SECTION 6

Regional Analysis of Use Patterns of Plant Protection Products in Six EU Member States: PES - A/Phase 2

(Sub-Report prepared by Landell Mills Market Research Limited)

This Sub-Report runs to some 1500 pages. Given the space considerations in this synthesis Report, and the substantial body of data reproduced in the sub-Report, reference is made only to the principle findings of the five-volume study conducted by Landell Mills.

The Executive Summary to the full Sub-Report has proved valuable in this context in identifying the primary policy indicators which can be drawn from the extensive findings reproduced in the full sub-Report.[1]

6.1 SUMMARY

This sub-Report followed a review conducted by LEI-DLO in Phase 1 of the project on possibilities for future EU environmental policy on plant protection products, which had proposed that further investigation be conducted of:

(a) the areas of more than moderate use of plant protection products, and
(b) the intensity of use of plant protection products which vary substantially between countries.

Through a basis of agronomic analysis at farm level, the objective of the sub-Report was to study both differences in PPP use at farm level within regions (and identifiable explanations for such differences) and the potential scope for economically acceptable reduction in PPP use. Possible future developments/trends were also to be identified.

It should be noted that the authors of this Sub-Report consider that budgetary constraints have not permitted as wide a geographical review as suggested by the LEI-DLO study and that, as a consequence, the crops studies were modified (largely on the basis of the Landell Mills in-house agrochemical database, indicating the crops of importance in total agrochemical load across the EU).

For example, vegetables were regarded as too fragmented a crop for satisfactory review at farm level so the four crops selected were:

- vines;
- winter wheat (the major agrochemical user in cereals);
- potatoes;
- apples (the major agrochemical user in pome and stone fruit).

[1] Further reference should be made to the full Sub-Report for development of what can by necessity be considered only as a distillation of primary conclusions. The full text of the Landell Mills Sub-Report is comprised of: Volume I - Executive Summary and Cross-Regional Revues for Wheat, Potatoes, Apples and Vines; Volume II - Winter Wheat: Volume III - Potatoes; Volume IV - Apples; Volume V - Vines. Full explanation of the crops selected and regions studied may also be found in the full Sub-Report.

Regions were selected across Europe where it was believed that there was above-average use of plant protection products for the crop and country concerned. In general, the regions selected proved satisfactory, although in hindsight a better choice for wheat in Italy would have been Emilia Romagna, where the crop is grown more intensively than in Piemonte.

Table 1 - Selection of Regions for Analysis

Crop	Country	Target	Actual
Cereals (winter soft wheat)	Germany UK France Italy	S Niedersachsen East Anglia Centre Piemonte	Hannover Cambridgeshire, Norfolk, Suffolk Eure, Eure-et-Loire, Oise, Loiret, Loir-et-Cher, Yonne Piemonte
Potatoes	Germany Netherlands UK France	N Niedersachsen Flevoland East Anglia Nord/Pas de Calais	Lüneberg Flevoland Cambridgeshire, Norfolk, Suffolk Nord, Pas de Calais, Somme
Pome/ stone Fruit	France Italy Spain	Languedoc-Rouissillon Trentino Cataluna	Bouche du Rhône, Vaucluse, Gard, Heralt, Drome Trentino Lerida
Vines	France Spain Italy	Bordeaux Rioja Veneto	Gironde, Charente and Charente Maritime Rioja Verona

6.2 METHODOLOGY

The method used in this study was face-to-face farmer interviews in each of the 14 regions. Preceded by a restricted number of farmer group discussions, a questionnaire of approximately one hour in length was developed (presented in the crop review volumes). Fieldwork was conducted in mid-1995 and details were asked regarding product use in the previous season (1994) as well as qualitative and attitudinal aspects. Approximately 60 farmers were interviewed in each region.

Once initial results had been provisionally analysed, a series of interviews were held with key extension personnel and local specialists in order to deepen the discussion and obtain models of growing costs and returns where possible.

6.3 CROSS CROP SUMMARY

6.3.1 Chemical Loads

Taking a by necessity somewhat simplistic approach for broad comparative purposes, the chemical loads in the regional sample of farms surveyed are summarised in the Table below:

Crop	Region	Chemical load per hectare of crop grown per farm kg ai/ha		
		Average	Range	
Wheat	Hannover (D)	4.5	0.08	8.5
	E Anglia (UK)	4.6	0	10.1
	N Central France	3.8	0.7	13.7
	Piemonte (I)	2.1	0.02	7.3
Potatoes	Lüneburg (D)	9.8	2.7	22.3
	Flevoland (NL)	12.6	1.6	34.6
	E Anglia (UK)	13.1*	2.0	26.7
	N E France	32.0	9.0	73.7
Apples	S E France	41.4	1.7	146.7
	Trentino (1)	33.7	0.6	83.4
	Lerida (E)	27.4	1.4	109.6
Vines	Bordeaux (F)	46.0	7.9	87.3
	Rioja (E)	16.8 (42) **	2.9	146.9
	Verona (I)	33.6 (43) **	0.8	142.4

* Excludes the use of sulphuric acid as a desiccant.

