Environmental aspects of spray drift

In addition to the concerns about pesticides affecting the human population directly, registration authorities are also concerned with more general effects in the environment on other non-target organisms, which can also have indirect effects on people.

Protecting water

- A major consideration in protecting the environment from exposure to pesticides has been to minimise spray droplets drifting and subsequently sedimenting on water surfaces.
- Studies in Germany and others countries have provided data to support legislation requiring no-spray or ‘buffer’ zones, the width of which depends on the type of pesticide and risk assessments in relation to fish and other aquatic organisms

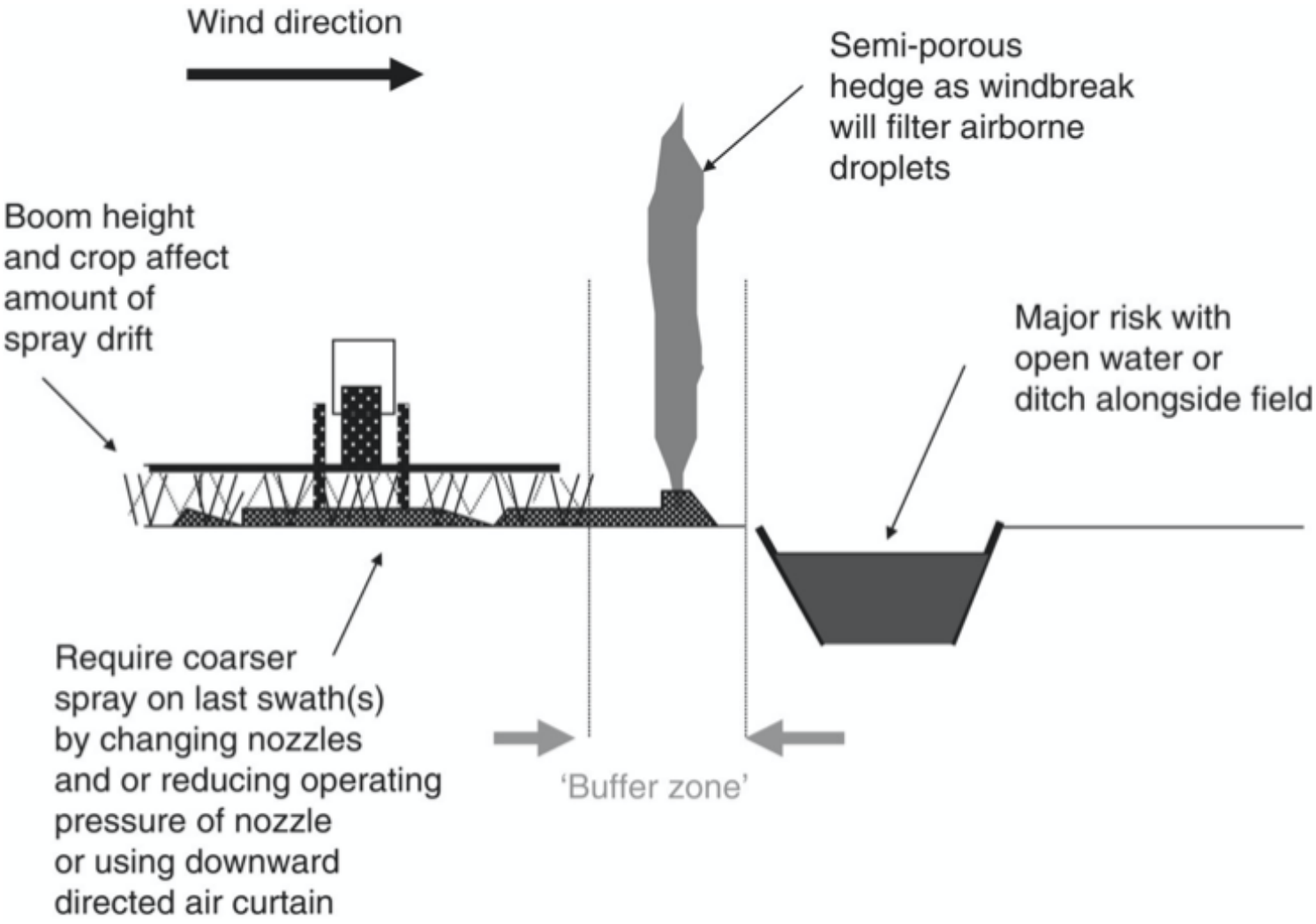

Fig. 6.1 Diagram showing position of a buffer zone to protect a watercourse.

