Offsetting industrial groundwater consumption through partnerships between industry and farmers

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Short title: Payments for ground water recharge, Japan

Key Message: A large percentage of Japan's urban population depends on groundwater for its drinking water needs. However, conversion of agricultural land to industries, coupled with increasing groundwater extraction has been depleting Japan's water reserves. A novel approach through corporate responsibilities and initiatives such as economic incentives for farmers funded by water-intensive industries is helping companies become water neutral and preserving the quality and quantity of groundwater.

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What is the problem?

Kumamoto Prefecture depends on groundwater for 80 percent of its drinking water (Kumamoto Prefecture et al, 2008a). 100 percent of the drinking water used in its capital city, Kumamoto City, with a population of approximately 680,000 people (Kumamoto, 2009). The Kumamoto area, which spreads from the western flank of Mt. Aso-Somma out to the Kumamoto Plain and the surrounding plateau area, is known to have a recharging capacity of 640 million m^3/year of water, 210 million m^3/year, or one-third of which rice paddies account for (Kumamoto Prefecture et al, 2008a). The middle basin area of Shirakawa river (Kikuyo Town and surrounding areas), in particular, can recharge 5 - 10 times more water than other areas (Kumamoto Prefecture et al.,2008a; Kumamoto, 2009). In recent years, however, the groundwater level has lowered as a result of policy-driven reduced rice production and urbanization in and around Kumamoto City (Kumamoto City, 2009).

According to Sato(2010) and Sony(2008) Sony Semiconductor Kyushu, the company's operations at the Kumamoto Technology Center (Kumamoto TEC) aroused local concerns over the impact that the cleaning process of a semiconductor plant that pumps up large amounts of groundwater would have on the groundwater resources of the area. The company is the first company in Japan to become water neutral, or to fully return the groundwater it has used. This innovative groundwater recharge scheme was launched by Sony Semiconductor Kyushu in cooperation with a local NGO, a local agricultural cooperative and land improvement districts and local municipalities, and later engaging other local firms, as well as Kumamoto City.

Which ecosystem services were examined? And how?

Kumamoto TEC asks volunteering local farmers to flood abandoned rice fields between crops or organic rice paddies after harvest with water drawn in from the Shirakawa River to let it soak back into the ground. The accumulated amount of water used by Kumamoto TEC as of 2009 (9.8 million tons) has been successfully recharged (estimate of 11.6 million tons)

(Sato, 2010). According to Kumamoto TEC[1], cooperating farmers are paid a fee of 11,000 Japanese Yen[2] per 1,000m^{2}a to cover management and preparation costs in 30 days of off-season flooding.

Table 1 Payment to partner farmers

Days of off-season flooding	Payment to partner farmers
30 days	11,000 円／1,000m^2
60 days	16,500 円／1,000m^2
90 days	22,000 円／1,000m^2

Source: data provided by Sony Semiconducter Kyushu[3]

Consuming one kilogram of rice is believed to have the effect of recharging 20-30m^3 of groundwater (Kumamoto, 2007). According to Kumamoto TEC, every year, employees participate in planting and harvesting rice grown with reduced pesticides and organic fertilizers in paddies owned by partner producers. Also, by purchasing this rice for 430 JYen[4] / kg and serving it at the employee cafeteria, Sony Semiconductor Kyushu has promoted returning the groundwater used to produce the purchased rice. According to Sato (2010), in 2009, the rice was made available in 5 kilogram packages for individual employees. 535 kilograms were bought, therefore contributing to recharging 11.235 tons of groundwater.

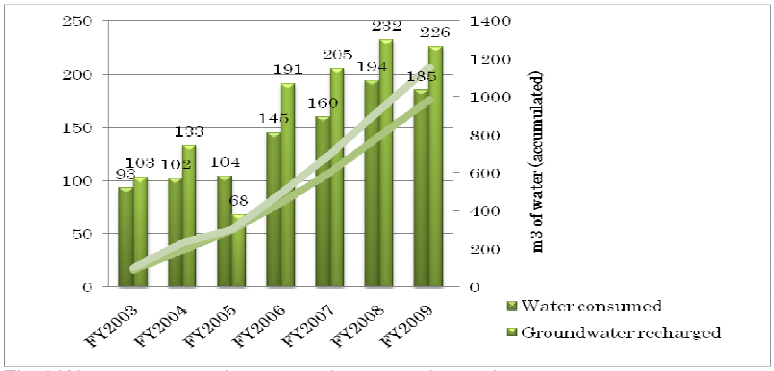

Fig.1 Water consumed vs groundwater recharged
Source: Sato, 2010

What policy uptake resulted from examining the ecosystem services?

