Summary

Effectiveness of energy conservation policy in the glasshouse horticulture industry

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Between December 2000 and June 2002 the Netherlands Court of Audit, with the assistance of the LEI,[1] investigated the effectiveness of the policy designed to foster energy conservation in the glasshouse horticulture industry.

The investigation examined the effect of energy conservation measures on energy consumption per unit product in the glasshouse horticulture industry (period investigated: 1994-2000), and the contribution made by government policy (period investigated: 1997-1999). 'Energy consumption per unit product' is the quotient of primary fuel consumption and turnover, in guilders, corrected for inflation.[2] Since the effectiveness of this aspect of climate policy had never been investigated before, one of the aims of this investigation was to provide an example for future investigation of the effectiveness of energy conservation.

The policy

The glasshouse horticulture industry is very important to the Dutch economy. The industry employs around 40,000 people, excluding suppliers. Over three-quarters of its product is exported. There are more than 12,000 horticultural businesses, occupying just over 10,000 hectares of land. The sector earns around EUR 3.2 billion a year.

[1] Previously known as the Agricultural Economics Research Institute. It is now known simply as the LEI and is part of Wageningen UR, a collaboration between the Agricultural Research Service, Wageningen University and *Instituut Praktijkonderzoek*.
[2] Now given in euros.

In 2000 the agricultural sector emitted some 24 Mtons of greenhouse gases (8 Mtons of CO_2, 8.7 Mtons of methane, 7.4 Mtons of nitrous oxide), over 10% of total greenhouse gas emissions in the Netherlands.

The government hopes to reduce CO_2 emissions from the glasshouse horticulture industry, which is the biggest energy consumer in the agricultural sector, accounting for 80% of its CO_2 emissions. Grants and tax incentives are being used to encourage enterprises in this sector to install energy-saving technologies. The government is also encouraging the use of residual heat and modernisation of glazing as part of the restructuring of the industry. Some EUR 280 million has been earmarked for the restructuring and energy conservation measures, excluding loss of revenue as a result of tax incentives, for the period 1997-2010.

Four ministries are involved in the implementation of the energy conservation policy in the glasshouse horticulture industry: the Ministry of Agriculture, Nature Management & Fisheries, the Ministry of Economic Affairs, the Ministry of Housing, Spatial Planning & the Environment and the Ministry of Finance.

The main policy measures geared towards energy conservation in the glasshouse horticulture industry ensue from the Multi-year Agreement on Energy agreed with the sector in 1993, and the Horticulture and Environment Covenant (known by the acronym Glami, from 1997). Policy includes general fiscal measures for environmental purposes, such as the scheme for accelerated depreciation of environmental investments (Vamil) launched in 1991 and the energy investment allowance (EIA, introduced in 1997). All the schemes aim to encourage investment in energy-saving technologies, with the implicit goal of achieving energy savings, which should lead to a reduction in CO_2 emissions.

The policy also includes education, information, research and demonstration projects which aim to develop new energy-saving alternatives, behaviours and management systems. Since 1 April 2002 regulations (with targets for individual companies) have been in place to encourage horticultural enterprises to switch to energy-saving technologies.

Effect of energy-saving technologies

A wide range of energy-saving technologies are used in the glasshouse horticulture industry to reduce energy consumption. This investigation covered climate

computers, condensers, heat buffers, combined heat and power, use of residual heat (a by-product of electricity production and industrial processes), movable screens and facade insulation. A number of measures designed to raise production (heating, lighting, CO_2 fertilisation and steam disinfection of the soil) were also covered, as they can affect fuel consumption. Some characteristics of individual enterprises (such as size, area and age of glazing, type of enterprise, age of owner), the type of crop being grown, the year and data relating to the restructuring policy were also included in the analysis.

The investigation of the effect of energy-saving technologies revealed the following:

- Only the use of residual heat has a demonstrable effect in reducing the amount of energy used. Consumption per unit product fell by around 4%. Use of this technique is being encouraged as part of the restructuring policy in setting up new horticultural areas.
- The other energy-saving alternatives have no demonstrable effect. This could be because horticultural enterprises are not using them to their full potential.