Protecting water

- The effectiveness of grass-covered buffer strips at the downwind and lower edges of fields will vary depending on a number of factors apart from its width
- Vegetation has been demonstrated to filter out spray drift, but surface run-off can also occur depending on the extent to which rain infiltrates the soil, the amount of rainfall and area that slopes towards a ditch

Case Study: USA

- Arias-Estevez et al. (2008) reviewed information on the influence of the physical and chemical characteristics of a soil system, such as moisture content, organic matter and clay contents, and pH, on the sorption/desorption and degradation of pesticides and their access to groundwater and surface waters.
- In the USA, a survey of over 1000 wells distributed nationally was carried out once between 1993 and 2001 and again between 2001 and 2011 to determine whether the occurrence of 83 pesticides could be detected in the water.

Case Study: USA

- The concentration of pesticides in 36 out of 58 well networks changed significantly between decades, mostly related to the most frequently detected pesticides (herbicides), but the changes were very small, ranging from 0.09 to 0.03 µg/l and well below human health benchmarks (Toccalino et al., 2014).

Case Study: France

- In France, Carluer et al. (2011) concluded that none of the buffer solutions examined removed pesticide 100% due to variations in hydrological flow (surface run-off, deep infiltration, lateral sub-surface flow and tile drainage flow) and pesticide properties.
- However they concluded that point source of pesticides could be reduced by improving sprayer filling and washing areas to reduce the amount entering a buffer zone.

Case Study: France

- Another idea has been to examine whether an artificial wetland can be used as a wastewater treatment dissipating pesticides by adsorption on substrates, for example vegetation, straw, sediments and clay (Tournebize et al., 2011).
- An understanding of the fate of pesticides is essential for rational decision-taking regarding their authorisation.

Choice of Nozzle

- Studies by de Snoo and de Wit (1998) confirmed that the amount of pesticide deposited in ditches was affected by the choice of nozzle and wind speed.
- They concluded that with a 6 m buffer zone no deposition was recorded in a ditch when the wind speed was 4.5 m/s, and therefore having unsprayed crop edges offered a good way of protecting aquatic ecosystems.

Fig. 6.3 Avoiding spray from nozzles at the end of a boom to reduce drift of spray into hedge (Photographs courtesy of Hardi International).

