生态系统
服务功能价值评估方法研究

—— 基于三江平原七星河湿地价值评估实证分析

刘向华◎著

中国农业出版社

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Study on Methods in the Valuation of Ecosystem Services

—Taking Qixinghe wetland in Heilongjiang Province as example

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内 容 摘 要

工业革命以来，工业生产规模的扩大和能源使用方式的改变使得自然界中本来以高品位状态存在的物质和能量，变成了低品位的存在形式。这种转变使得自然环境日趋恶化，生态系统服务功能遭到严重破坏，进而严重影响了人类生活质量。因此，可持续发展已经成为全球各国社会发展的必然选择，而人类社会的可持续发展又从根本上取决于生态系统及其服务的可持续性。

生态系统作为生物圈中最基本的组织单元和最为活跃的部分，它不仅为人类提供各种商品，而且在维系生命的支持系统和环境的动态平衡方面起着重要作用。但是，长期以来，人们对生态系统服务功能价值的认识片面地集中在具有商品属性的部分，而对具有公共物品属性的服务功能认识不足。

因此，必须研究生态系统服务的经济价值，并将其纳入国民经济核算体系，才能促进自然资本开发的合理决策，避免损害生态系统服务的短期经济行为，实现生态系统的全面保护，协调经济发展中的效率和公平问题，促进公众环保意识的提高和环境生态规划的合理实施，实现环境友好型社会。同时，加强生态系统服务功能及其经济价值的研究，可以更加全面地揭示生态系统的功能特征及其对人类社会发展的影响，极大丰富生态学和经济学的理论体系，有效地促进生态经济学的健康发展。

实际上，自从生态系统服务在得到公众、政府广泛认同后，

很多研究人员就试图将其作为一种稀缺性资源纳入经济学的研究范围，力图在有关理论的基础上揭示生态系统服务的价值量。不过，生态系统服务功能的研究是一项极为复杂的研究工作，它不仅取决于生态系统本身的自然特点，同时也取决于社会经济条件。因此，对于面临许多不确定因素生态系统服务的研究必须在过去工作的基础上进行深入和多学科的综合研究。

具体到我国来说，独特的自然地理条件、复杂的生态系统类型以及面临的严重生态环境问题与紧迫的生态建设任务，决定了我国在这方面的研究必须结合我国实际，探索适合我国实际情况的评价方法与指标体系。特别是要结合科学发展观，正确地建立我国资源与生态环境价值评估体系和核算方法，以此准确评价我国现有主要生态系统类型的服务功能及其经济价值。

本书应用微观经济学、生态经济学、环境经济学以及统计学等有关原理和方法深入分析和解释了生态系统服务功能价值评估的理论背景和方法论基础。同时，从商品属性原理出发结合我国国情，分析了当前生态系统服务功能价值研究面临的难题和困境，在此基础上结合生态系统服务功能的国内外研究，提出了针对具体生态系统服务功能价值评估方法体系。

在上述理论分析的基础上，本书挑选了湿地生态系统作为理论实践的评估对象。实际上湿地与人类生存最为密切，它为人类提供生产、生活所需的宝贵资源，具有独特、重要的商品与服务功能，是“地球之肾”和“生命的摇篮”。但是，湿地也是目前国内外各类生态系统中受到威胁最大的生态系统。因此，开展对湿地生态系统的价值评估的研究就显得尤为紧迫和具有重大现实意义。在我国众多湿地中，三江平原的七星河湿地生态系统结构保存较为完整，存在大面积的芦苇沼泽，动植物物种丰富，同时

该地区具有较好的科学研究基础，其物质循环和能量流动等科学研究数据较为充分，拥有较为详细的数据和背景资料。因此，本书就最终确定了七星河湿地作为评估对象，进而从对七星河湿地的价值评估中探讨相关评估方法的可靠性和实用性，为建立符合我国国情的生态系统服务功能价值评估方法体系，提供有效的实践研究依据。具体来说，本书内容包括：

1. 生态系统服务功能价值评估的理论基础。本书首先从生态经济学的角度出发分析了生态系统服务功能的内涵和概念，并且结合国内外对于生态系统服务功能的分类研究，提出并重新界定了十种生态系统服务功能：生产有机物；水循环；保护土壤；生物多样性；环境净化功能；调节气候；调节干扰；科研文化；休憩娱乐；非使用价值。

在此基础上，本书结合国内外生态系统服务功能价值研究现状，提出了自身生态系统服务功能价值分类标准和类型，并且详细分析了进行生态系统服务功能价值评估所涉及的微观经济学基础以及统计学、社会学基础。

