The grain mirage:

ideal and reality in early Wellington agriculture

BRAD PATTERSON

THE FOCUS OF MY PRESENT research, or rather writing, is a study of the dynamics of 'settler capitalism' in the southern North Island districts, from the beginnings of European settlement to about 1876. Within that framework I am endeavouring to probe the evolution of socio-economic, and by extension political, elites in this one small part of that hegemony that was the nineteenth-century British Empire, formal and informal. A particular concern is with the accumulation of colonial wealth: by whom, how much, by what means? That said, however, there is interest in the losers, as well as winners. The organising theme is embodied in the present working title : *Wakefield, Wool and Waste Lands.* If it is accepted that the European settlers came with overtly capitalistic objectives in mind (and only the very naive, surely, could now ascribe purely altruistic motives to the founders) the title nicely sums up the message. Capitalist exploitation of the southern North Island commenced replete with an organising ideology. Hence Wakefield, or more properly, Wakefieldism. Just how pervasive that ideology was is still not fully appreciated. What is generally recognised is that it was found wanting as a basis for colonial development. Alternative capitalist strategies therefore had to be devised. This is where wool comes in, even if it seems likely that the most successful accumulators of all were town merchants. The means of achievement, in all cases, however, was the one natural resource that all of the New Zealand settlements were believed to possess in relative abundance - land. 'Waste lands' derives from the notion that unless lands were occupied, and utilised, they were essentially there for selection and/or purchase by Europeans, at any rate appropriation, whatever the complexities of customary tenure.

In an earlier Stout series I discussed the origins of pastoralism in the southern North Island districts to about the mid 1850s. At that stage the inevitability of an early switch to sheepfarming as the primary export producing activity of the settlement was suggested. It is now intended to take the argument back one step, and to demonstrate why a preference for extensive grazing was inevitable. The immediate concern is with how land was utilised, or rather how it might be utilised. This was a lively matter of debate at Wellington right to the mid 1850s, even if by that point the way to the future was becoming clearer. By that date a settlement conceived as agriculturally based was already well on the way to becoming one with a rural economy dominated by large sheepruns. Yet the uncertainty which had marked the first efforts to wring returns from the breaking of soil was in striking contrast to the assurance with which the colonising enterprise had been launched. At the outset, prospective settlers, of all classes, had embarked with a vision. It was one of a prosperous arable future. It was one in which the landscape would be transformed into a neat chequerboard of waving wheat stalks. It was one in which grains and flour would amass at the wharves awaiting shipment to a range of overseas destinations. Above all, it was one in which control would be entrusted to a small group of major landowners, they providing the capital for property development, and employment for lesser settlers. At Port Nicholson, however, intensive agriculture had inauspicious beginnings, being characterised more by chaos than by concerted attempts to test crops or growing conditions. There was the initial problem of confronting an alien environment. Ignorance of appropriate agricultural practice, inadequate planning and relative isolation from more developed agricultural settlements were all additional constraints; and they were magnified by excessive optimism prior to arrival. Once these obstacles were overcome they were supplanted by new ones, by acute shortages of capital and labour, by highly variable demand, and by marked price fluctuations. And, in the background, always present, were the difficulties imposed by the New Zealand Company's land distribution system. The greatest check was the complete unsuitability of much of the first settled land surface for cultivation; but this handicap was exacerbated by promoter decisions. At first land shortage was absolute, settlers arriving before the rural sections had been laid out. Then the deficiency was one of suitable lands, better cultivation sites being passed over for lands nearer the harbour. Finally it was the availability of land in lots of a size appropriate for the forms of agriculture which had taken root. Whatever, 'coming to terms' was a slow and painful process, but by the mid 1850s there was majority agreement that the vision of a grain based economy had been no more than a mirage. And there was another, and