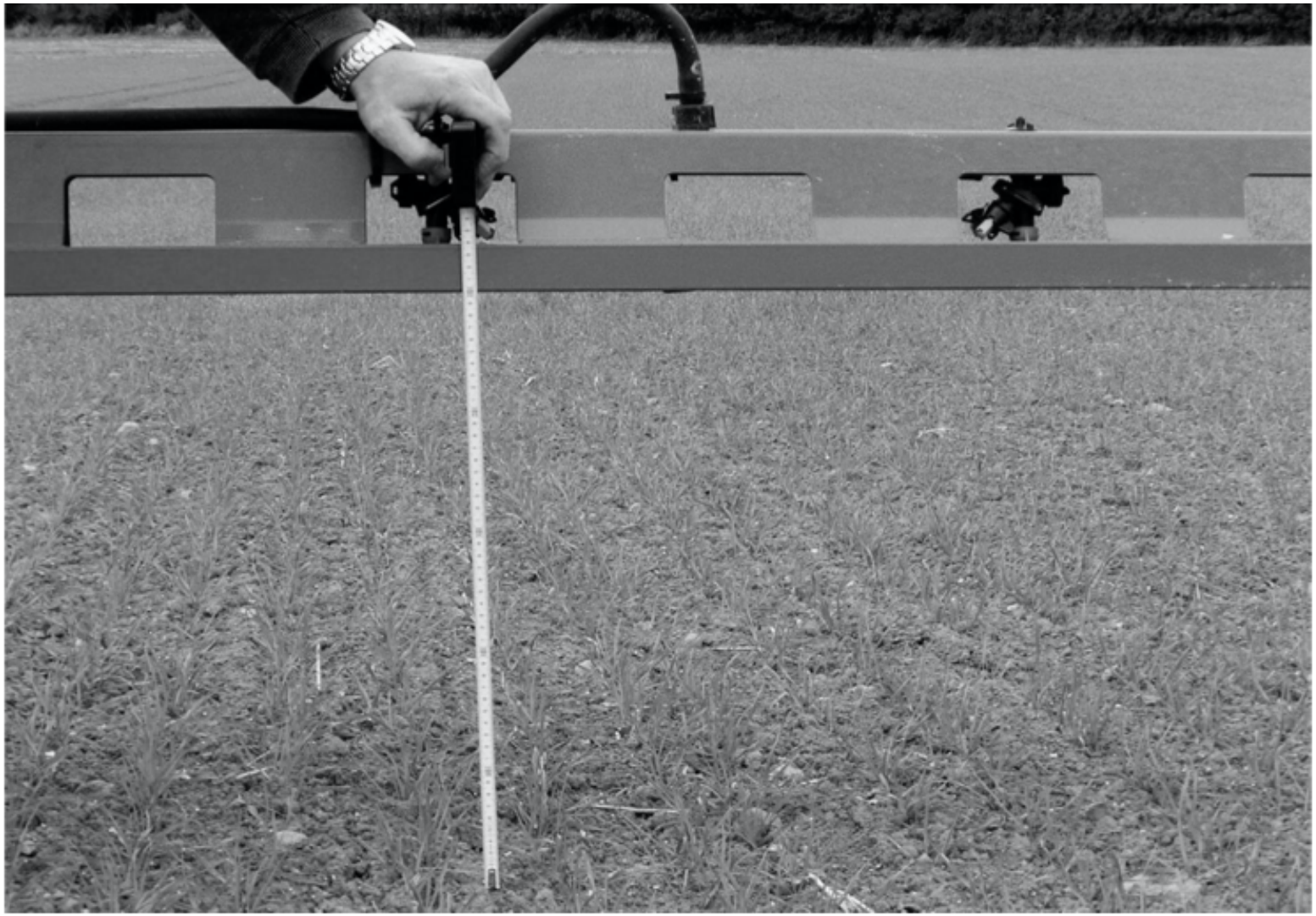

Fig. 6.4 Checking the height of boom to avoid causing too much downwind spray drift. (Photographs courtesy of Hardi International).

