

## Economic instruments in pollution control on the Finnish agricultural sector

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Finland has only a brief history in use of economic instruments for pollution control in agricultural sector. Practically, only taxes levied on fertilizers have been used. The taxes were first destined to restrict over-production and collect funds towards export subsidies, however, they have been later directed to restrict pesticide use. The fertilizer taxes were launched on 70's and they were used through 80's, however, abandoned the year 1995 when Finland became a member of the EU.

With pesticides no clear economic instruments have been utilized in order to restrict their use. Since joining to the EU, Finland has relied purely on agri-environmental program (AEP) designed according to EU 2078/92 program. No other direct economic pollution control mechanisms have been instituted.

### *Fertilizer taxes*

Initially, fertilizer taxes were collected in order to raise funds for export subsidies. First, the taxes were levied per kg N purchased (see the table below). In 1990 an actual environmentally related tax on phosphorous fertilizers was introduced. The goal was to lower the phosphorous content in the fertilizer mixes (Kettunen, 1992; Sumelius, 1994).

period	tax	nutrient
July 1st 1976 - June 30th 1977	5	
July 1st 1977 - June 30th 1978	11	
July 1st 1978 - June 30th 1982	11	
July 1st 1982 - June 30th 1983	6	
July 1st 1983 - June 30th 1984	10	
July 1st 1984 - June 30th 1985	12	
July 1st 1985 - Aug 31st 1985	20	
Sept 1st 1985 - Aug 31st 1986	23	
Sept 1st 1986 - June 30th 1978	19	
July 1st 1987 - Sept 30th 1988	3	
Oct 1st 1988 - June 14th 1990	5	
Jan 1st 1990 - June 15th 1990	50	(pennies/kg P)
June 15th 1990 - Dec 31st 1990	15	
June 15th 1990 - June 15th 1991	100	(pennies/kg P)
Jan 1st 1991 - June 15th 1991	20	
June 16th 1991 - Aug 31st 1991	35	
June 16th 1991 - Dec 31st 1991	150	(pennies/kg P)
Sept 1st 1991 - Dec 31st 1991	60	
Jan 1st 1992 - Aug 31st 1992	290	
Jan 1st 1992 - Aug 31st 1992	170	(pennies/kg P)
Sept 1st 1992 - June 15th 1994	260	
Sept 1st 1992 - June 15th 1994	170	(pennies/kg P)

*Fertilizer taxes in Finland since 1976 until 1994. Generally, the tax was levied per kg N used, however, from 1990 onwards a specific environmental tax based on kg P used was launched. (Sumelius, 1994), (€ 1 = 594,573 pennies).*

From Jan. 1<sup>st</sup> 1992 the fertilizer tax (based on N) and the environmental tax (based on P) were combined and the combined tax was substantially raised. Now the common goal was both, to decrease the phosphorus use and to collect funds worth of about € 110 millions for financing exports of agricultural commodities (Kettunen, 1992). In June 1994 the fertilizer taxes were abolished altogether in order to facilitate a Finnish membership in the European Union. (Sumelius, 1994)

Peltola (1999) analyzed impact of the Finnish agri-environmental program on fertilizer use. The analysis does not directly reveal effect of taxes, however, it signals the effect of price and thus indirectly effect of taxes.

In case of nitrogen, the econometrically estimated own-price-effect of N is quite strong (Peltola, 1999, pp. 147-148). Thus tax levied on N appears to be an effective way to decrease use of nitrogen. In the same analysis it was found that the price-effect of N on use of phosphorous, P, and potassium, K, appeared significant. This is understandable due to the strong complementary character of N, P and K in a fertilizer mix. The clear price effect can also be seen when amounts purchased and price index of the aforementioned nutrients are presented in the same graph (Peltola, pp. 143-144, 1999, *in Finnish*).

Thus the result supports the notion that taxing nitrogen (as ingredient of a fertilizer-mix) could be an effective way to cut down the use of phosphorous (and potassium) also. However, the tax level has to be quite high for the demand effect to be significant. The same conclusion was reached by Sumelius (1994), in a technical simulation, where the author compared four different instruments, namely, i) 112% N-fertilizer tax, ii) 50% output tax, iii) combined 112% N-fertilizer tax and 50% output tax, and iv) N-fertilizer quota of 50kg N/ha. In that comparison 112% N-fertilizer tax appeared to be the most cost-efficient control mechanism.

