become productive. Agricultural land use may therefore be discontinued, modified, or dis-intensified ahead of actual urban encroachment. The innermost ring of rural land, therefore, may not be given over to highly intensive agriculture or to the production of poorly transportable commodities, but it may instead be characterised by a lower level of agricultural activity than that prevailing further from the advancing city.

The Sinclair model

These characteristics of rural land use around the expanding city were considered to be sufficiently consistent and widespread by Sinclair (1967) for him to suggest a revised pattern of concentric zonation of rural land uses (Fig. 5.4).

In contrast to the von Thünen model, the three inner zones are characterised by negative influences exerted by the city on agriculture, while the fourth zone, some distance beyond the city edge, is distinguished by dairying and similar types of farming, oriented towards the city market but displaced from it by a belt in which urban pressures are dissipated. Beyond this zone, the regional type of agriculture, which was feed-grain/livestock farming in the Mid-West setting of Sinclair’s model, prevails. In the Sinclair model, agricultural land values are depressed in the fringe immediately around the city where urban pressures are greatest, although the development land value is highest here.

Bryant (1973) has subsequently refined this aspect by pointing out that different types of agriculture are affected differently by possible urban encroachment. Types of land use requiring initial investment which yields only long-term returns (such as orchard trees) are more likely to be adversely affected than shorter-term investments. Therefore, there may be several curves on the graph of agricultural land values against distance, and not just one.

The Sinclair model is not based on rigorous deduction as was the von Thünen one, although it has a clear logical basis. Regularity and circularity will require uniform physical conditions and uniform rates of urban expansion in all directions. Neither of these prerequisites is likely to exist in reality. Nevertheless, elements of the patterns suggested by Sinclair can be seen around many cities, and perhaps his model has a widespread though partial validity. Areas of derelict agricultural land, with tall, ungrazed grass and broken-down fences, are not unusual on the urban fringe. These areas have probably been acquired by builders or speculators seeking capital gain rather than annual income, and agriculture has simply been discontinued. Another common feature is grazing land of modest quality, in which some grazing use is maintained, perhaps seasonally or for

Fig. 5.4 The Sinclair model and land values around a city.
(a) Sinclair model
(b) Land values: urban and agricultural
(c) Land values: urban and agricultural with planning controls in urban expansion

Sources: (a) Sinclair (1967); (c) Modified after Boal (1970).

special purposes. Land where development is likely to occur fairly soon but is not imminent may be let on an annual or seasonal basis by the farmer-owner, or more probably by the builder or in-
stitional owner. With a lack of security and a likelihood of development, there is a reluctance to invest in fertilisers and other inputs, and the quality of management is often modest. Institutions and other public bodies may maintain such tenure and use for many years, retaining the land against a belief that it will be required eventually for the expansion of the hospital (for example), and letting it out meintime on an annual basis. Around some segments of the city, there is a demand for such land for the grazing of horses and ponies, to the extent that traces of a zone of ‘horseyculture’ may be apparent.

Factors other than the pressures created by urban/rural differentials in land values may also contribute to the relatively low level of agriculture immediately around the city. The first of these is nuisance effects. The theft of crops, disturbance to animals, and dangers from litter and refuse may all discourage the farmer from continuing certain or all of his land enterprises. The nature of these nuisance effects may vary from place to place. In France, Chassagne (1979b) has referred to what she describes as the ‘inordinate’ use of land by hunters and its negative effects on agriculture around Lyons. Table 5.1 illustrates the reported extent of some nuisance factors around built-up areas in England during the 1970s.