The analyses also showed the following:

- Enterprises with more modern glazing clearly consume less energy (7%) per unit product. The modernisation of glazing is being stimulated under the restructuring policy.
- Heating to raise production leads, on balance, to an increase in energy consumption per unit product.
- The type of crop being grown has a major effect on energy consumption per unit product. Growing tomatoes and roses takes a particularly large amount of energy.

Impact of policy

To gain an impression of the impact of government policy, the Court of Audit and LEI conducted a written survey among 220 horticultural enterprises in spring 2001. They were asked whether they had participated in the government's information activities, whether they had invested in energy conservation measures and whether they had used the tax breaks and grants put in place for such investments.

The survey revealed that over 70% of the enterprises had received information on energy-saving technologies. Of those enterprises, 33% said it had prompted them to

invest in the technologies. Over half the enterprises had also invested in one or more of the five specified technologies between 1997 and 2000, with 72% using a government scheme, particularly EIA and Vamil. Reasons why enterprises had not applied for these schemes included the fact that they were unaware of them, that they did not meet the conditions or that they felt it involved too much paperwork. The majority of respondents who had applied for EIA and/or Vamil said they would not have made the investment without the tax incentive.

Grants had been used to such a limited extent that it was not possible to properly assess their impact on energy consumption.

Although horticultural enterprises do take advantage of policy measures designed to encourage energy conservation, such as EIA and Vamil, this led to a clear drop in energy consumption per unit product in only one case – the use of Vamil for purchasing facade insulation.

Companies that had received information about energy conservation were not found to have demonstrably lower consumption per unit product than those that had not received information.

Conclusion

Of all the energy-saving alternatives installed by horticultural enterprises, only the use of residual heat produces a clear reduction in energy consumption per unit product. The fiscal policy instruments EIA and Vamil, which are often used for investment in energy-saving technologies, led in only one instance to a clear fall in energy consumption per unit product.

Other factors not directly linked to energy conservation policy were found to have an important effect on energy consumption in the glasshouse horticulture industry. For instance, re-glazing under the restructuring policy for the industry lowers energy consumption, while the use of technologies designed to raise production and the growing of certain crops lead to higher energy consumption.

Possible explanations for the energy-saving alternatives' lack of effect include:

- the enterprises are not using them to their full potential once installed;
- the impact of energy conservation measures is fairly marginal compared with a number of other factors that determine energy consumption.

Recommendations

The Court of Audit makes the following recommendations:

- Government policy on energy conservation should not focus exclusively on investment in energy-saving measures. It should also target horticulturalists' behaviour and attempt to ensure that the technologies are actually used once installed.
- Use of residual heat should be encouraged by accelerating the establishment of new horticultural areas.
- When companies modernise, there should be more emphasis on using modern glazing. This could also be done in association with an intensification of the restructuring policy.
- In view of the 'From Policy Budgets to Policy Accountability' process, the ministers concerned should launch a further study of:
  - the impact of other factors on energy consumption per unit product in the glasshouse horticulture industry, such as business practices and management styles; and
  - the effect of research and information, and the recently introduced order in council under the Glami covenant, which imposes energy-saving targets on individual enterprises. Only then will it be possible to conduct a more comprehensive quantitative analysis of energy conservation policy in the glasshouse horticulture industry in 2005-2006.
- Research could also be carried out into the effectiveness of energy conservation policy in other areas of climate policy, such as in the built environment.

Response of Ministers and State Secretaries

The State Secretary for Housing, Spatial Planning & the Environment responded to the investigation in a letter of 27 September 2002, written on behalf of the Minister of Economic Affairs, the Minister of Agriculture, Nature Management & Fisheries and the Minister of Finance.