2. 生态系统服务功能价值评估的困境分析。由于受到目前科技水平的限制，以及生态系统服务功能自身具有的非竞争性、非排他性、难以分割等属性的影响，都导致了进行具体的生态系统服务功能价值评估时存在很大难题。包括：①缺乏进行经济价值评估所需的决定因素和假设前提，导致评估结果的不准确；②生态系统服务公共物品性，以及目前评估过程和评估指标的不规范，导致生态系统价值评估结果缺乏可信性和可预测性，难以实现生态系统服务功能的动态测量；③难以进行生态系统负面影响的评估；④由于社会、经济和自然地理条件的不同使得难以准确核定单位价值量；⑤相关具体统计方法上存在较多困难，导致

评估结果不合理。

3. 生态系统服务功能价值评估方法体系的建立。在明确了生态系统服务功能价值评估的理论基础和进行生态系统服务功能价值评估的困境，总结分析目前生态系统服务功能价值评估具体方法的优缺点以及适用范围和条件的基础上，提出了核心服务功能的概念、内涵和挑选具体方法的评估原则和程序，规范和合理化生态系统服务功能价值评估方法的选择过程，并从理论上建立了相应的方法体系。

4. 三江平原七星河湿地价值评估。结合上述理论分析和研究，本书在详细分析我国湿地生态系统及其服务功能的基础上，阐明了选择七星河湿地作为最终评估对象的原因，并详细分析了七星河湿地的自然地理和社会经济状况。然后，根据上述理论，结合我国相关具体研究现状和七星河湿地的具体情况，确定了七星河湿地的核心服务功能及其相应的评估方法。具体评估了七星河湿地的使用价值、非使用价值和相对价值的年度价值量，进而分析了其结果的合理性和可靠性。

5. 本研究的主要结论和研究展望。本书根据上述理论研究和实践，对七星河湿地价值评估结果进行了详细的分析和总结，提出了完善我国生态系统服务功能价值评估方法体系的建议，展望了未来生态系统服务功能价值评估研究的发展方向。

针对目前进行生态系统服务功能价值评估中存在的难题，结合我国具体国情和相关国内外研究现状，本书进行了理论和实践上的一些创新：

1. 核心服务功能的界定。目前生态系统服务功能的研究及其价值评估的困境，造成在进行生态服务功能价值评估时，挑选评估指标时难以统一和规范，导致评估结果千差万别。这种现象

造成公众和政府对评估结果不信任和不认同。为了合理化和标准化评估指标，提高评估结果的确定性，本书提出了核心服务功能的概念和内涵，详细分析了确定核心服务功能的经济学标准和实践标准，规范了生态系统服务功能价值评估时具体评估对象的选取标准。这种评估指标范围的明确和认定，有助于避免对于同一生态系统服务功能进行评估时，由于指标范围的不同导致评估结果产生差异和不合理，有助于提高相应评估方法的通用性，实现生态系统服务功能价值的动态评估，提高评估结果的可预测性和科学性。

2. 方法选择的标准化。进行方法选择过程的标准化研究，可以为选择合理的具体评估方法提供可靠保证，进而保障相关评估过程和评估结果的客观性，为后续相关研究提供可借鉴的研究基础，实现生态系统服务功能的动态评估和全面衡量。本书提出了针对具体生态系统的核心服务功能进行相应评估方法的选择原则和程序。评估方法的选择原则包括：实践检验、统计资料完整性、技术保障、制度保障、降低人为因素影响、方法的通用性和实用性等六项；评估方法选择程序包括六步：①了解评估的基本背景，确定方法选择的基本原则；②确定生态系统类型、范围和其他基本情况；③确定生态系统服务全部类型；④确定要评估的核心服务类型；⑤针对要评估的各种核心服务类型，从理论上选择可供使用的评估方法；⑥根据选择原则和相关条件，确定最终的评估方法。

3. CVM（Contingent Valuation Method）具体实践应用中的完善。根据 CVM 的国内外研究，结合经济学中关于理性人的假设前提，本研究针对目前使用 CVM 时只单方面进行支付意愿（Willing to Pay）来评估服务功能价值的缺点，从 WTP 和接受

赔偿意愿（Willing to Accept）两个角度结合出发重点改进了CVM：①试访和正式访谈相结合。在试访的基础上，对CVM的核心部分——问卷中的引导技术进行了有效设计。②根据相应的社会经济和自然条件选择了双鸭山、哈尔滨、长春、北京和郑州五地居民作为调查对象，扩大样本量，提高统计准确性。

实际上，公众都有追求自身利益最大化的心理，且由于生态系统服务功能的公共物品性，使得公众存在“搭便车”心理。因此，从经济学角度来说，公众的支付意愿和接受赔偿意愿可以看作公众或者说理性人对于某种服务功能价值评估的下限和上限。所以，本研究在具体应用中就以WTP和WTA的统计结果来综合确定七星河湿地非使用价值的真实价值。