**Table 5.1** Nuisance effects on peri-urban agriculture in England

(a) Sample of 100 farms near Slough, Bucks.*

<table>
<thead>
<tr>
<th>Type of nuisance</th>
<th>Percentage of holdings affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops damaged or stolen</td>
<td>35</td>
</tr>
<tr>
<td>Rubbish left</td>
<td>32</td>
</tr>
<tr>
<td>Damage to fences or gates</td>
<td>25</td>
</tr>
<tr>
<td>Damage to fixed equipment</td>
<td>15</td>
</tr>
<tr>
<td>Livestock worrying</td>
<td>10</td>
</tr>
</tbody>
</table>

(b) Sample of 69 farms in Hertfordshire urban fringe†

<table>
<thead>
<tr>
<th>Type of nuisance</th>
<th>Percentage of holdings affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trespass</td>
<td>88</td>
</tr>
<tr>
<td>Trespass resulting in damage</td>
<td>78</td>
</tr>
<tr>
<td>Rubbish dumping</td>
<td>71</td>
</tr>
<tr>
<td>Livestock farming problems (e.g. worrying)</td>
<td>29</td>
</tr>
<tr>
<td>Theft of crops or livestock</td>
<td>16</td>
</tr>
</tbody>
</table>

Sources: * Based on data in ADAS (1973); † Hall (1976).

In a survey parallel to the one on which Table 5.1a is based, 84 per cent of a sample of 91 farms in the green belt around Newcastle upon
Fig. 5.5 (b) Land transactions around Kitchener, Waterloo, Galt, Preston and Hespeler (Ontario) 1966–71.

Sources: (a) Troughton (1976); (b) Bryant (1976).

Tyne reported some form of trespass damage. On 20 of these holdings, farming systems had been changed to some degree because of trespass, and sheep, beef cattle and potato enterprises had been reduced or discontinued (ADAS, 1976).

Some shapes and patterns of urban expansion are likely to give rise to stronger nuisance effects than others. For example, wedge-like expansion along radial routes may leave a farm unit with a longer interface with the built-up area than a more compact, concentric pattern of growth. With a longer interface, nuisance effects may be more noticeable. On the other hand, if the urban edge abuts against a major barrier such as a river, railway or motorway, then the farmland may be largely isolated from urban nuisances.

Another characteristic of the peri-urban zone that can give rise to distinctive patterns of agriculture is the structure of land ownership (Ch. 2). The demand for hobby farms and the possibilities of part-time farming allied with urban employment can mean that the farm structure is different from that in more rural areas. With a different framework of land ownership and different user-motives, then the prevailing land-use decisions may be different from those in the deeper countryside. An interesting example from around London (Ontario) is presented by Troughton (1976) (Fig. 5.5a).

Hobby farmers predominate in the inner ring, and part-time farmers are also fairly numerous. The number of full-time farmers increases steeply with increasing distance from 8 to 16 km beyond the city. In other words, there is a distinct spatial pattern of decision makers in the rural fringe, and this pattern may have implications for land use and land management. For example, Munton (1983a) reports that a relationship exists between hobby farmers and run-down farmland in the London (England) green belt. (He also concludes that agricultural dereliction is associated with detached fields, and especially those next to new roads or housing, and with short-term lets.)

The degree of activity in the land market also tends to be greater around cities. Bryant (1976) presents data for some cities in Ontario that indicate that the overall density or frequency of land transactions decreases outwards (Fig. 5.5b), and that farmer-to-farmer transactions increase rapidly in that direction, in contrast to the pattern of farmer to non-farmer deals. Changes in land ownership, as well as in the character and use of the land, can begin more than 20 years before the rural countryside is actually converted to urban use, according to Brown et al. (1981) on the basis of their work around a number of North American cities. But the timing of the initial sale varies according to the financial position of the landowner. Generally, institutional landowners can hold out longer for a better price than small farmers. Absentee owners, elderly farmers and those who have held the land for only a short time are most likely to sell (Kaiser et al. 1968). Around Padua in Italy, Merlo (1979) found that non-agricultural landowners were the first to sell, and that when agricultural owners did eventually sell, they retained part of their land and remained in part-time farming. It may be speculated that hobby farmers, motivated by factors other than purely economic ones (for example, status or amenity – Munton 1974), may resist pressures to sell more strongly than some other types of owners.