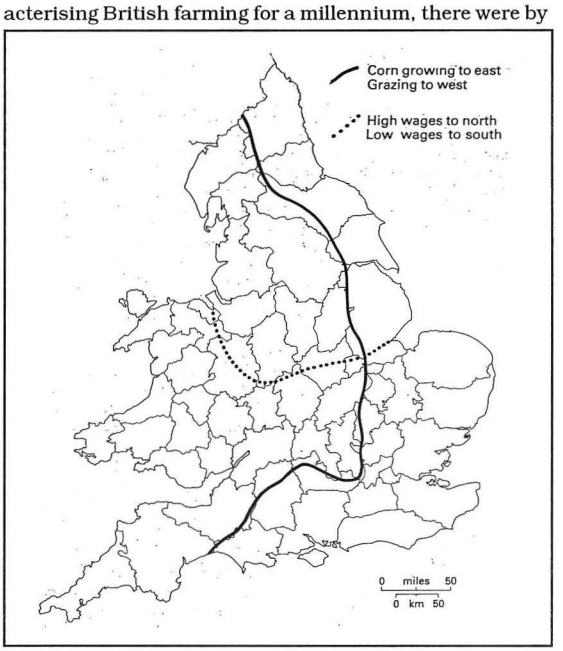
more fundamental, realisation: large fortunes could *not* be made from the forms of intensive agriculture that were possible.

THE IDEAL: 'CORN CRAMMED PARALLELOGRAMS, NEAT HEDGEROWS AND TRIM COUNTRY SEATS'

What, then, were the origins of the launching vision. For this it is necessary to go back to Britain, to Edward Gibbon Wakefield, to his writings, and to the sources and experiences upon which he drew. That the settlement would draw its economic strength from tillage had been a consistent tenet of Wakefield's theorising. His idea of a prosperous colony was one in which agriculture was practised on a large and extending scale; one where arable continually displaced the grazing of sheep and cattle. Grazing, other than in a regulated mixed farm format, should never be more than a short term expedient. Nor was Wakefield in any doubt as to the preferred products: grain, grain and grain; though he was also prepared to countenance vines and olive culture. New Zealand, he argued, was ideally situated to become the 'granary of the Pacific', eventually the supplier of cheap corn to British markets. On its extensive fertile plains, or so he wrote, wheat simply scattered on the ground, left without care, would flourish beneath the 'happy skies'. As actual formation of the settlement came nearer, optimistic phrases continued to flow from Wakefield's pen, and from those of his associates. Yet, nothing was to be left to chance. To ensure that the planned ploughing, and subsequent sowing and reaping, were appropriately prosecuted, the theorist set out a full prescription as to how agriculture should be organised. What he sought was some idealised replication of the economic, social, and not least spatial, arrangements of the farming districts with which he was most familiar - the agricultural counties of south eastern England.

The foundations for Wakefield's enthusiasm for arable were a mix of the apparently pragmatic and his deepseated desire to foster an elitist social order. The latter will be dealt with presently, but of the need to augment Britain's grain supplies there can be no doubt. In the preceding 100 years Britain had been transformed from a net grain exporter to a net grain importer. Although agricultural productivity had been greatly enhanced over the same period, British population growth had outstripped the domestic sector's capacity to supply. By this time the greatest demand was for wheat. This, in itself, owed much to the contemporaneous restructuring of the British economy. As late as 1800 wheat had been the dominant food grain in the south of England only, but in the next four decades there was a trend towards a nationally uniform pattern of cereal eating based on the wheaten loaf. To some extent this reflected upwards trending real incomes, wheat having previously been reserved for more genteel tables, but it also reflected the increasing urbanisation of the British population, towns being crucibles for imitative changes in tastes. What then had to be faced was that Britain was not an optimal grain-growing location. Beyond the limits imposed by finite land resources, wheat was never an easy crop to grow, even on well managed farms. Appropriate soil conditions were limited, and climatic fluctuations had the potential to blast production in otherwise favourable districts. *Prima facie*, then, a case could be made for grain growing in British overseas possessions, both to supply the home market, and, no less vitally, subsidiary markets in other British colonies. And the Corn Laws lent the notion added attraction. But there were several provisos. The promotion of this specialised agriculture would only be viable *if* suitable grain growing lands could be located, *if* the lands could rapidly be brought into production at relatively low cost, and *if* the colonial produce could be cost-effectively conveyed to primary markets. These were important provisos, as shall be demonstrated.