** There was suggestion by local specialists that farmers' use of sulphur was understated. Figures in brackets are computed as if all farms used sulphur.

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It can be seen that chemical loads[2] per crop varied widely between farms and regions. Comparative differences between regions were identified, although individual reasons for variability between farms were more difficult to identify, in particular due to the fact that there were so many variables in play, not the least of which was the difference in inherent activity between individual chemicals. This feature can result in dose rate differences, often varying by a factor of between 100 and 6,000 (sulphur compared to pyrethroids).

As a result of this difference in inherent activity of different chemicals, a broad comparison by weight of active ingredient is of limited value. However, in the absence any other parameter, and consistent with other pan-European studies, this measure has been used for the purposes of the present sub-Report.

Applying this method demonstrated that fungicides dominated that chemical load in all crops except wheat. In potatoes, apples and vines, season-long disease protection is required. Given the chemicals available, this necessitates a series of prophylactic treatments throughout the season. In wheat on the other hand, which shows relatively modest total chemical loads, herbicides were the major contributor, and fewer applications are required compared to the other three crops.

6.3.2 Provisos

The great range of chemical loads presented in the Table above are explained by differences in inherent activity together with the agronomical factors elaborated in Section 6.2.3 below. In addition, however, the following general factors governing variability were also found to be of significance:

(a) Managerial Expertise

Specialists emphasised the effect that good management can have on pesticide use. This covers particularly the choice of chemicals and the timing of applications. A mistimed application can lead to spiralling pest infestations later in the season and result in a requirement for excessive remedial use of chemicals as a consequence.

(b) Pest-Incidence and Infestation Levels

The sub-Report examined the incidence of major pests at farm and regional level. It was not felt possible, however, to determine the differences in intensity of infestations between farms.

(c) Control Achieved

It was not felt possible to measure the level of control achieved by different pesticide application regimes. For example, farms using lower levels of pesticides may have achieved lower levels of control of the pests.

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[2] Chemical load is the cumulative weight of active ingredient applied per hectare of crop per farm.

(d) Agronomic Variables

The following agronomic variables were found to have a substantial influence on pesticide use at both a farm and regional level:

- Crop types

  This is primarily of significance in potatoes. In contrast to ware (which has a long growing season, requires blemish-free produce, and therefore results in high fungicide use) seed has a shorter growing season, and hence requires less disease protection. High levels of insecticide applications are necessary, however, to control the aphid virus vectors. Starch is a lower priced and lower input crop.

All crop types may be grown on the same farm and the most sensitive crop type may dictate the regime for the whole farm in order to reduce reservoirs of infection. This attitude may be taken at times for all the crops studied.

- Varieties

  Variety choice is determined by end-use market demand. Only as a second priority are disease and pest susceptibility considered. In all crops, varieties differ markedly in their susceptibility to disease, attacks from insects, nematodes, *etc*. the need for growth regulators and, in the case of potatoes, for desiccants. As with crop types, in certain circumstances for diseases and insecticides, the most susceptible variety on a farm can determine the spray regime.

In many instances, crops in a region are dominated by a single variety often susceptible to particular diseases. It is suggested that widening variety shares would lead to considerable easing of the pesticide load. However, this in turn is determined by market demand.

- Target pests and level of pest control required

  The target pests were clearly the determining factor in chemical use. The technical levels of control required varied in relation to both pest and crop types (aphids in seed potatoes or ware, *etc*.). In relation to the levels of control required by individual farmers, weed control resulted in the greatest variation, showing considerable differences from region to region in their willingness to accept less than complete weed control.[3]

[3] This was particularly marked in relation to vines in Verona, whose farmers were least demanding in the levels of weed control sought.

- Treatment timing

  In all crops and in all the regions, an official warning system exists to help time the start of applications against major diseases and insects. Some of the systems are less than optimal or geographically restricted and more sophisticated techniques are being developed. Farmers make use of these systems to varying degrees, in many cases employing them alongside less targeted techniques, such as crop stage or date. It was felt that this area could be developed with advantage to assist improved targeting of fungicide and insecticide use and reduce any unnecessary treatments.

- Dose rates

  Dose rates generally followed recommended rates except in wheat, where considerable reductions were made in herbicides and fungicides, and in potatoes with herbicides. Specialists felt, however, that this practice had reached its maximum utility.

- Application volumes and dose rates

  For fungicide and insecticide applications in apples and vines, volumes of spray applied per hectare increase throughout the season as the leaf canopy develops. Differences in planting density, crop height and training architecture also influence spray volume per hectare, while seasonal average volumes of application were found to vary substantially.

Chemical dose rates are generally given in concentration of product per volume of spray mix, though for vines in France this is only partially practised. Given the variation in spray volume used, it is suspected that some unnecessary use of chemical is therefore occurring.

- Herbicide placement

  In the perennial crops, application of herbicides along the crop rows was widely practised, although variations occurred between farms and regions, suggesting that there remained some scope for increasing this practice and further reduce the herbicide load.