Effects arising from the distinctive patterns of land ownership may combine with nuisance effects to strengthen the influence of expected agricultural encroachment in discouraging intensive agriculture around the urban edge. Numerous examples from different parts of the western world could be cited in support of Sinclair's concept. For example, Mattingly (1972) presents empirical evidence from a case study of Rockford (Illinois) which indicates that the labour input per unit area increases for some distance outwards from the urban edge. He also finds that part-time farms are twice as common in the inner zone, and that the relative roles of dairying and cash-grain farming change outwards from the city. Dairying becomes more prominent outwards: in the inner zone farmers seem to be reluctant to invest in the necessary fixed equipment amidst uncertainty about the long-term survival of their farms in the face
of urban pressures. Grain farming requires less investment in fixed equipment, and is thus perhaps more suited to the inner zone (Berry 1979). Around Belfast, Boal (1970) found clear evidence of reduced intensity of inputs and greater use of conacre (see Ch. 2), as compared with the deeper countryside. In England, Thomson (1981) has characterised the typical urban-fringe farm, on the basis of parish summaries of the agricultural census, as being smaller and as having a higher proportion of permanent grass and a lower stocking rate than the average 'national' farm. In Germany, large areas of land have passed out of agricultural use and remain unused while weeds, bushes and scrub take over. This 'social fallow' is related to alternative employment opportunities taken up by the former farmers, and is not confined exclusively to the peri-urban zone, although it is very pronounced there. Between 1965 and 1970, for example, the area of social fallow around Hamburg and Bremen more than doubled (Kunnecke 1974). A decline in livestock farming around the Ruhr cities has been reported by Mrohs (1979), although the number of horses has increased as farmers have catered for nearby urban recreational demand by developing equestrian enterprises. One of the reasons for the decline in cattle and pigs, as described by Mrohs, is the need to feed and tend the animals regularly, which does not fit in well with part-time farming. Another reason is complaints from the nearby urban population about bad smells. This factor seems to be especially significant in Sweden (Brasch 1979). Under the Environment Protection Act, permits are required for buildings for large-scale pig, poultry and fur farming, and distance from neighbouring residential areas is considered as an important factor in the granting of permits.

These European examples illustrate some distinctive features of farming on the urban-rural fringe, rather than the full development of a Sinclair model. In North America, clearer elements of a Sinclair zonation may be apparent: for example, Clawson (1971) refers to the complete abandonment of farmland and to the resulting large areas of idle land in the great urban complex of north-eastern America. After analysing air-photographic evidence of land-use change in 53 rapid-growth counties in the United States between 1961 and 1970, Ziemetz et al. (1976) concluded that 33 per cent of the land developed for urban use had been idle immediately previously.

On the other hand, Heaton (1980) reports that the gradients of land values and value of farm products per unit area slope outwards from metropolitan centres in the United States. Working at the broad scale, he concludes that the more centrally located areas are more likely to be characterised by capital-intensive production and by highly intensive land use. This is in accordance with what might be expected from von Thünnian analysis, and the apparent conflict and contradiction with the Sinclair model can be explained at least partly in terms of different scales. At the broad scale, land use in the vicinity of cities is usually more intensive than in the remoter rural areas, perhaps because historically cities have tended to grow up in fertile lowlands where intensive agricultural land use is rewarded, as well as because of the influence of the urban market. At the more local scale, however, expected urban encroachment casts a shadow around the rural fringe, and the belt of maximum intensity may be removed from the urban edge by a distance proportional to the rate and likelihood of urban growth. It would be an over-simplification, however, to suggest that the pattern of rural land use discernible around a city is solely a function of scale. Numerous cases of at least some aspects of von Thünnian elements have been reported close to the urban edge. Around Christchurch and Auckland in New Zealand, for example, intensive market gardening and orchard farming have been reported respectively by Smith and Mears (1975) and Moran (1979). Urban encroachment and loss of land in the case of the former was met with a response of further intensification and specialisation. Furthermore, the negative effects of the urban shadow may be so controlled or counteracted that no elements of a Sinclair zonation are discernible, as Moran (1980) illustrates in his case study of the Auckland area.