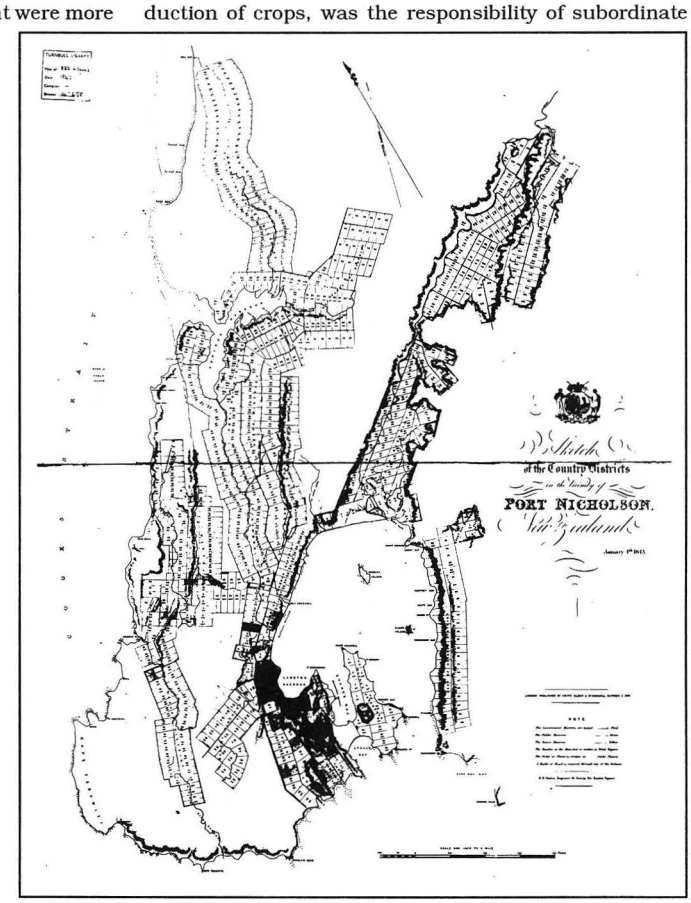
Though much of Wakefield's prescription amounted to a fond looking back to Britain's pre-industrial past, his agricultural model, intriguingly, was very much the product of more recent developments. Recent research lessens the case for a classic 'Agricultural Revolution', but there can be no questioning there had been considerable upheaval in British agriculture in the late eighteenth and early nineteenth centuries. In the place of traditional all-purpose mixed crop/livestock farming, something characterising British farming for a millennium, there were by



Agricultural divisions of England and Wales: after James Caird 1850-51.

the 1830s clear regional divisions, most distinctively between the grazing west and the arable east, and between the high rural wage north and the low wage south. (Fig. 1) Wakefield's preference for the south eastern England model reflected both his preference for arable, *and* his conviction that intensive agriculture held the best prospects for excess population absorption. There were, however, several critical oversights. First was that, while the south eastern counties were indisputably corn-growing, they were never exclusively so. The form of agriculture was a mixed farming variant. To be sure, arable crops had primacy, but with stock fattening an important subsidiary. In words of one commentator, it was 'an elegant interlocking system'. Second was that the south eastern counties largely extended their lead in British corn production between 1814 and 1840 through new methods and expensive new inputs. Soil improvement provides one example. The depletion through generations of cropping was addressed not just through animal manure, but also through topdressings of ground bones and ash, spreadings of marl and lime. Applications of compost were important in several counties. Field drainage was a natural extension to this activity. Allied to soil improvement were more sophisticated cultivation techniques. The introduction of ironshared ploughs, for instance, had enabled deeper and more repeated breaking of the soil. Coupled with the sturdier ploughs, harrows and rollers speeded soil breaking, while the diffusion of seed drills ensured that wasteful broadcast sowing became rare. Though hand methods still dominated the reaping process, the advent of scythes had superseded cutting by sickle. The conclusion must be that farming in the south eastern counties had clearly become more complex within Wakefield's lifetime. But there is little indication this was fully recognised. Wakefield based his theorising on surface appearances, not being too concerned about the subsurface nuts and bolts holding the structure together.

