

## Investigation and Comprehensive Benefit Analysis of 11 Typical Polar-Based Agroforestry Models Based on Analytic Hierarchy Process in Anhui Province, Eastern China

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**Abstract :** The development of polar-based agroforestry was necessary due to the influence of the timber market environment in China, which can promote the coordinated development of forestry and agriculture, and gain remarkable ecological, economic and social benefits. The main agroforestry models of the main poplar planting area in Huaibei plain and along the Yangtze River plain were carried out. 11 typical management models of poplar were selected to sum up: pure poplar forest, poplar-rape-soybean, poplar-wheat-soybean, poplar-rape-cotton, poplar-wheat, poplar-chicken, poplar-duck, poplar-sheep, poplar-Agaricus blazei, poplar-oil peony, poplar-fish, represented by M0-M10, respectively. 12 indexes related with economic, ecological and social benefits (annual average cost, net income, ratio of output to investment, payback period of investment, land utilization ratio, utilization ratio of light energy, improvement and system stability of ecological and production environment, product richness, labor capacity, cultural quality of labor force, sustainability) were screened out to carry on the comprehensive evaluation and analysis to 11 kinds of typical agroforestry models based on analytic hierarchy process (AHP). The results showed that the economic benefit of each agroforestry model was in the order of: M8 > M6 > M9 > M7 > M5 > M10 > M4 > M1 > M2 > M3 > M0. The economic benefit of poplar-A. blazei model was the highest (332, 800 RMB / hm<sup>2</sup>), followed by poplar-duck and poplar-oil peony model (109, 820RMB /hm<sup>2</sup>, 5, 7226 RMB /hm<sup>2</sup>). The order of comprehensive benefit was: M8 > M4 > M9 > M6 > M1 > M2 > M3 > M7 > M5 > M10 > M0. The economic benefit and comprehensive benefit of each agroforestry model were higher than that of pure poplar forest. The comprehensive benefit of poplar-A. blazei model was the highest, and that of poplar-wheat model ranked second, while its economic benefit was not high. Next were poplar-oil peony and poplar-duck models. It was suggested that the model of poplar-wheat should be adopted in the plain along the Yangtze River, and the whole cycle mode of poplar-grain, poplar-A. blazei, or poplar-oil peony should be adopted in Huaibei plain, northern Anhui. Furthermore, wheat, rape, and soybean are the main crops before the stand was closed; the agroforestry model of edible fungus or Chinese herbal medicine can be carried out when the stand was closed in order to maximize the comprehensive benefit. The purpose of this paper is to provide a reference for forest farmers in the selection of poplar agroforestry model in the future and to provide the basic data for the sustainable and efficient study of poplar agroforestry in Anhui province, eastern China.

**Keywords :** agroforestry, analytic hierarchy process (AHP), comprehensive benefit, model, poplar

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