Around Auckland, dairy farms supplying the urban market occupy much of the inner part of the fringe, with similar types of farm supplying processing factories in an intermediate band, and grazing and fattening farms further out still. The main town-dairying zone has been static for some decades, and Moran concludes that elements of a Sinclair pattern are absent or, at the most, very poorly developed. This he attributes partly to historical factors, and indeed he concludes that Sinclair underestimates the historical legacy. The location of town dairying around Auckland has perhaps been stabilised, in the face of the expanding urban area, by a system of supply quotas. Production is controlled by the allocating of these quotas, with preference being given to farmers close to the urban area. There is therefore a tendency for the pattern in existence when the quota system was first introduced to be perpetuated. Another factor identified by Moran as contributing to the absence of Sinclair elements is the growth of direct-sales and 'pick-your-own' fruit and vegetable enterprises around the city. Proximity to the urban market is obviously a distinct advantage here, and in this case a peri-urban location has more advantages than disadvantages. Indeed, Blair (1980) on the basis of his work in Essex concludes that the disadvantages of farming in the fringe have been over-rated and the advantages under-rated. He found that 29 per cent of his large sample of farmers in the country derived an income from farm-gate sales, averaging 19 per cent of total farm income. On the other hand, although 70 per cent of his sample farmers complained of nuisances, 78 per cent of these took no action, and of the remainder only 15 per cent actually changed their farming systems or methods.
Planning and the peri-urban zone

Rural land use in the urban fringe can contain elements of both von Thünen and Sinclair patterns. Indeed the zone is one of great variability in intensity of land use. The historical legacy may be one important factor in the existence of von Thünen elements: the rate of growth and the nature of expected growth are likely to be the major determinants of Sinclair elements. If the relationship between agricultural and urban land uses is determined solely or primarily by economic forces, then agriculture will almost inevitably be displaced by urban uses, and a dense shadow may be cast on the rural area around the expanding city. However, market forces are now usually constrained, to a greater or lesser degree, by mechanisms that express social values of land. If the relationship between urban and agricultural uses is regulated by a planning system, then the urban shadow should be smaller and much less dense. Indeed, if the planning system exerted complete control on change of land use, then there should be no shadow at all. Boal (1970) has attempted to modify Sinclair’s representation of the spatial pattern of agriculture and other land uses in the rural fringe for situations where ‘stop line’ or boundaries to permitted urban development have been imposed by planners (Fig. 5.4b). If a credible stop line is defined, then speculative or development land value beyond it should be negligible, and the value of land would be related solely to its agricultural use. On the other hand, the speculative value of land between the urban edge and the stop line would increase, and its agricultural value would fall. In theory, an intense urban shadow (with its effects on rural land use) should exist within the stop line, but it would be contained within that line and not overlap onto the land beyond it.

The intervention of planning and land-use controls on the urban fringe is epitomised by the green belt. Many cities in Britain are now wholly or partly encircled by formally designated green belts. The first and largest of these – around London – has had government approval since the mid-1950s, but the concept itself has a longer history, dating back to the early years of this century and before. It is closely associated with the names of the pioneers of town and country planning, such as Ebenezer Howard, Raymond Unwin and Patrick Abercrombie. But even among these early proponents of green belts there were different interpretations of the concept, and differences remain to this day in interpretation of its role and objectives. Unwin, for example, envisaged a narrow strip of land, perhaps only 2 km wide, where land would be acquired by public authorities and made available for recreation for the citizens of London. In fact, during the late 1930s, some land was acquired in this way. Then during the Second World War, a plan was prepared by Abercrombie for the Greater London region. In this plan, the objectives for the green belt were broader. One was to restrict the growth of London; another was to maintain the character of existing but separate settlements by preventing their merging in an amorphous sprawl. Another again was to safeguard land for agriculture and recreation. This plan was incorporated into the rapidly evolving structure of town and country planning in the early post-war years (see Ch. 8), and in due course it became the basis of the approved London Green Belt from the mid-1950s onwards. Over the years the belt has been expanded, and it is now about 20–25 km in width and 4,300 sq. km in area.