The same superficial appreciation was also apparent in Wakefield's prescription for the social organisation of colonial agriculture. Intensive agriculture of the kind favoured was dependent on heavy capital investment. To ensure that the necessary funds were available, an elaborate estates system had emerged in Britain. Yet, with the estates of the south east varying greatly in layout and size, from under 1000 acres to more than 100,000, Wakefield's preoccupation was with those towards the lower end of the scale. His suggestive emphasis was on units occupied by the 'landed gentry', and by more recent emulators, those ranging from under 1000 to around 10,000 acres. That there might be some discrepancy between these already developed properties of around 1000 acres plus and slices of colonial wilderness sold off in 100 acre parcels was never addressed. Nor was the question of the sources of capital for colonial farm development. Nevertheless, Wakefield's preoccupation with the landed gentry as role models for an Antipodean Squirearchy was understandable, if scarcely more realistic. Commonly the gentry were men of substance, men well fitted to afford the type of leadership considered appropriate for an agricultural settlement. What he down-played was that the landowners - his agricultural capitalists - were but one part, if a critical part, of a structured multi-tier agrarian relationship. Few British landowners, for example, were themselves practical farmers. They were concerned with overall decision-making and general administration. The actual supervision of farming on British estates was the prerogative of land stewards, or bailiffs. Tillage, the production of crops, was the responsibility of subordinate



The Estates Framework: layout of Wellington Country sections to January 1843. [Turnbull Library]

tenant farmers, who, while renting farmlets from the landowner, were nevertheless themselves subject to the directions of his agent. At the very base of the hierarchy, were the agricultural labourers, who, while employed by the tenants, were also subject to landowner dictates. For the system to be successfully replicated, it was essential that all the component parts be transferred, and that preconditions exist for successful reintegration in the new environment. The indispensable lubricant was availability of capital.

It was not just British farming methods, however, nor indeed the underpinning social order, that Wakefield sought to replicate. It was also the very physical appearance of the south eastern farming counties. The inherently alien had to be rendered familiar. In the densely settled English rural landscape the estates, large and small, fitted together like a jigsaw. Yet each estate had recognised components, they being smaller jigsaws in themselves. At the hub was the 'home farm', replete with 'great house', the base of the landowner's operations. Where a bailiff was employed, the managerial residence was generally close by. Beyond this, radiating out from the home farm in their own complexes of fields, were the tenant farms, the true profit-making units. At some convenient point estate villages, housing the agricultural labourers, were situated. In its setting, the arrangement was tidy and functional, even if it was already being challenged. What was overlooked was that it was a system which had evolved over hundreds of years; and that it had been fashioned for a landscape which had been modified by human action over a much longer period. What Wakefield urged was that in New Zealand the modification processes should be telescoped, and that in a few short years the settlement landscape be rendered as 'English-like' as possible. Great houses should be erected with little delay. The apportionment of estates into tenant farms should follow clearance, when properties had been rendered fully productive. Moreover, the passion for conversion extended to the fields themselves, it being urged these be stripped of indigenous vegetation and enclosed by hedgerows. Such modification, in Wakefield's detached view , should pose few problems. It was well known, he pronounced, that the prospective site encompassed thousands of moderately flat grassed acres, that stands of more substantial vegetation could be cheaply and readily cleared, and that the future agricultural heart of the settlement was served by a navigable river wholly comparable to the Thames.

That Wakefield's agrarian vision should be accepted unquestioningly, at least in Britain, and that it should continue to be given credence for a half a dozen years, even in the face of emerging evidence to the contrary, says much for the theorist's parallel skills as propagandist. It also reflects his backing by those with the means to disseminate his views. His notions were reiterated so frequently, so strongly, and so convincingly, as to stand as verities. The backing came in a minor flood: in books and journals sponsored by the Company; in so-called independent papers (editors' willingness to publish gratis contributions being much the same as today); in displays; and in public lectures. In all cases the sources were much the same : Edward, the father; Edward Gibbon, the son; and latterly Edward Jerningham, the grandson; all plus supporting cast. Little hint of disappointment, of unexpected surprises, was permitted to appear in type, much less to be broadcast from public rostrums. Yet, if embarkees were trusting, it would be nevertheless wrong to label them as gullible for accepting the intelligence that they were departing for 'a land blessed', indeed 'a perfect site for a little England across the seas'. Even official publications perpetuated the statements of those with no first hand knowledge of the milieu.

