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Ministry of Agriculture, Fisheries and Food  
Whitehall Place London SW1A 2HH

From the Minister's Private Office

**CONFIDENTIAL**

Mr Dominic Morris  
Private Secretary to  
The Prime Minister  
10 Downing Street  
London  
SW1A 2AA

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*Mr Dominic*

**CLIMATIC CHANGE**

At the meeting chaired by the Prime Minister on 12 January my Minister was asked to commission a paper on agriculture's contribution to global warming and the scope for mitigating action for discussion at a second Ministerial meeting (now fixed for ... 19 April). This is attached.

I am copying this letter and the attachment to the Private Secretaries of the Prime Minister, the Chancellor of the Exchequer and the Secretaries of State for Foreign and Commonwealth Affairs, for the Environment, Energy, Trade and Industry, and Transport, the Paymaster General, the Minister for Housing, Environment and Countryside and Sir Robin Butler.

SHIRLEY STAGG (MRS)  
Principal Private Secretary

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CLIMATIC CHANGE: PAPER BY MINISTRY OF AGRICULTURE, FISHERIES  
AND FOOD

Background

1. Agriculture is a source of three of the greenhouse gases (carbon dioxide, methane and nitrous oxide). It is also a sink for one of them (carbon dioxide). This paper is not concerned with emissions from fuel used in tractors and farmers' cars, together with emissions from manufacturing processes involved in the production of agricultural chemicals and machinery and of food, since the main potential for reduction in these sectors will come from increased efficiency in energy utilisation which is considered in other papers.

2. Quantitative information on the emission and absorption of greenhouse gases by agriculture is scanty, there being only a limited number of direct measurements. Further research is therefore needed both to quantify agriculture's contribution to the greenhouse effect and to determine whether there are any changes in farming activities which could have detectable offsetting savings. Preliminary indications are, however, that its contribution to the net UK emission of carbon dioxide is tiny. There are indications that it is a more important contributor to our national emissions of nitrous oxide and methane. But taking into account that purely domestic emissions across all sectors of UK economic activity are themselves small in world terms, the role of UK agriculture in total world emission of greenhouse gases is quite insignificant.

3. In the case of carbon dioxide, plant growth is the principal land based mechanism by which the gas is removed

from the atmosphere. But most of the carbon dioxide which is fixed by agricultural plants is subsequently returned to the atmosphere over quite a short timescale either through the food chain or by decomposition of plant residues. Some carbon is stored in soils in organic matter but changes in organic matter levels take place very slowly and the net effect on carbon dioxide cycling is small. Essentially, therefore, there is a balanced CO<sub>2</sub> cycle within agriculture with only small changes in the period of time for which CO<sub>2</sub> is fixed in plant matter as a result of changing agricultural practices.

4. Methane is produced mainly in wetland and ponds on the one hand and on the other from ruminant livestock mainly in the form of slurry and manure. Changes in the numbers of ruminants and in the areas of wetland can have some effect. But this is likely to be smaller than other sources of methane notably from decomposition of land-fill sites.

5. Nitrous oxide is produced by the denitrification of nitrates in both natural and agriculturally intensive soils. The main factors governing the volume of emissions are likely to be the rate of application of artificial or natural fertilisers and the extent and frequency with which the land is cultivated.

#### Scope for mitigating action

6. It follows from the above that there is no realistic prospect of taking any action on a UK scale which would have a perceptible effect on worldwide emissions. Indeed, any attempt to introduce measures in the UK of a sufficiently radical nature to have any perceptible effect on national emissions would be likely to be so severe as to have a prohibitively damaging effect on the competitiveness of UK agriculture.

7. Having said this, however, a number of environmentally friendly measures have recently been introduced in our agricultural sector - either on a UK or EC basis - which could be prayed in aid in international discussions as examples of steps that can be taken to help to protect the environment. Thus,

- the Farm Woodland Scheme locks up CO<sub>2</sub> for longer periods than conventional agriculture and also reduces the need for fertiliser applications.

- Environmentally Sensitive Areas and set-aside can both result in a reduction of inputs of fertilisers (although there is probably little direct affect on CO<sub>2</sub> emissions).

