The historical role of seagrass harvesting for fertilizer in nutrient removal from an estuarine lagoon, Lake Nakaumi, Japan.

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Until the early 1950’s, seagrass and macroalgae were used as fertilizer throughout Japan. Eelgrass (Zostera marina) and brown algae (Sargassum thunbergii) were intensively collected from Lake Nakaumi, a eutrophic estuarine lagoon. Collections ceased about 50 years ago, primarily because these plants are no longer used as fertilizer. Moreover, Z. marina disappeared during the 1950’s in L. Nakaumi; the main reason for its loss remains unknown.

To estimate the amount of nitrogen (N) and phosphorus (P) removed from the lagoon through eelgrass harvesting, we analyzed the N and P concentration in Z. marina collected from Akkeshi Bay. Plants were weighed before and after removal of attached material, and elemental concentrations were measured separately for different portions of plants.

The coastline of L. Nakaumi is in Tottori and Shimane prefectures. In Tottori prefecture, annual harvest of Z. marina in the late 1940’s was estimated by the local fisheries station as at least 56,250 tons fwt (fresh weight). In the 1950s eelgrass grew to depths up to 3 m. The area shallower than 3 m in 1954 was 2,012 ha. The annual net production of Z. marina was reported to be ca. 15 kg fwt m⁻² y⁻¹ in Italy and 669 g dwt m⁻² y⁻¹ in Japan. If these productivity rates were typical of Lake Nakaumi, then the amounts produced would have been 300,000 tons fwt and 150,000 tons fwt, respectively. Therefore, 56,250 tons fwt of annual eelgrass harvest is not unlikely.

The nutrient content of 56,250 tons of Z. marina would be 61.4 tons of N and 12.8 tons of P. Present annual nutrient loads to L. Nakaumi are 1164 t N and 116 t P. Therefore, the former Z. marina harvest would be equivalent to 5.3% and 11% of the present N and P loads to L. Nakaumi, respectively. Since we excluded nutrients removed in brown algae from Tottori prefecture and in both eelgrass and brown algae from Shimane prefecture from consideration, and also because the lake should be more eutrophic now than in late 1940’s, these percentages should be considered minimum estimates. Eelgrass harvesting for fertilizer seem to have played an important role in suppressing eutrophication.

中海における肥料藻採取業の歴史的意義と環境浄化機能

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中海では昭和40年代頃まで湖内に繁茂するアマモを大量に採集して沿岸の農地に施肥していた。肥料藻は痩せた砂浜を豊かな農地に変え、特産品の綿花栽培を可能にした。施肥量は年間1万トンにも達し、これに伴う水域からの栄養塩除去システムは「里海」である中海の水質浄化をはじめとする自然環境の維持に大きな貢献をしていた。