ECONOMIC INDICATORS OF SUSTAINABLE DEVELOPMENT IN FISH CULTURE

Lawrence Wai-chung Lai
Centre for Studies in Urban Sustainability, Faculty of Architecture, University of Hong Kong, China.

PingSun Leung
Department of Molecular Biosciences and Bioengineering, University of Hawaiʻi at Manoa, USA.

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Contents

Summary

This chapter presents a number of micro and institutional economic indicators for fish farming that arguably satisfy the basic criteria for measuring sustainable development as a human-centred and development-oriented concept. The indicators are suggested as supplements to the Total Factor Productivity (TFP) and the Relative Labour Productivity (RLP) methods, which can evaluate aquaculture from a macro, sectoral and firm perspective, to measure the economic dimension of sustainability of the fish culture industry.

1. Introduction

As part of the agreement ensuing from the Earth Summit 1992, the selection of indicators for **sustainable development**, often-abbreviated to **sustainability** in the literature, has become a major academic and policy endeavour of countries (Authors' Note 1). The FAO's policy towards sustainability follows faithfully the intent and spirit of the Earth Summit and has led to the development of sustainability indicators for capture fisheries, as exemplified by various papers in a special issue of the *Marine Freshwater Research* in 2000 (notably Dahl 2000; Garcia 2000a; Garcia 2000b; Hundloe 2000).

With a view to promote research and partake in the multi-disciplinary discussion in the development of sustainability indicators for aquaculture (Authors' Note 2), this short chapter seeks to develop simple economic indicators that are essential for two purposes. They are (a) the comparative measurement of the sustainability of a spatial entity (say a country, a region or a village) over time and/or (b) the ranking of sustainability of a spatial entity relative to other entities in the same period. These purposes meet the requirements of scientists who may use indicators as a method to describe and monitor changes without any policy agenda. They may also help satisfy the needs of policymakers who would like to use indicators as methods of control and as the basis for establishing goals to promote public efforts in achieving certain objectives.

In the next section, the requisite characteristics of the indicators are specified in order to show that the major issue in developing indicators lies in the theoretical understanding of sustainable development. Then two convenient approaches to index sustainability partially, namely the Total Factor Productivity (TFP) and Relative Labour Productivity (RLP), are presented. Finally, as supplements to either the TFP or RLP approaches that can be of macro, sectoral and firm-level application, the possible micro and institutional economic indicators for measuring sustainability of fish farming are discussed. Such indicators are considered applicable to Hong Kong as a small open *laissez faire* economy. As Hong Kong's economic policies are well known as non-interventionist, the indicators should be of interest also to polities that are liberalising their economies.

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Yu B.T., Shaw D., Fu T.T. and Lai L.W.C. (2000). Property rights and contractual approach to sustainable development, *Environmental Economics and Policy Studies* Vol.3, No.3, pp.291-309. [This is the paper in which the Yu's interpretation, using conventional neoclassical techniques, is first discussed. The techniques help distinguish the "soft" from "hard" sustainability. Examples of the application of this interpretation to promote sustainable development from Hong Kong and Taiwan are demonstrated.]

Authors' Notes

1. In this short paper, unless otherwise specified, sustainable development is used as a synonym of sustainability. For a general discussion of sustainability in agricultural economics, see Norgaard (1991, 1992); and Yu *et al* (2000).

2. Aquaculture as defined by FAO is "the farming of aquatic organisms including fish, mollusks, crustaceans, and aquatic plants under some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc." In this paper, the terms aquaculture, fish culture, and fish farming are used interchangeably.

3. The Index of Biotic Integrity (IBI), initially developed for fish (Karr 1981), has been suggested for application to urban planning. See Alberti (2000).

4. For competing approaches, see Fullenbaum *et al.* (1972); Smith and Berkes (1991)

5. The ornamental fish culture industry is an engine of such an evolution. The story of the goldfish is a good example to show how a natural species evolves into a rich variety. (Man 1982)

6. For other methods, see Squires (1992).

7. The approach is versatile and can be used for "weighing" various ratios, such as casualty rates in battles (Lai 2001).

