduce the amount of household waste in the household, and the rate of the waste is 50.39% and 68.29% in winter respectively. The rate was 47.43% and 49.03% in summer. The stronger the ability to recycle garbage and kitchen waste, the lower disposal pressure. The percentage of hazardous waste, construction waste and other waste products in the two seasons has remained little changed. In summer, the daily average household waste per capital is only 70% of the total garbage production in winter, and the garbage production in winter and summer is basically in line with the living habit in different seasons in Heilongjiang province[4].

## *2.2 Production of garbage*

The area of farmland per capital is arrives at 0.56268 hectares, ranking first in the country. Heilongjiang province is a major agricultural which is supported to the development in China, and province that is supported by the state key development, and the development of agricultural economic has been given a huge impetus[5]. While the by-products produced by agricultural production gradually came into view. Rural production waste in Heilongjiang province contains pesticide packaging waste, agricultural plastic mulching film and crop straw. It has been calculated that the annual output of production waste in Heilongjiang province can reach 5.25 million t. To sum up, the annual output of rural waste in Heilongjiang province contains a total of 516.85 million t.

## **3. Set up a perfect technical system of rural garbage management**

### *3.2.1 Increase the technical research and development of rural garbage management*

#### **a. Encourage and support innovation in research institutions**

Rural waste management technology application in cold area is in the blank stage for a long time, our province should mobilize various departments, and organizations held on "rural waste management", "Internet + rural environmental governance" and other aspects of the subject to promote the development and application of garbage disposal technology.

#### **b. Make effort to research and develop the "harmless" rural garbage technology in cold regions**

Scientific and technological innovation can improve the efficiency of garbage disposal in rural areas and save cost. Combining with modern advanced technology, optimizing treatment is the basic way to solve the pollution problem of rural environment. Each regions in Heilongjiang province should adopt scientific treatment to control rural garbage pollution, that eliminate or reduce pollution from the source. At the same time, it can improve the technological innovation capability by introducing advanced technology and production equipment, and develop the non-hazardous waste disposal technology applicable to the region[6].

The moisture content of mixed garbage is calculated as follows:

$$C_{\text{mix}} = \sum_{i=1}^n C_i \times W_{i(\text{wet})} \quad (2)$$

$C_i$ :The moisture content of some garbage,%;

$W_{i(\text{wet})}$ :The content of water content in some garbage,%;

The ratios of garbage are measured using the following formulas.

$$W_{i(\text{wet})} = \frac{m_s}{m_a} \times 100 \% \quad (3)$$

$m_s$ :The water content of some sample,kg;

$m_a$ :The total quality of some sample,kg.

$$W_{i(\text{dry})} = W_{i(\text{wet})} \times \frac{1 - C_i}{1 - C_{\text{mix}}} \times 100 \% \quad (4)$$

$W_{i(\text{dry})}$ :The content of dry content in some garbage,%.

Table 2. The moisture content of each component and the percentage of its dry weight

	content of household garbage	moisture content	the occupied dry weight/%
compostable	kitchen waste dust	$35.67 \pm 1.66$	11.12
	grass	$44.17 \pm 3.79$	22.45
flammable	wood	$20.18 \pm 2.65$	19.56
	paper	$22.38 \pm 1.04$	1.73
	cloth	$33.82 \pm 3.14$	10.15
	plastics	$21.63 \pm 1.69$	14.36
The moisture content of mixed garbage		30.16	

There are many garbage treatment process available in Heilongjiang province such as compost indoor, which can improve indoor garbage disposal ability; the landfill protection measures are established to recycle the landfill waste leachate. Establish a waste incineration plant to regulate incineration and reduce environmental pollution. It is strictly prohibited to bury, burn, or small braised incineration directly[7]. If was found, it shall be strictly punished according to relevant laws and regulations.

### 3.2.2The classification of rural garbage in rural areas

In real life, the village committee promoted the farmer's own quality by publicity and education, and formed a good sense of garbage classification in the household, so as to control the total amount of garbage. The household classification of rural garbage can be used to raise farmers' enthusiasm for sorting rubbish. The source classification of garbage can not only realize the recycling and utilization of resources, but also reduce the workload of the total classification in the subsequent processing and save social cost[8].

#### 4. Conclusion

Rural garbage management is still in the primary exploring stage in China. The different condition of rural garbage disposal between provinces and cities is also bigger. Heilongjiang province is the northernmost in China, and the temperature varies with the season alternating temperature obviously. Heilongjiang province has a small population density, rich green resources, and large environmental capacity. As a big agricultural province, the rural household garbage and production waste presents a certain distribution and seasonal variation characteristics. Under the lead of 3R technology, harmless, reduction, and recycling are the precondition of harmlessness. Only the effective indoor garbage classification, efficient garbage recycling, can use work garbage disposal technology, that is the purpose of the garbage harmless management. So offering a proposal about harmless management in rural garbage governance mechanism is the key step to solve the problem. The significant new findings of the research is that the rational governance path of garbage is that, first classification, second recycling and third harmless treatment.

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