- Part-crop spraying

  In all crops and chemical sectors, targeted spraying of parts of the crop most prone to or infected by a pest were evidently undertaken. This practice varied widely and, it is suggested, offers opportunity together with closer crop monitoring to wider exploitation.

- Mechanical weed control

  While practised specifically only in relation to potatoes, this technique tentatively resulted in lower use of herbicides where used. It should be noted, however, that soils vary considerably in their ability to benefit from this technique. Most widely

practised in East Anglia, it is under further development there (and in Flevoland for potatoes).

6.3.3 Crop Economics and Pesticides

The majority of farmers felt that the profitability of their crops was satisfactory or above in most crops and regions in the study year (1994). However, for wheat in Hannover and apples in S.E. France and Trentino, the majority of farmers were dissatisfied with their profitability. Anticipated levels of profitability for a given crop had no influence, however, on product choice or use for the great majority of farmers.

The chemical sector considered by farmers to have the most significant contribution on profitability was fungicides in all crops and regions, with the sole exception of apples in the Lerida (E) where insecticides dominated. Farmers were divided as to which sector contributed least in wheat and potatoes, although in apples and vines herbicides were identified as of being of least influence of profitability.

The majority of farmers in all crops and regions felt that no reduction in chemical use would be possible without reducing profitability. The minority which did feel reduction without loss of profitability was possible tended to refer to fungicide use in apples. It is worth noting that consumer demand for blemish-free quality produce (particularly in relation to potatoes, apples and vines) makes growers of these crops particularly risk-averse.

6.3.4 Pesticides and the Environment

(a) Product Labeling

In all regions, a large majority of farmers believed that label restrictions on handling and the environment were important or very important with regard to their choice and use of products. It should be noted, however, that in some sectors local specialists felt unable to accept that that these responses were genuine.

(b) Environmental Factors Influencing Product Choice

Consideration for environmental factors when choosing pesticides was not high on the agenda of most farmers. Wheat farmers paid greatest attention to these factors in Hannover and Piemonte (largely for reasons related to ground water considerations). In relation to potato growing areas, environmental factors were accorded most importance by farmers in Lüneburg. In the apple regions, only farmers in Trentino demonstrated reasonable consideration for factors of soil protection, ground and surface water. For vines, farmers in the Verona area demonstrated the greatest attention to environmental factors, in particular for soil protection.

(c) Alternative crop protection systems

Aspects of Integrated Crop Protection Management (ICM'), Integrated Pest management ('IPM') and Organic Production ('OP') methods were discussed with farmers. Replies were unsatisfactory as terminology appeared to be interpreted in a variety of different manners or not understood at all (although definitions were provided during interviews). It appears nevertheless that ICM or IPM techniques are practised, or under development to one degree or another in all crops and regions (in particular in relation to apples and vines).

In relation to apples, Trentino is noted for its local IPM/ICM protocol, the effects of which are very positive when compared to other regions subject to this study. In relation to vines, local trials in Rioja have demonstrated that improved adherence to advisory/warning systems can halve the number of fungicide applications.

It is evident that there is undoubtedly scope for these systems to be more widely introduced. However, they require significant commitment and technical awareness on the part of farmers and growers as well as considerable support from the extension network, a conclusion supported by the other sub-Reports summarised above.

6.3.5 Opportunities to Reduce Chemical Loads

In the light of the foregoing summary across crops, the following opportunities for chemical load reduction are proposed for the main chemical sectors:

(a) Seed Treatment

This is a low dose, environmentally sound way of plant protection which, with recent technological innovations and chemicals, now offers enhanced protection. It can reduce the need for early field applications of fungicides and insecticides. Pre-storage treatment of potatoes can in addition be substantially reduced through use of cold storage techniques.

(b) Herbicides

Dose rates are reported to be at a minimum in all crops, although particular opportunities for reduction in chemical loads applied to wheat are suggested to arise through increased use of selective targeting of fields. This can be assisted through greater use of the newer post-emergence chemicals now available, increased use of mechanical weed control where soils permit in potatoes, and continuing the move away from residual soil acting herbicides in favour of contact acting chemicals in apples and vines. Increased use of treatments along the crop rows would also have benefits in some vineyards.

(c) Fungicides

Varieties differ considerably in their susceptibility to diseases. This factor, however, is of a secondary priority to suitability for the end-user and so choice is considered to be consumer driven. In relation to potatoes in particular, the most dominant varieties are especially susceptible to disease. In the short term, reducing this dominance would help reduce fungicide requirements. In the longer term, newer breeding techniques may be able to marry up end-user demands with disease resistance. Influencing the consumer to accept some skin blemish would also help.

In all crops, increased use and continued development of disease warning systems would help to better target treatments and reduce load, although certain of the systems under development are some way off practical application. In apples and vines the optimisation of spray volumes would appear to offer additional opportunities for reducing unnecessary load.

(d) Insecticides

As with fungicides, increased use of local warning systems could tighten up use in all crops. Extension of IPM/ICM techniques, particularly in apples and vines, could also reduce load as would the optimisation of spray volumes.