Green belts are now an accepted and widespread planning designation, where particular policies apply towards changes of land use and their control. Ambivalence remains, however, in their objectives. In the case of the London Green Belt, Munton (1983a) distinguishes the aims of designation as seen by central government from those of local planning authorities. The former sees the green belt as a means of restraining urban growth at a strategic or sub-regional scale, while the latter place more emphasis on goals such as the protection of local landscape and provision of recreational facilities.

The primary means by which green-belt policies are implemented within the designated zone is through the development-control system, whereby the consent of the local planning authority must be obtained before certain changes in land use can be effected. Proposed residential and industrial developments, for example, require consent. Evidence from the London Green Belt indicates that all these land uses have tended to expand over the last few decades, and that complete control has not been achieved. There is little doubt, however, that the rate of expansion of these broadly urban uses has been retarded, and in any case green-belt designation did not necessarily mean that all development would be prohibited.

One consequence of the fact that some development has been permitted in the London Green Belt (as in others) is that at least some development value attaches to agricultural land within the designated zone. All speculative value does not disappear at the green-belt boundary, as Fig. 5.4 would suggest, and where there is some speculative value, and some expectation of urban development, then there may be a ‘shadow’ effect on agriculture. Munton (1983a) reports that 5.5 per cent of the agricultural land in the inner half of the London Green Belt is in a derelict or semi-derelict condition and that a further 30 per cent shows some management problems. Green-belt designations in itself has not shielded agricultural areas from all urban pressures, although it may have reduced the extent and severity of these pressures. Development-control powers on their own cannot, of course, ensure good land management, since they are essentially only a check or curb on certain types of land-use changes.

Recently, increasing attention has been paid to management agreements as means of achieving public goals in green belts and other peri-urban areas, as well as in the deeper countryside. Under
these agreements, the land occupier may be compensated for foregoing certain proposed changes in land use, or for managing his land in such a way that landscape objectives are achieved. While this ‘carrot’ approach is a welcome addition to the ‘stick’ of development-control powers, it is probably more useful and practicable in small, selected areas than on an area-wide basis. Attempts may also be made to achieve recreational objectives by management agreements, while development-control powers are not usually helpful in this respect. The other major means of encouraging recreational use of land is by public acquisition, which, of course, also permits the use of management of land in accordance with other publicly defined objectives. Although significant areas of land are in public ownership in most green belts, the cost of acquiring entire greenbelt zones (or other extensive parts of the rural fringe) would be enormous, not least because of the high development value of the land, and complete public ownership is not a practicable proposition in the foreseeable future.

Recreation

Recreational land use is a distinctive feature of many rural fringes. Several centuries ago, land adjacent to some Scottish towns such as Aberdeen and Ayr was set aside for public recreation, and this tradition has been maintained and extended in many cases in more recent years, so much so that Aberdeen is now almost encircled by recreational land (Fig. 5.6b).

Around the much larger city of London, as much as 9 per cent of the Green Belt is in informal recreational use, in addition to more formal areas such as golf courses and playing fields. Why should recreation often be a distinctive element in rural land use on the urban fringe?

As in many other aspects of land use in this zone, a simple, single answer cannot be given. In some cases, recreation may be the type of land use which is most profitable: the bid-rent curve for golf courses catering for an urban market may be steeper than that of agriculture, and so recreation can compete successfully in purely economic terms. Economic arguments may also be offered for providing facilities in the rural fringe for unpriced, passive forms of recreation such as walking and picnicking; it being argued that the optimal location is close to the centre of urban demand, and that summed transport costs (taken as a surrogate or indicator of the perceived value of unpriced recreation) may exceed potential returns per unit area from agriculture or other uses. In such cases, public acquisition or provision might be justified for purely economic reasons.