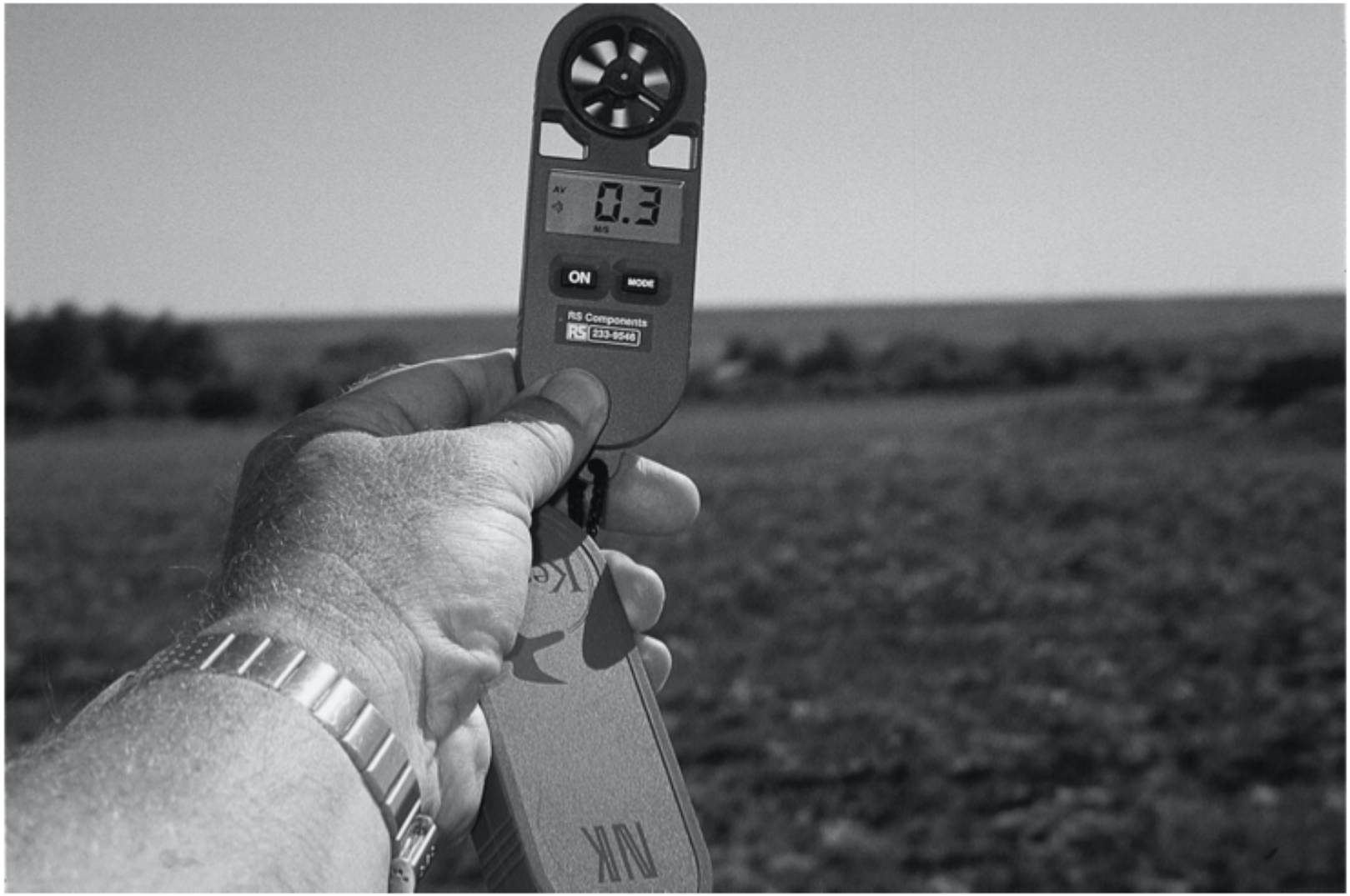

Fig. 6.5 Checking wind speed as to suitability for spraying (Photographs courtesy of Hardi International).

Fig. 6.6 Comparison of spray drift with conventional flat fan nozzle and reducing drift with different nozzle (Photographs courtesy of Hardi International).

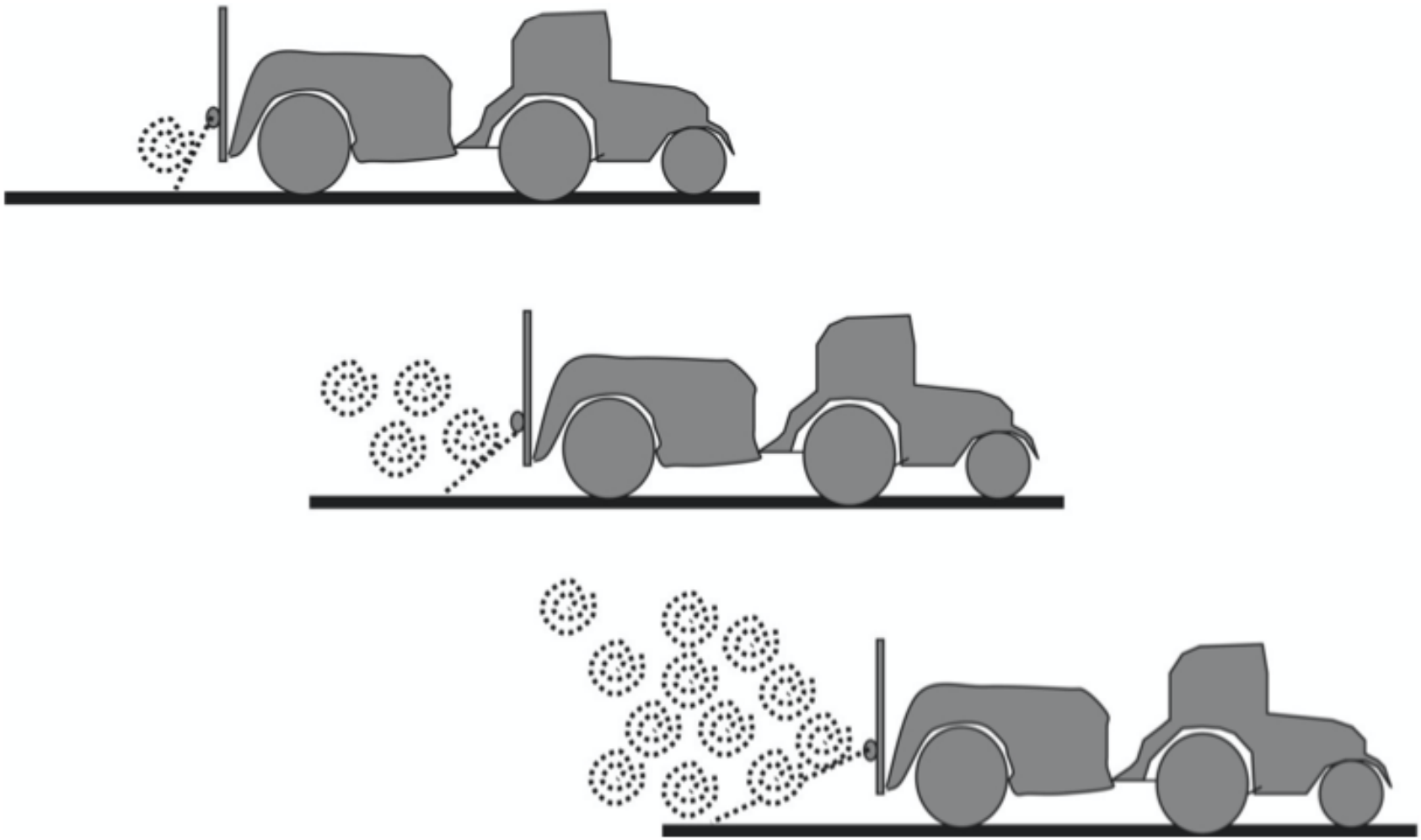

Fig. 6.7 Higher tractor speeds create more turbulence, causing (potentially) more spray rift behind the tractor.