The fertilizer tax was abolished 1995, and this control mechanism was replaced by a control based on a more holistic approach, namely agri-environmental program. Seemingly, this resulted in decreased use of fertilizers, at least initially. However, that change may have depended more on the large structural change in the Finnish Agricultural Support system than on the change in the fertilizer tax. That year Finland joined to EU and adopted a policy with low(er) product prices combined with high(er) direct subsidies. The adoption of the CAP changed tremendously the price ratios of agricultural outputs.

There has been only few studies made on the subject in Finland. Besides the studies evaluating aggregate effects, no single-farm analysis on impact of fertilizer taxes have been done.

### *Pesticides*

Direct economic instruments controlling and directing the use of pesticides have not been used in Finland. There exists a fixed payment (about € 800 in the first part of 90's) for manufacturers covering costs from the initial official evaluation and control of a new pesticide. Additionally, when pesticides are traded, there is a 2.5% fee (counted from the value of the product before VAT) to be paid by a manufacturer/importer. Although, not directed to be paid by an end-user, the fee naturally increases the costs of pesticides and thus may affect their use respectively (Miettinen, 1994).

## *Coverage*

The fertilizer tax, when in effect, was levied on fertilizer price, first on N, later also on P. As the tax was part of the fertilizer price, there were no exemptions based for instance on farm size or production type. Similarly, the pesticide fee is collected uniformly without exemptions.

## *The Finnish Agri-environmental Program, FAEP*

In the FAEP, there are some economic instruments concerning the fertilizer and pesticide use. The Finnish AEP is divided into two, to general agri-environmental program (GAEP) and to supplementary protection system (SPS). The general agri-environmental program relies mainly on general principles, “the good farming methods”, and on some specific rules like those stating the maximum amount of fertilizer allowed per hectare. However, in SPS there are some direct economic instruments purchasing pollution reductions from farmers. These measures compensate farmers for e.g. further fertilizer reductions above GAEP requirements. In this way there are some economic instruments also built in the current Finnish agri-environmental system. According to Nokkala (2001), the effects of the FAEP on herbicide use are ambiguous.

## *Conclusion*

In conclusion, use of economic instruments in Finland has been very brief, hardly extensive enough to produce reliable data for evaluating their effectiveness. Levying of pesticide control and manufacturing fees as well as taxing of fertilizers both initially had some other than environmental goals. Like earlier mentioned, the fertilizer (nitrogen) tax was started in order i) to decrease the needs and ii) to raise funds for export subsidies. However, in the beginning of the 90's the tax became environmentally motivated, and it was then modified and adjusted in order to directly affect the fertilizer use. However, this environmentally directed tax had a life of only some five years and was abolished when Finland joined to EU. Without the EU membership and subsequent adoption of EU 2078/92, I believe, Finland would have carried on using fertilizer taxes.

According to aforementioned analysis, the fertilizer taxes seem to be quite effective, however, for that they have to be high enough. Naturally, the tax were never well-liked by farmers as the tax very transparently increased production costs. On the other hand, if it was necessary to choose from a few alternative direct pollution control measures, I find a fertilizer tax to be quite a competitive measure, as it leaves lots of room for farmers' own adjustment. For instance, a farmer may decrease the amount of fertilizer needs (and use) by improving their productivity e.g. by adoption of drainage-irrigation systems or through the increased use of lime on the soils.

Currently, used agri-environmental program (AEP) is voluntary, and a farmer is compensated for the measures she takes to in order to decrease environmental nuisance from her operation. It is based on collection of “good farming methods” and on some other, more direct measures. I consider the approach of this program to be preferable to the use of taxes alone. Agricultural pollution is such a complex issue and a product of numerous different inter-active actions, and thus a control method based on information and incentives is better than a simple tax. However, taxes could be still used as complementary methods. The agri-environmental program seems to be also well-accepted and widely adopted by farmers. However, the agri-environmental program may need to be further modified in the near future in order for it to better reflect the changing nature of agricultural production and changes in EU agricultural policies.