4. 相对价值的衡量。目前的生态系统服务功能的评估基本都是直接采用货币衡量方法来计算其货币价值，所以，常常导致在实践的评估结果中出现很多偏差，或者对于某个具体的生态系统服务功能价值评估，由于时间或者参与人员的不同导致最终评估结果出现很大的偏差。

因此，为了保证最终结果的可信度，就使用相对价值评估方法，结合问卷调查的形式来衡量七星河湿地每公顷提供的产品和服务的价值。本研究根据当地的实际情况，选择了大田农业生产——稻谷种植的收益作为对比指标来计算七星河湿地提供的产品和服务的单位价值。实际上这种方法计算出的结果更符合公众和政府的心理预期，便于最终结果进入实践操作和使用。

5. 单位价值量的合理确定。针对CVM常常按照人口作为基准来衡量某种生态系统服务功能的价值所导致的评估结果变化幅度大的缺点，本研究直接询问个人对于每公顷湿地愿意支付和接受赔偿的金额，而不是询问个人对于湿地整体的支付和接受赔

偿意愿，从而有效避免了由于衡量基准的不合理导致评估结果难以被验证的现象。总之，单位价值量的有效确定可以保证最终评估结果的可信度，并提高可预测性。

6. 采用区间值作为最终评估结果，减少评估误差。本研究首次采用区间值来表明七星河湿地的经济价值，这避免了过去那种以某个具体数值作为某项服务功能的经济价值导致评估结果误差较大的缺陷。实际上生态系统服务功能多数属于公共物品，缺乏明确的效用和生产边界，因此，如果认定某个具体数值为某项服务功能的经济价值，就容易导致高估或者低估，进而导致结果难以被公众和政府接受。本研究根据两种方法体系计算的价值评估结果建立某个区间作为七星河湿地价值的估价范围。这种区间的设置提高了公众和政府对于结果的认可度，进而可以保证生态系统服务功能价值评估结果在行政管理等社会、经济具体事务中发挥作用。

关键词：生态系统核心服务功能；价值评估方法；方法选择；七星河湿地；湿地价值

Abstract

With the rapid development of global economy, environmental pollution is more serious than before, which becomes highlight on society and economy. So the strategy of sustainable development becomes the priority choice for all nations. But because sustainable development in society and economy depends on sustainability of ecosystems and its services, it is urgent to realize the sustainability of ecosystem services at present.

Ecosystem is most important in the creature cycle. It not only provides us with many kinds of commodities, but also plays an important role in sustaining livings and dynamically environmental balance. But people used to focus on private economic profit of ecosystem services, and pay less attention to its public benefits.

So, it is necessary to do some research on private and public economic benefits of ecosystem services. Accurate economic value of ecosystem services helps to take reasonable measure in exploiting resources, and to get rid of the economic behavior in short run that do harm to the ecosystem services, as well as to create awareness in the public consciousness of environmental protection in order to realize environment-friendly society. Meanwhile, the further research on valuation of ecosystem

services helps to interpret the characters of ecosystem services and its effect on society, and enrich the theory of ecology and economics.

In fact, since it is useful and important for government and the public to sustain ecosystem services, many researchers attempt to bring it into economic research regarding it as rare resources and to interpret the value of ecosystem services. But the research on ecosystem services is the most complex task at present because it takes nature and characters of ecosystem services, and social and economic situation, and so on, into account. So be faced with many uncertain situations, the research on ecosystem services must be based on much previous research and combined with multi-disciplines research.

And there are unique natural environment and complicated types of ecosystem in China. And China is faced with serious ecological problems and urgent task on recovery of ecosystems. So, under Chinese reality and sustainability strategy, the researchers should put forward methods and indices of valuation of Chinese ecosystem services in order to evaluate the ecosystem services in China accurately.

The dissertation exerts on principal theory and methods of microeconomics, ecological economics, environmental economics and statistics in order to paraphrase theoretic and methodological base of ecosystem services. At the same time, the dissertation discusses predicaments of valuation of ecosystem services under Chinese circumstance according to nature of goods in economics.

And then the dissertation puts forward system of methods of valuation of ecosystem services in theory.

In order to take full advantage of theoretic analysis as it is stated above, the dissertation takes the Qixinghe Wetland in Heilongjiang Province as an example. The study on valuation of wetland ecosystem services is the most urgent and important research because the threat to wetland is the most serious all over the world at present. Meanwhile, the structure of the Qixinghe wetland is still in its integrity. There are large marsh and rich vegetables and animal in Qixinghe wetland. Qixinghe wetland, which is rich in scientific data, has the better basis of scientific study than other places in China. Hence the dissertation estimates the value of ecosystem services of Qixinghe wetland in Heilongjiang Province.

