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Analysis on Wind Environment in Winter of Different Rural Courtyard Layout in the Northeast

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Abstract

Through to survey the northeast region in China, summarized four kinds of typical rural courtyard layout forms. Using Fluent software to simulate the wind velocity of different layout forms, combined with the assessment criteria of wind velocity ratio, considering factors such as the wind shadow area and the numbers of eddy current, to analyze advantages and disadvantages of wind environment in existing courtyard.

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Keywords: Courtyard; Wind speed; Fluent software simulation;

1. Introduction

Screened from more than 2,000 the satellite images of towns and villages in the northeastern region, and ultimately selected 33 villages in the territory of Heilongjiang, Jilin, Liaoning and Inner Mongolia to do the research. Each village takes at least 30 residents at random, the number of valid questionnaires is 896. Each questionnaire contains courtyard plan, which as this study courtyard sample.

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1.1. Courtyard elements

According to the function in the courtyard, elements can be divided into four categories: production, life, entertainment and vegetation. Production function including poultry and livestock breeding, vegetable planting, store tools and food, or agricultural vehicles parking, and the corresponding elements are livestock shed, vegetable garden, warehouse and garage. Through the questionnaire data statistics, the proportion of vegetable garden and warehouse is larger, accounted for 34% and 33% of the overall production function elements. Life functions include accommodation, washing, drying, toilet, etc., and the corresponding elements are main room architecture, outdoor toilet, and the open space of the courtyard. The proportion of outdoor toilet is larger, accounted for 50% of the overall life function elements.

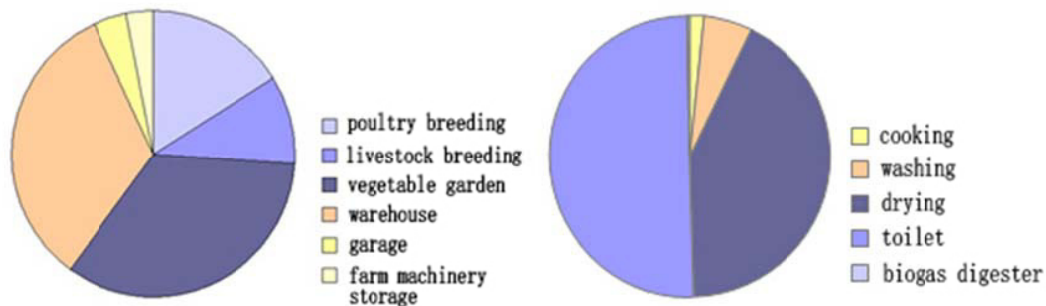


Fig. 1. the percentage of production function elements and life function elements.

Entertainment function mainly refers to the leisure activities within the courtyard, such as enjoying the shade, playing cards, etc. Through questionnaire survey, respondents enjoy the shade in the courtyard as the main leisure activities, and there is no recreational facilities for respondents such as seats, arbor. Respondents said they enjoyed the shade in the main room shadow, no fixed area.

Vegetation mainly refers to grow vegetables and crops in the vegetable garden, but tall woody plants in the yard, and residents also don't want to plant trees in the yard, the reason is that planting trees have no spare space, also don't want to sacrifice the area of the garden for planting trees.

In addition, there is a more important element-fence. Fence as a borderline of the courtyard, is the exterior protected construction, which makes the whole courtyard to form a private space.

1.2. Shape and scale of courtyard

For the type research purpose, the 896 samples according to aspect ratio are divided into three types: Square courtyard, aspect ratio is approximately equal to 1; Rectangular courtyard, aspect ratio is less than 2:1; Bar yard, aspect ratio is greater than or equal to 2:1. Rectangular courtyard accounted for about 47.7% of the total number of samples, is currently common courtyard type in the northeast rural. The size of Rectangular courtyard, is generally between 400 m² to 900 m². In this paper, in order to ensure the research are universal, defined the rectangular courtyard 18 m wide (east-west) * 30 m long (north-south).

1.3. Courtyard layout form

The courtyard layout form is determined by the location of the courtyard elements. The location of the vegetable garden is determined according to the location of the main house and warehouse. Because of its peculiar smell, outdoor toilet usually locates at the downwind, according to the prevailing northwest wind in the northeast, generally in the southeast of the courtyard. So the main house and the warehouse both determine the courtyard layout form.

According to the position of the main room, the courtyard can be divided into three types: Front yard, Back yard,

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