

## 中国东北地区中长期畜禽粪尿资源与污染潜势估算

### Assessments of the production of animal manure and its contribution to eutrophication in Northeast China for middle and long period

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中文摘要:

规模化畜牧业、农牧分离等引起了一系列问题,尤其是饲养方式改变后,畜禽粪尿养分的循环和处理最值得关注。该文利用统计资料和文献数据,估算了东北三省畜禽粪尿产生量及其中的氮磷养分和COD含量,在此基础上评价和预测了2002~2020年畜禽粪尿资源及其环境风险。结果表明,2003年辽宁省、吉林省、黑龙江省畜禽粪尿耕地承载量分别为24、20、11 t/hm<sup>2</sup>,耕地畜禽粪尿承载量在空间上分布极不平衡。2003年,辽宁省、吉林省、黑龙江省畜禽粪尿排泄物进入水体的COD数量占畜禽粪尿、工业、生活排放COD总量的52%、65%、40%。预测表明,2010年、2020年畜禽养殖业对东北三省环境污染的风险将进一步扩大。因此,需要制定相应的政策法规来控制畜禽粪尿污染。

英文摘要:

There is an increasing concern about the environmental consequences of the intensification of animal production, and the spatial decoupling of animal feed production and animal production in China. A major concern is the difficulty of properly disposing and recycling the nutrients from the animal manure. This holds true especially for confined animal feeding operations as the land-base is missing here. The aim of this study was to assess the changes in the production of animal manure and its contribution to surface water eutrophication in northeast China in the period 2002~2020. Data statistics and literature data were used to calculate the production of animal manure, the amounts of nitrogen and phosphorus, and the chemical oxygen demand of the manure. The authors used simple emission factor equations to assess the discharge of animal manure into surface waters. The study was carried out for the three Provinces Liaoning, Jilin and Heilongjiang. Results indicate that the mean amounts of animal manure produced in 2003 were equivalent to 24, 20 and 11 Mg per ha of agricultural land in Liaoning, Jilin and Heilongjiang Provinces, respectively. However, the production was spatially very uneven, suggesting that some areas received much higher doses than the mean amounts. The estimates suggest that the discharge of animal manure contributed 52%, 65% and 40% to the total loading of chemical oxygen demand of surface waters in Liaoning, Jilin and Heilongjiang Provinces, respectively. Clearly, discharges of animal manure have a large share in the total loading of surface waters with nitrogen, phosphorus and oxygen demanding substances, and thereby greatly contribute to the deterioration of the surface water quality in these provinces. Forecasts suggest that the intensification of animal production will develop further during the next decades, and that the discharges to surface waters will also continue to increase, unless drastic policies and measures are implemented to regulate animal production or animal manure management. In conclusion, animal manure greatly contributes to the eutrophication of surface waters in Northeast China. Drastic measures are needed to reverse the trend of increasing discharges of nutrients from animal manure to surface waters.

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