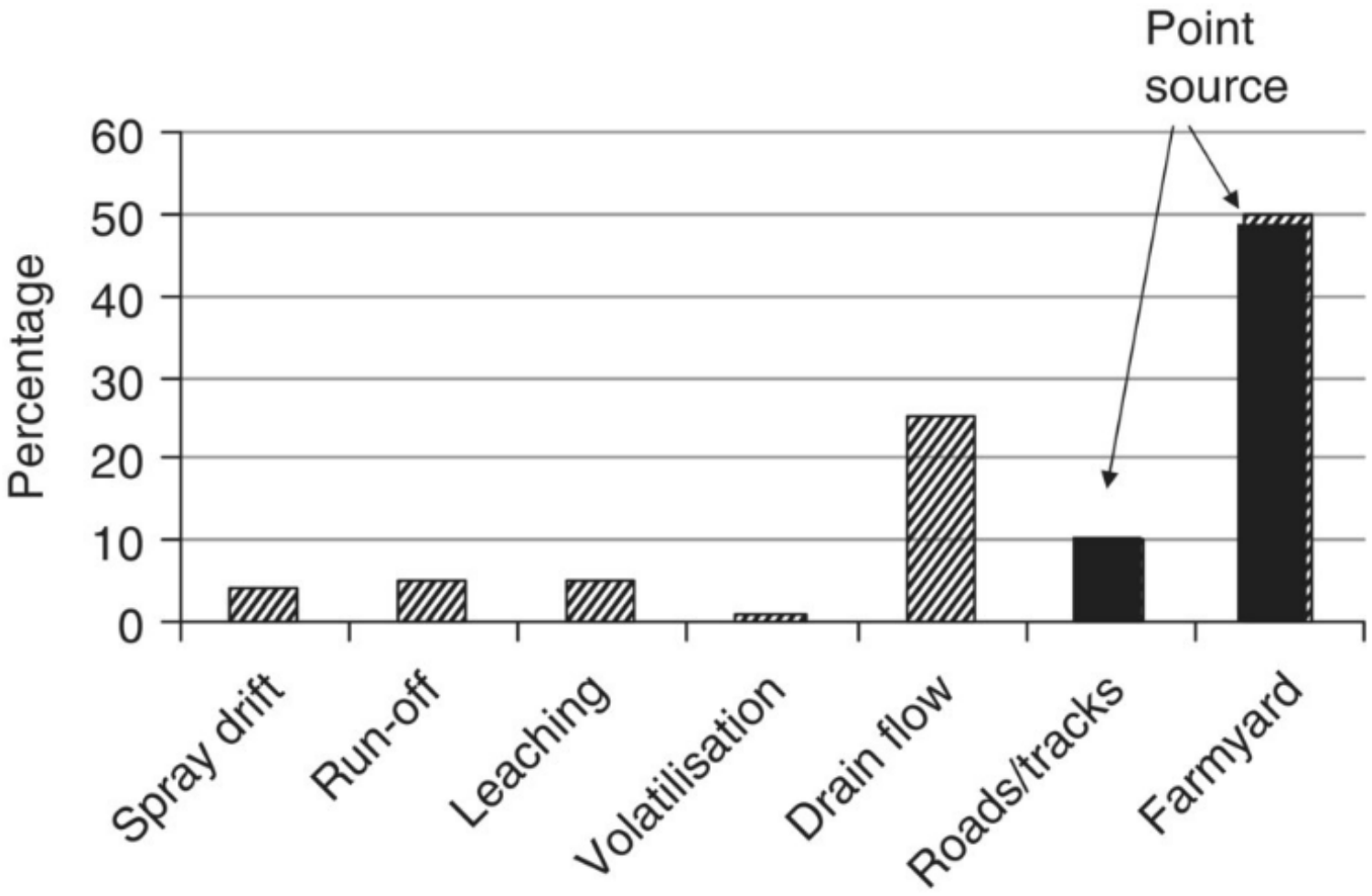

Fig. 6.11 Sources of pesticide pollution in water.