8. This section is largely taken from Leung (1996).

9. As mentioned earlier, a similar relative index can be developed using the TFP concept to provide an analysis of all factors of production instead of just labour input as follows: $RTFP = TFP_f / TFP_y$, where TFP_f and TFP_y are the total factor productivity of the fish culture industry and the entire economy,

respectively. Obviously, to implement such an index would require information on all factors of production in addition to labour, which is frequently not available.

10. Examples of studies on sustainability of fish culture in Hong Kong include Wilson (1997); Lam (1999).

11. Though the regulation of the fisheries industry by the Hong Kong's Fish Marketing Organisation (Food and Agriculture Organisation of the United Nations 1955); Szczepanik, E.F. 1960) may not breach WTO's policies, it has been criticised by Lai and Yu for preventing vertical integration (Lai and Yu 2002).

12. His Supreme Pontiff (John Paul II: Chapter IV) refers to this concept of the Second Vatican Ecumenical Council in addressing the issue of private property discussed in various passages in *Rerum Novarum* of Leo XIII, which have been quoted by Buchanan (1993, p. 50) as an apology for the institution of private property.

Biographical Sketches

Professor Lawrence Lai L.W.C. Lai, B.Soc.Sc., M.T.C.P., M.Soc.Sc. (Econ), LL.B., Ph.D, F.R.I.C.S., PFM, M.R.A.P.I., M.H.K.I.P., M.C.I.L.T., M.I.A.A.E.M., R.P.P. Lawrence Lai is Reader in economics, law and planning with the Department of Real Estate & Construction, University of Hong Kong. Professionally, he is a Registered Professional Planner, Fellow of the Royal Institution of Chartered Surveyor, Fellow of the Hong Kong Institute of Facility Management, member of Royal Australian Planning Institute, Hong Kong Institute of Planners, Chartered Institute of Logistics and Transport, International Association of Aquaculture Economics and Management, and World Society for EKISTICS. He is a member of the Board of Review (Inland Revenue Ordinance) of the Government of the Hong Kong Special Administrative Region. With government and consultancy experience in the arena of planning and environmental protection, his research interest is in the economics of planning, heritage conservation and sustainable development. He is on the editorial boards of peer-reviewed academic journals Planning Theory and Property Management and has edited special issues for the Town Planning Review; Property Management; and Aquaculture Economics and Management. In 2004, he received a University of Hong Kong Outstanding Young Researcher Award in recognition of his achievements in planning and real estate research.

Professor PingSun Leung is a professor and researcher in biosystems economics at the Department of Molecular Biosciences and Bioengineering at the University of Hawaii at Manoa. He also serves as a cooperating graduate faculty with the Department of Economics and the Department of Natural Resource and Environmental Management. He is an honorary guest professor of management science at Jilin University, China. Before joining the College of Tropical Agriculture and Human Resources, he has served as econometrician at the State of Hawaii and has taught management science in the College of Business Administration and the Japan-America Institute of Management Science. His current teaching responsibility is in engineering economics, spreadsheet modeling, biosystems modeling, biosystems simulation and operations research for management. He has published extensively in professional journals. His international experience includes spending a year as a Fulbright Scholar in China, a recent sabbatical leave at the Norwegian College of Fisheries Sciences, City University of Hong Kong, UN Food and Agriculture Organization, and short-term consultancy assignments with Network of Aquaculture Centres in Asia-Pacific, Asian Development Bank, WorldFish Center, Mekong River Commission, UN Food and Agriculture Organization, and UN Development Program. He is the founding editor of Aquaculture Economics and Management and serves on the editorial board of Aquaculture. He also serves as a member of the Technical Advisory Committee for the Center for Tropical and Subtropical Aquaculture and was chair of the committee in 2002.