## References

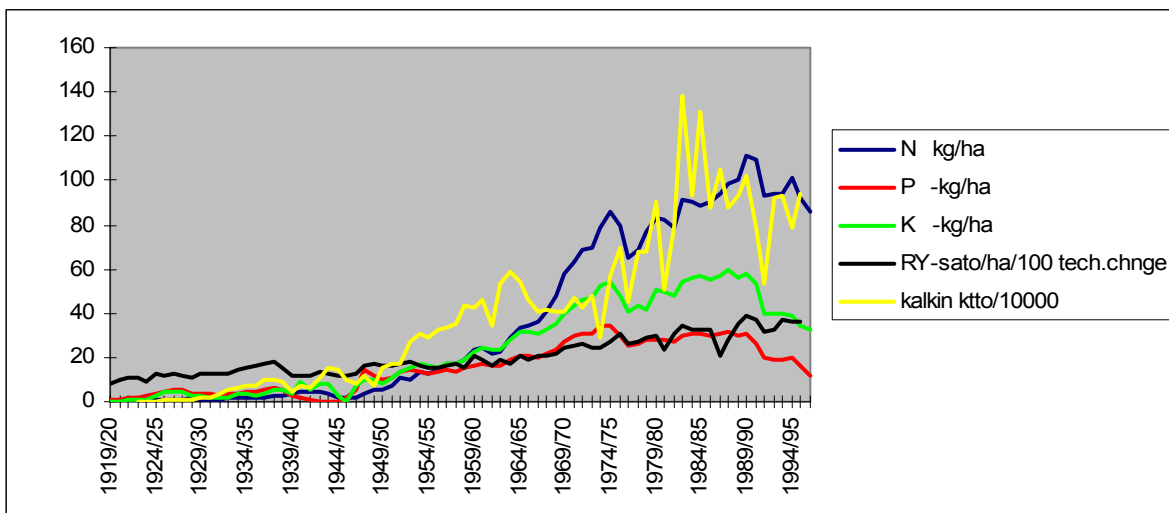
Kettunen, L. 1992. Suomen maatalous vuonna 1991. Agricultural Economics Research Institute, Publications 65b-1992.

Miettinen, A. 1999. Maatalouden ympäristönsuojelu – toimenpiteet ja niiden kehittyminen Suomessa. Vesi- ja ympäristöhallituksen monistesarja, Nro 553, 33 pp.

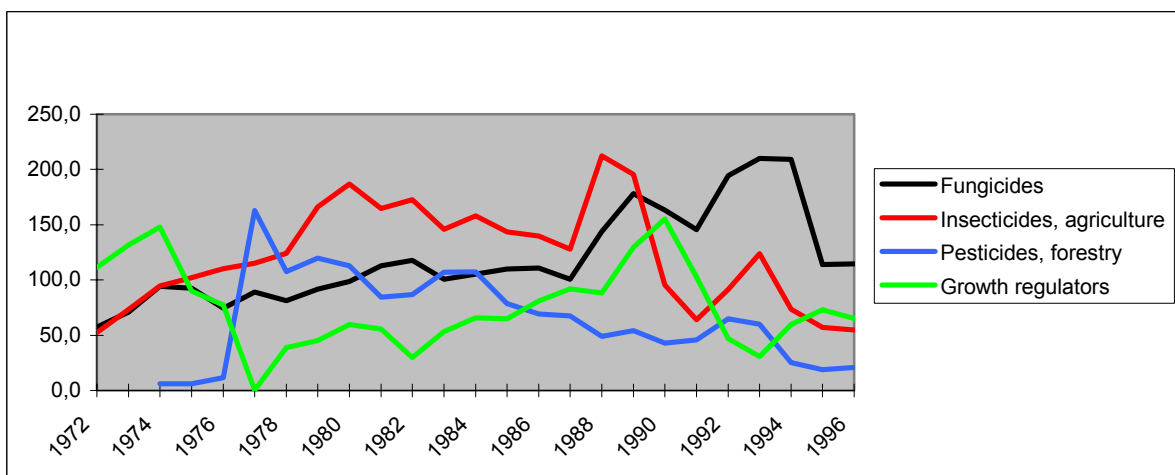
Nokkala, M. 2001. On the effects of the Finnish Agri-Environmental Programme 1995-1999 on the use of pesticides. Agricultural Economics Research Institute, Working papers, 24/2001. *In Finnish.*

Peltola, J. 1999. Effects of Finnish Agri-Environmental Programme on demand for main nutrients in *Maatalouden ympäristöohjelma 1995-1999:n taloudellinen analyysi – Ympäristötukijärjestelmä ja tulevaisuus – tutkimuksen loppuraportti.* Agricultural Economics Research Institute, Publications 90-1999. *In Finnish.*

Sumelius, J. 1994. Controlling nonpoint source pollution of nitrogen from agriculture through economic instruments in Finland. Agricultural Economics Research Institute, Publications 74-1994. *In Finnish.*



*The use of nutrients and liming and the production of feed units per hectare in Finland 1920 – 1997 (Peltola, 1999).*



*The sales of herbicides in Finland, 1972 – 1997.*