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灰色关联理想解法在秸秆综合利用方案优选中的应用

**Application of GC-TOPSIS on optimizing choice of utilization programs of crop straw**

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英文关键词: [straw optimization](#) [scheduling](#) [comprehensive utilization](#) [combination weights method](#) [GC-TOPSIS](#)

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中文摘要:

农作物秸秆是一种重要的生物质资源,其综合利用不仅保护产地环境、促进农民增收,而且是循环经济与新兴产业发展的基础与机遇。农作物秸秆综合利用方案主要分为秸秆用作饲料、食用菌基料、肥料、燃料和工业原料。为了对农作物秸秆综合利用方案进行合理优选,根据文献信息对评价指标体系进行赋值,应用基于序关系分析法和熵值法的综合集成赋权方法进行指标权重确定,采用灰色关联理想解法将指标权重和指标属性值进行集结,并将该方法应用于黑龙江地区的农作物秸秆综合利用方案优选中。该文分析的适宜黑龙江地区农作物秸秆综合利用方案排序为:饲料化利用>肥料化利用>燃料化利用>食用菌基料化利用>工业原料化利用,优选结果与黑龙江地区的实际情况及发展规划相吻合,同时优选结果为按照多元利用原则规划黑龙江地区农作物秸秆综合利用模式提供支持。此外该文评价指标的赋值根据已有文献信息进行9级赋值,方法具有较好的适应性,可很方便的用于不同区域农作物秸秆的综合利用评价。

英文摘要:

Abstract: Crop straw is an important biomass resource. The comprehensive utilization of crop straw not only protects the environment of producing areas and increases the farmers' income, but also lays foundation for circular economy and emerging industry. The main utilization approaches for crop straw are converting to animal feed, fertilizer, fuel, material of edible fungi, and material of industry. In order to optimize the utilization approaches of crop straw, the evaluation indices are assigned based on information from references, which are measured by nine grade assignment. The evaluation indices are formed by functional indices, economical beneficial indices, environment beneficial indices and adaptability indices. The functional indices are formed by maturity of engineering and effective transformation of engineering. The economical beneficial indices are formed by the utilization cost of crop straw per ton and the benefit of resource substitution per ton. The indices of environmental benefit are formed by the profit of waste reduction per ton and the secondary pollution degree per ton. The adaptability indices are formed by the coordination degree of regional crop straw variety, the coordination degree of regional crop straw density, the coordination degree of regional crop straw collection, transportation, storage and the coordination degree of regional policy planning. The combination weights method based on entropy and rank correlation analysis method is used to obtain the weights of evaluation index, and GC-TOPSIS (technique for order preference by similarity to ideal solution combined by grey correlation) serves as decision-making method. The combination weighting method gives consideration for both subjective and objective influencing factors, by comparing with simple subjective weighting method or objective weighting method, which is scientific, easy, and feasible. GC-TOPSIS method is a new kind of relative similarity degree by combining the Euclidean distance with grey correlation degree. It reflects the distances and the different shapes among a selected scheme, the ideal solution and negative ideal solution. The implication is clearer, valid and feasible. And these methods are applied to the optimization of utilization approaches of crop straw in Heilongjiang province. The preference order of five utilization approaches obtained for Heilongjiang province in this paper is: as feed > as fertilizer > as fuel > as material of edible fungi > as material of industry, which is consistent with actual development and scheme in Heilongjiang province. At the same time, the optimization method provides foundation to scheme the various choices of utilization approaches in Heilongjiang province. Furthermore, the evaluation indices are assigned by information from the reference, which is practicable and gives access to optimized choices.

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