The reality: 'Scratching amongst the stumps'

If the ideal was an image of 'com-crammed parallelograms, neat hedgerows and trim country seats', the reality was far different. By the early 1850s, despite more than a decade of spasmodic effort, the Wellington settlement was far from the model location for agricultural enterprise postulated. The cultivated landscape, certainly around Port Nicholson, rather than a neat mosaic of enclosed fields, was more an untidy patchwork of part cleared sections, bush still dominating. While a scatter of more sophisticated intensive farms was slowly materialising on the more open lands of the north west (Wanganui, Rangitikei), these had been held back by the inter-racial conflicts of the 1840s. In the words of an 1854 visitor, the much vaunted agricultural districts of the settlement were 'a disappointment', having assumed 'a shabby North American' tinge. The houses were 'all wooden and anything but English-like', and their general decrepitude was in keeping with 'the stumps of trees in the swampy ground, primitive bridges and careless piled log fences'. No Antipodean Squirearchy had emerged. Of the larger resident landowners who had attempted to cultivate, only a small rump remained, this largely reduced to grubbing for subsistence. Unexpectedly, the vacuum, at least partially, was being filled by a cottier caste, this group opting for a mix of stock-raising and gardening on small family plots. That the plan to bank on an arable future, one founded on large estates, had been an abject failure was apparent to even the most sanguine of former Company apologists.

The extent of the failure is evidenced by contemporary cultivation returns, i.e. returns of lands broken and sown (Table 1: *see over*) Notionally, with distribution of the Company lands complete, some 110,000 acres were available for tillage; far more when sales of Secondary Land

Table 1

LANDS UNDER EUROPEAN CULTIVATION : 1845, 1850 & 1855
- WELLINGTON SETTLEMENT -

	1845 acres	%	1850 acres	%	1855 acres	%
Wheat	642.5	(45.0)	438	(9.5)	573	(5.4)
Oats	86	(6.0)	299	(6.5)	727	(6.9)
Barley	85	(6.0)	89	(1.9)	61	(0.6)
Maize	-	-	3	(0.1)	9.5	(0.1)
Potatoes	144.5	(10.1)	808	(17.6)	542	(5.1)
Garden Crops	192	(13.5)	374	(8.1)	587.5	(5.6)
Sown Grass	276.5	(19.4)	2627	(56.3)	8030.5	(76.3)
Total acres cultivated	1,426.5	(100)	4,584	(100)	10,530.5	(100)
Cultivated acerage per head of population	.33		0.77		1.3	

Sources: 'Blue Books'

Orders are also taken into account. Accepting that a proportion of the lands sold would always have been unsuitable for cultivation, and that it could only be advanced through heavy infusions of capital and labour, it should nevertheless have been feasible for up to one quarter of the lands sold, say 27,500 acres, to have been brought in within 15 years. Yet by 1855 only 10,530 acres, around one and one third of an acre per head of settler population, was recorded as being in intensive farming use. Even this, *prima facie*, represented a considerable advancement in a decade. Closer examination of the figures reveals, moreover, a fundamental transformation in the nature of intensive farming between 1845 and 1855. In the former year despite five years of backbreaking effort, grain crops remained paramount in settler sowing strategies, collectively accounting for 57% of the sown acreage. Just under half the total acreage was in the nominated primary staple, wheat. By 1855 only 13% of the cultivated acreage was in grain, with wheat, at 5.4% of the acreage, having paled into relative insignificance. The actual acreage in each of the principal grain crops had also declined, with the exception of oats, this being in demand as stock feed. The moderate advance in the settlement's cultivated acreage therefore has to be explained in other terms. It was largely accomplished through converting bush and fernland, and much former grainland, into sown sward. Whereas intensive livestock farming had been initially viewed as an essential adjunct to cropping, animal husbandry had in short order become an end in itself in the former Company districts. The significant increases in potato and garden crops also suggest that, though the short haul export potential of the produce should not be overlooked, tillage had become more semi-subsistence in character.

That intensive farming was hemmed in, largely confined to small pockets in the former Company districts in the foundation years, is also attested to by the cultivation returns (Table 2). The initial focus was overwhelmingly on the Hutt Valley, the most extensive expanse of flatland and therefore the projected granary of the settlement. This district continued in the forefront of the public imagination through the 1840s, although it was being challenged by 1855. In the early and mid -1840s, the principal ancillary agricultural districts were those to the south of the main town, the relatively open land of Watts Peninsula and the corridors leading to the southern coast, together with lands adjacent to the Porirua Road in the Near North West districts. In the latter case, small family farmers early established footholds. It was an index of early enthusiasm that a start was also made on the clearance of western hill slopes, particularly those abutting the town. With a multiplicity of difficulties to be faced, agricultural production barely got under way at the overspill settlement at Wanganui. By the mid-1850s the most conspicuous advance statistically had been immediately to the northwest of the main town, sowings along the Porirua Road being augmented in the Porirua Basin proper. In terms of cultivated acreage, the Near North West and Porirua districts could claim 31.8% of the settlement's total by 1855, as compared to 33.8% at the Hutt. Almost as striking, and possibly of even greater