This is an example of a water offset program for water consumed by factories. Also Kumamoto TEC, being a beneficiary, has to pay money for the conservation of ecosystem services, for example that of groundwater. Therefore, this case can be classified as a PES of direct negotiations between stakeholders. They estimated water consumption and the amount of water recharged to the ground.

Studies by Professor Tsutomu Ichikawa of Tokai University's School of Industrial Engineering have revealed that the spring water in Lake Ezu[5] has recently resumed an upwards trend,

[1] Data obtained in interview at Kumamoto TEC on February 8, 2010
[2] Exchange rate was as of 2 Sep 2010; 1US$=84.1874JPY
[3] Data obtained in interview at Kumamoto TEC on February 8, 2010
[4] Data obtained in interview at Kumamoto TEC on February 8, 2010
[5] Lake Ezu was artificially made in the Yedo era by banking up the water of a wetland formed by spring water originating in the abundant groundwater resources of the region. Discharging approximately 400,000 tons daily (450,000 tons/day in 1992, decreased to 380,000 tons/ day in 2006), it symbolizes the rich water resources that Kumamoto City is blessed with. It is a favorite relaxing spot for the citizens of Kumamoto and is home to many important species. Professor Ichikawa has surveyed the volume of water discharge from Lake Ezu since 1991.

indicating signs of recovery in Kumamoto's groundwater resources[6]. We have yet to wait for further scientific evaluation of this program but this attempt to recharge water to the ground may be successful.

Sony Semiconductor Kyushu's efforts have later been joined by other local firms, as well as Kumamoto City, which even included the groundwater recharge scheme in its five-year Kumamoto City Water Conservation Plan in 2004 and also in its current plan for fiscal years 2009-2013.

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References:

Kumamoto City (2007) *Projects that foster groundwater, Kumamoto Water Life,* available at www.kumamoto-waterlife.jp/default.asp (in Japanese; last accessed on October 1, 2010)

Kumamoto City (2009)*Kumamoto City Groundwater Conservation Plan: Establishment, Enhancement and Partnership*

Kumamoto Prefecture, Kumamoto City, Kikuchi City, Udo City, Koshi City, Jonan Town, Tomiai Town, Ueki Town, Ozu Town, Kikuyo Town, Nishihara Village, Mifune Town, Kashima Town, Mashiki Town, Kosa Town (2008a) Comprehensive Plan for Groundwater Conservation and Management

Kumamoto Prefecture, Kumamoto City, Kikuchi City, Udo City, Koshi City, Jonan Town, Tomiai Town, Ueki Town, Ozu Town, Kikuyo Town, Nishihara Village, Mifune Town, Kashima Town, Mashiki Town, Kosa Town (2008b) Comprehensive Plan for Groundwater Conservation and Management Appendix

Sato, Tomio (2010) Returning Consumed Groundwater through Rice Paddies: The First Japanese Corporate Project to Recharge Water, *Global Net,* Tokyo: The Global Environmental Forum

Sony Corporation (Environmental Promotion Department) (2008) Returning Every Drop of Groundwater Used through Rice Paddies: Hands in Hands with the Community for the Circulation of Living water, *eco press*, pp.1-5

Sony Semiconductor Kyushu Corporation (2009) Environment Report 2009

Takemori,Yuji, and Tsutomu Ichikawa （2008） On Effect of Groundwater Recharge Evaluation by Keeping Water in no use Paddy field in the Middle Shira-River Area, Bulletin of School of Engineering Kyushu Tokai University, : 1 , pp.53-59 (abstract in English)

Other information is based on interviews with Sony Semiconductor Kyushu at the Kumamoto Technology Center on February 8, 2010 etc.

[6] "Signs of Recovered Groundwater Levels"Kumamoto Nichinichi Shimbun, July 10, 2009