There are several aspects to be analyzed in the dissertation as follows:

Firstly, the dissertation analyses the theoretic and methodological basis of valuation of ecosystem services. Using the principals in ecological economics, it describes the meaning of ecosystem services. And then it defines all kinds of ecosystem services such as providing organic matter; water cycling; protection of soil and so on. On the basis of analysis as it is stated above, the dissertation interprets the basic theory and methodology with regard to valuation of ecosystem services.

Secondly, the dissertation discusses the predicaments of valuation of ecosystem services. From economic viewpoint, the

nature of ecosystem services belongs to public goods. So when the valuation of ecosystem services is mentioned, it leads to many obstacles such as lack of sufficient prerequisite that is necessary for valuation of ecosystem services, statistical straits and estimation of unit value and so on. In addition, it is difficult to value the negative effects of ecosystem services under scientific situation.

Thirdly, the dissertation puts forward methodological system of valuation of ecosystem services. Base on analysis of the predicaments of valuation of ecosystem services situation, the dissertation discusses its strengths and weaknesses, and its application. So the dissertation proposes the definition of the ecosystem core services, and standardizing the principles and procedure of how to choose methods of valuation of ecosystem services.

Fourthly, the dissertation estimates the value of Qixinghe wetland in China. The dissertation describes the ecosystem services of wetlands in China, and explains the reasons why taking the Qixinghe wetland as an example, and analyses social, economic and environmental situations of Qixinghe wetland. Based on the theoretic and methodological analysis as is stated above, the dissertation puts forward methodologies of valuation of Qixinghe wetland services. At last, the dissertation estimates the value of Qixinghe wetland services such as use and non-use value and relative value in contrast to economic value of agricultural development.

Finally, Based on analysis the result of valuation of Qixinghe wetland services, the dissertation indicates some countermeasures in the valuation of ecosystem services in China and some future research fields.

Some innovations in the dissertation:

(1) At present , there are some straits in the valuation of ecosystem services which make it difficult to estimate the value of ecosystem services . So the government and the public discredit the results of valuation of ecosystem services. Therefore, to improve the valuation of ecosystem services, the dissertation defines the core ecosystem services. And it analyses the economical and practical criteria in order to standardize the indices of valuation of ecosystem services. Actually, the definition of ecosystem core services helps to avoid unreasonable results of valuation of ecosystem services because of different indices, and make improvement in standardization of relative methods in order to realize dynamic valuation of ecosystem services and enhance the availability of relative results in practice.

(2) Standardization of how to choose methods of valuation of ecosystem services. According to the definition of ecosystem core services, the dissertation puts forward the principles and procedure of choosing methods of ecosystem services. Among them, the principles include six items such as practical test, comprehensive data, technological and institutional guarantee, objectivity and availability of relative methods. And the procedure

includes six steps as followings: ①knowledge of basic surroundings of valuation; ② understanding of surroundings of ecosystem services; ③ defining all kinds of ecosystem services; ④putting forward ecosystem core services of valuation; ⑤selecting relative methods in theory according to ecosystem core services; ⑥choosing practical methods.

(3) The dissertation makes progress in practical valuation of ecosystem services. According to the hypothesis of reasonable consumption in economics and relative studies, the dissertation joins Willing To Pay (WTP) and Willing To Accept (WTA) together to estimate non-use value of the Qixinghe wetland. Actually, according to the hypothesis of "Free rider", WTP is regarded as minimum of its value. Correspondingly WTA is regarded as maximum of its value.

Concerning to accurate value of the Qixinghe wetland, the dissertation applies the method of relative valuation of ecosystem services in contrast with absolute (dollar-based) ecosystem valuation to estimate use value of the Qixinghe wetland on basis of economic value of agricultural development in the Qixinghe wetland. The relative ecosystem valuation can reflect aggregate WTP and relative preferences for mix of services, and take account of aggregate ecosystem services of the Qixinghe wetland in order to meet with application of environmental administration.

(4) The researcher asks respondents by ways of questionnaire what should be WTP and WTA each in hectare of the Qixinghe wetland . So the value of each hectare is a unit of aggregate value

of the Qixinghe wetland, which avoids the variation of result because of variation of the unit of value and the public to lack trust to the results of valuation.

(5) Using interval value to estimate the value of the Qixinghe wetland. In many researches, it used to regard some concrete variable as the statistic results, which causes error of valuation of ecosystem services. Hence, the dissertation uses some interval by ways of two kinds of methodological system to estimate its value, which makes governments apply relative results to social, economic and environmental administration.

Key words: ecosystem core services; methods of valuation; choice of methods; the Qixinghe wetland; value of wetland