More frequently, recreational land (and especially sites for informal recreation) reflects a purely social evaluation. Green-belt and other urban control policies have sometimes contained a recreational component as well as ones directed at agriculture and urban pattern: recreational land uses may well be compatible with policies designed primarily to contain urban growth (e.g. Bowen 1974). It has sometimes been suggested that recreation has an important role to play in the fringe (e.g. Countryside Review Committee 1977) and that it should be actively promoted. The rural fringe is optimally located with respect to urban demand for recreation: recreation is a means of deriving social benefit from land which may be underused; the provision of recreational facilities in the fringe may intercept recreational demand which might otherwise affect other more sensitive parts of the countryside and coast; and recreational land use is an effective buffer separating town and country, and shielding agricultural land from the negative urban effects.

Recently, however, some of the assumptions on which the planning of recreation in the rural-urban fringe is based have been questioned by Harrison (1981, 1983). In a study of part of the London Green Belt, she found that little recreational use is made by inner-city residents, and that rural-fringe sites and facilities do not intercept demand for other countryside recreation. If her conclusions also apply to smaller cities than London, then perhaps the policies of providing rural-fringe country parks and other facilities ought to be rethought. Nevertheless, she did find that considerable local use was made of the rural fringe for purposes of recreation, and this local demand may be considerable, irrespective of the city-wide demand.

Fig. 5.6 Aspects of rural land use around Aberdeen 1870 and 1980
(a) Nurseries and market gardens 1871
(b) Recreational land use c. 1980
Sources: (a) Keith and Gibb (1871) Plan of the city of Aberdeen; (b) Field survey.
CONCLUSIONS

The rural-urban fringe is a zone of transition between town and country. Urban influences are strong and diverse: they may take the form of demands for recreation or for agricultural products, or they may be expressed more negatively in the fear or reality of urban encroachment and in a general climate of uncertainty on the part of land occupiers, and they may be manifested in broken-down fences, derelict farmland and general landscape decay. The precise nature of urban pressures, as well as their intensity, varies from place to place, and their symptoms are variable rather than consistent. Elson (1979) concludes that there is a distinct urban fringe problem, but that its manifestations in land use are not evenly spread around cities. Perhaps it might be added that they are not evenly spread around fringes of individual cities, far less around all cities. Perhaps there has been a tendency to concentrate too much on metropolitan and other large cities and to ignore smaller urban centres, and to think solely or primarily in terms of single models such as those of von Thünen and Sinclair.

As long ago as 1942, Wehrwein observed that one of the characteristics of the rural-urban fringe was that most of its land uses were in a state of flux. Because of this state, he argued, they could be subject to planning control and direction. In theory, planning systems and other mechanisms for controlling land use ought to be effective in such a zone, and indeed Golledge (1960) concluded that zoning could gradually destroy the distinctiveness of Sydney's rural-urban fringe by removing many of the characteristics of its land uses. However, few would contend that complete control has been established even in British rural-urban fringes where planning controls are relatively stringent. Perhaps the basic problem is that planning controls can prevent certain changes in land use from taking place, but they cannot force land owners to use their land efficiently or in a way which maintains landscape quality. Zoning, as such, cannot ensure full and efficient land use. For this and other reasons, a number of experimental projects have been established in the rural fringes of English cities such as London and Manchester, under the aegis of the Countryside Commission (e.g. Hall 1976). The aims of these projects are concurrently to improve informal recreation facilities; to improve landscape (or at least to prevent further deterioration); and to maintain where possible the viability of farming in the face of urban pressures. Whether such projects can be effective in the long term in the face of such pressures, and whether they can provide for fuller and more efficient land use, remain to be seen. Sometimes it seems that land in the peri-urban fringe is valued by many (if land prices are an accurate indicator of values), used by

relatively few and managed by none, so that dereliction and decay are all too familiar. But perhaps these characteristics are inevitable in the no man's land between town and country.

FURTHER READING

Barlowe, R. (1978) Land resource economics. Ely, R. T. and Wehrwein G. S. (1964) Land economics. Both of these are standard works on land economics and deal with the relationship between location, land value and land use.

Numerous general texts on urban geography are available. One of the most readable is: Carter, H. (1972) The study of urban geography.