- The EC extensification scheme could have some effect on reducing the numbers of ruminants and the amount of fertiliser and hence methane emissions. The new Farm and Conservation Grant Scheme offers grants for pollution control (helping to reduce methane) and for the better management of heather and woodlands which could result in locking up CO<sub>2</sub> for longer periods.

8. There would not appear to be any significant ways in the fisheries sector of mitigating the greenhouse effect though the complex relationships between marine biological processes and climate require further study.

#### EC considerations

9. Once again, there is no precise data but the situation in the rest of the EC is probably broadly comparable with that in the UK. The main differences would appear to be the high concentration of intensive livestock in Denmark and the Netherlands and the production of rice (notably in Italy)

which cause larger methane emissions in these countries than in the UK.

10. The major thrust of recent EC policies towards the reduction of production on the one hand and the increase in environmental awareness on the other is broadly compatible with efforts to reduce the emission of greenhouse gases to the extent possible. Certainly there seems no reason for the UK to change its existing emphasis in the EC for a continued reduction in production so as to bring the market into better balance.

#### Wider international aspects

11. Even worldwide, the contribution of agriculture to a reduction in greenhouse gases is likely to be small. Only 10% of the world's surface is in agricultural use in any meaningful sense. As in other sectors, however, there is likely to be fierce resistance from those in less developed areas to taking any steps that would slow down their economic development.

12. A number of other countries with developed agricultural systems of production have introduced measures to encourage environmentally friendly farming or to reduce agricultural pollution some of which would limit greenhouse gas emissions. A response strategy on a global scale for the agriculture, fisheries, forestry and food sectors is being developed by the IPCC for consideration in 1990. It is likely that action on deforestation will be proposed; but it is not clear what additional proposals on agriculture could be formulated which would command universal acceptance.

13. Unlike most temperate agriculture, tropical agriculture is not in long term equilibrium; instead the area used is expanding. Tropical forests are being cleared at a rapid

rate for agriculture. This releases CO<sub>2</sub> as forests are burnt and the subsequent degeneration of the forest soil and breakdown of its organic matter adds to the problem. Similarly draining swamps for agriculture releases carbon which was previously effectively fixed and speeds up the release of methane. Increasing the area of rice paddy through irrigation, increasing livestock populations and greater use of composting to improve soil fertility also raise methane emissions. This all suggests that tropical agriculture is likely to make a significant contribution to the build up of greenhouse gases.

14. Tropical agriculture may also offer significant opportunities for mitigating measures. Trees grow more rapidly in the tropics than in temperate zones and are often more closely linked with agriculture in farming systems, making it possible to encourage agroforestry. There is scope for using vegetable oils, wood and biogas generation as renewable fuel to reduce fossil fuel use, thereby decreasing the amount of previously locked carbon being released into the atmosphere.

15. There is a need for research to assess tropical agriculture's role in generating greenhouse gases, in absorbing CO<sub>2</sub> and in providing alternatives for more permanently fixed carbon.

16. Any restrictions on agriculture that might conceivably be agreed worldwide are highly unlikely to affect production patterns to an extent that would have a perceptible influence either on world food production as a whole or on international trade policies. As indicated above, the most that can probably be hoped for is that some of the environmentally friendly policies now being introduced in the UK and EC can be adopted as models in some of the more agriculturally developed countries although, as in the UK,

the practical effect of this on the emission of greenhouse gases is likely to remain small.

### Conclusions

17. Agriculture is only a very small net contributor to greenhouse gases either domestically or worldwide. It is therefore unlikely to have a major role to play in the effort to reduce emissions of these gases. Further research would, however, be valuable to refine a number of aspects (discussed more fully in the paper on future research requirements). In the meantime, there seems no reason to change our existing mix of policies in the EC for reducing surpluses whilst encouraging farmers to be more environmentally friendly. On the wider international scene, the main emphasis should be to seek to persuade other countries to follow our lead on the environmentally friendly policies we have already introduced.

18. We should continue to play a constructive role in the IPCC's examination of the possibilities for limiting emissions from agriculture. Any proposals which emerge from the IPCC or from the European Community should be carefully scrutinised to ensure that the UK industry is not subject to unnecessary controls or placed at a competitive disadvantage.