The State Secretary finds the report's conclusion surprising, and contrary to what would be expected on the grounds of economic logic. He finds the idea that the technologies do not lead to savings in energy unlikely, particularly given the developments in energy consumption in the sector in recent years, citing studies by the Netherlands Bureau for Economic Policy Analysis (CPB), the Energy Research Centre of the Netherlands (ECN), the Netherlands Agency for Energy and the

Environment (Novem) and the National Institute of Public Health and the Environment (RIVM). According to the State Secretary, this means that if the technologies do lead to energy savings, the effect is counteracted by other factors or masked by a lack of data or incomplete specification of the model.

He states that the government's policy is to develop new horticultural sites where maximum use is made of residual heat. Such sites are available only in limited number and, given the preparations involved in land-use planning, only in the medium term.

As regards the use of EIA and Vamil, the State Secretary states that these measures cannot be expected to lower energy consumption per unit product. Although they lower the costs of the investment, they do not raise the energy-saving impact of the technologies. The State Secretary agrees with the Court of Audit's conclusion that reglazing could have a major impact on energy consumption per unit product in the glasshouse horticulture industry.

In response to the recommendation that the Minister of Agriculture, Nature Management & Fisheries stress the need to modernise glazing in greenhouses, the State Secretary indicated that the opportunities to do so under the RSG scheme for improving the structure of the glasshouse horticulture industry and the STIDUG incentive scheme for sustainable glasshouse horticulture would not be extended.

In response to the Court of Audit's recommendation to conduct further research, the State Secretary states that in autumn 2001 the Ministry of Agriculture, Nature Management & Fisheries commissioned the LEI to study the behaviour of horticulturalists with respect to energy. A draft report will be available soon. The State Secretary also states that, in accordance with the order on performance data and evaluations in central government, periodic ex-post evaluations of the various policy instruments for energy conservation will be carried out. Several methods will be used. He questions the idea that econometric models could or should be applied in all cases to establish the effectiveness of energy conservation policy. He also believes that the gathering of data at micro-level could place an excessive administrative burden on horticultural enterprises. The question of whether the method used here should be applied will therefore be examined on a case-by-case basis.

Finally, the State Secretary indicates that he intends to analyse the reduction effect of the entire package of policy instruments in one particular sector of climate policy each year. The 'built environment' sector has already been selected for 2003.

Court of Audit afterword

The Court of Audit shares the State Secretary's view that the results of the investigation are in themselves surprising. But, in its opinion, this does not necessarily mean that the results are incorrect. The Court regards the State Secretary's citation of the reports by the CPB, ECN, Novem and RIVM as not entirely appropriate, since they are based on data at sector level, rather than data on individual enterprises. Furthermore, the savings they mention refer to the entire agricultural and horticultural sector, not just the glasshouse horticulture industry.

The Court of Audit notes with concern the State Secretary's announcement that sites where residual heat can be used will become available only in the medium term, and observes a discrepancy between the agreements made in the framework of the restructuring of the glasshouse horticulture industry, whereby these areas would become available between 2000 and 2005.

As regards the use of EIA and Vamil, the Court of Audit is of the opinion that these measures do not merely constitute support for investments. They are designed to encourage higher and more frequent investment in energy conservation than would otherwise be the case. And that should, of course, lead to more energy savings than would otherwise be the case.

The Court of Audit is pleased that the State Secretary shares its conclusion that there is an important link between modern glazing and energy savings, but does not see why this knowledge has not prompted a review of the restructuring policy.

The Court wishes to emphasise that, given the move towards more policy accountability, the ministries should obtain more insight into the effects of their policy. This implies that, more than in the past, thorough ex-post evaluations of policy will be needed to ensure that the required information becomes available. The Court observes that further studies are being initiated in various areas. It will monitor the outcomes, and the thoroughness of the studies, with great interest.

The Court of Audit agrees with the State Secretary that econometric models are not appropriate for assessing policy in all cases. At the same time, however, it believes these models are crucial for providing insight into the effectiveness of the policy instruments used. It allows the necessary data to be collected at micro level, without imposing an extra administrative burden on companies.

This type of effectiveness audit has been lacking in the ministries' evaluation audits. With the present investigation, the Court of Audit has taken a step towards bridging the gap. It is up to the ministries concerned to build on this first step.