

Prediction Method Study on the Remaining Useful Life of Plant New Varieties Rights Based on Weibull Survival Function and Gaussian Model——Taking Hybrid Rice Variety for Example

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Abstract In view of the difficulty in determining remaining useful life of plant new variety right in economic analysis, Weibull Survival Analysis Method and Gaussian Model to were used to study how to accurately estimate the remaining useful life of plant new variety right. The results showed that the average life of the granted rice varieties was 10.013 years. With the increase of the age of plant variety rights, the probability of the same residual life T_i reaching x was smaller and smaller, the reliability lower and lower, while the probability of the variety rights becoming invalid became greater. The remaining useful life of a specific granted rice variety was closely related to the demonstration promotion age when the granted rice variety reached its maximum area and the appearance of alternative varieties, and when the demonstration promotion age of the granted rice variety reaching the one with the maximum area, the promotion area would be decreased once a new alternative variety appeared, correspondingly with the shortening of the remaining useful life of the variety. Therefore, Weibull Survival Analysis Method and Gaussian Model could describe the remaining useful life's time trend, as well as determine the remaining useful life of a concrete plant variety right, clarify the entire life time of varieties rights, and make the economic analysis of plant new varieties rights more accurate and reasonable.

Key words Remaining useful life; Weibull Survival Function; Gaussian

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In recent years, with the vigorous development of China's plant new variety right protection, the applied and granted amounts of plant new variety rights have increased rapidly, but the problems of no payment for the annual feed and declaration of avoidance that cannot be resolved in a timely manner have resulted in the ultimate failure of a large number of variety rights. According to statistics, by the end of June 2014, the granted cases of plant new variety rights had reached 4 492 in China, and the number of invalid variety rights reached 1207, making the failure rate reach 24.64%^[1]. The failure of variety

rights would not bring economic losses for the applied units, but also result in serious wastes of resources. Therefore, it is of great significance if estimation on the remaining useful life (RUL) of variety rights can be carried out at the beginning of the failure of variety rights, and on this basis to determine the optimal valid time of variety rights, especially in the economic analysis on plant new variety rights.

The economic analysis on plant new variety rights mainly includes the pricing of variety rights, valuation of the economic losses of variety rights, transfer price and permission rate of authorization grant, and the remaining

基于威布尔生存分布和高斯模型的品种权寿命预测研究——以杂交水稻品种为例

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摘要 针对新品种权经济分析时剩余有效寿命难以确定的问题, 采用威布尔生存分析方法和高斯模型研究如何精确估算品种权剩余有效寿命的问题。结果表明: 水稻授权品种的平均寿命为 10.013 年, 随着品种权年龄的增加, 相同剩余寿命 T_i 达到 x 的概率越来越小, 可靠度越来越低, 品种权失效的概率就越大; 某一具体水稻授权品种的剩余有效寿命与其达到最大推广面积时的示范推广年龄和替代品种的出现密切相关, 当授权品种达到最大推广面积的示范推广年龄时, 一旦新的替代品种的出现会使其推广面积速度下降, 相应其剩余有效寿命便会缩短。因此, 利用威布尔生存分析方法和高斯模型既能描述品种权剩余有效寿命的时间趋势, 而且还能确定具体品种权的剩余有效寿命, 明确品种权整个生存期, 使植物新品种权的经济分析工作更加精确和合理。
关键词 剩余寿命; 威布尔分布; 高斯模型; 植物新品种权

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