Table 2

LANDS UNDER EUROPEAN CULTIVATION
BY DISTRICTS : 1845 & 1855

	1845 acres	%	1855 acres	%
Wellington Country District				
- Town & Southern Districts	299	(20.9)	400.5	(3.8)-
- Western Hill & West Harbour Districts	146.5	(10.3)	858	(8.1)
- Hutt & East Harbour Districts	667.5	(46.8)	3556	(33.8)
- NNW & Porirua Districts	226.5	(15.9)	3275	(31.1)
Total for Wellington Country District	1339.5	(93.9)	8089.5	(76.8)
Wanganui	87	(6.1)	1535	(14.6)
Rangitikei-Turakina	-	-	504.5	(4.8)
Wairarapa-East Coast	-	-	279.5	(2.6)
Ahuriri	-	-	122	(1.2)
Total for Wellington Settlement	1426.5	(100)	10,530.5	(100)

Sources: 'Blue Books'

long-term significance, was the increase in the Wanganui tilled acreage after 1849. After 15 years the signs were that the arable future, if there was to be one, was likely to be focused on Wanganui and the adjoining Rangitikei district, even if this was still largely a matter of promise [Table 3]. In truth, the distant north western districts had always been better suited to arable, earlier exploitation having been held back by the Company's inability readily to deliver lands to purchasers. The delay was to have further deleterious effects on cropping expansion. At the very time suitable ploughland began to become available, the returns from pastoralism were already tempting farmers to switch from field crops to grass.

Just why the development of arable was so faltering, and ultimately so unsuccessful, in the Wellington settlement now has to be addressed. What is certain is that no simple monocausal explanation suffices. A combination of factors ensured the slow progress of intensive farming, in the process scuttling the Wakefieldian dream. For a start, the confinement of intensive farming to a few small pockets was dictated by the natural environment encountered. To their dismay, settlers found that the chosen site was no 'smiling land', reminiscent of southern England. The climate may have been acceptable, even if the winds were bracing, but there were hills all about, in some places right to the harbour's edge. As one aspiring young farmer wrote : '... in whatever direction the eye fell it was on mountains rising in the blue distance, ridge above ridge, in continued succession'. There was, he recorded 'disappointment on every countenance'. Even discovery that, beyond the harbour littorals, tracts of more moderate topography lay in the valleys between the ridges, sometimes promised only to deceive. The vulnerability of those valleys to flooding was learned only by experience. Closer acquaintance with the locale also revealed another uncomfortable fact of life. The vegetation cover was quite dissimilar to any observable in the settlers' former homelands, being remarkable for its density and rank luxuriance. Its very thickness and matted nature more closely resembled the vegetation of moist tropical countries than the open woodlands of Canada or Australia, much less the modified English landscape. The natural conditions thus posed challenges that had to be confronted. There was no alternative. At the beginning settlement was necessarily restricted to Company lands, and, whatever that organisation's claims, the only lands within its grasp, and then but tenuously, were those at the toe of the island, and later Wanganui. Moreover, at the toe of the island, the ranges proper beyond the hills provided a further natural bulwark. Environmental shock therefore functioned as the first filter in separating the potentially successful from also-rans.

A further factor was the identity of those shocked. Whether or not the particular settlers introduced might have been better prepared is debatable, but it is likely any group transported from the same source areas would have experienced trauma. What is certain is that the majority of those introduced to form an agricultural corps had but a meagre background knowledge of their colonial calling, even in British conditions. If the Wakefieldian design was to be fulfilled it was imperative there be agricultural entrepreneurs or capitalists (estate owners), experienced bailiffs or stewards (estate managers), and tenant farmers/agricultural labourers (estate labour). The failure of the New Zealand Company adequately to recruit in any of these categories was to be at some substantial cost. The almost complete absence of former farm owners amongst the land purchasers was bad enough. Certainly there were some hopeful amateurs, but the overall grasp of farming practice, much less estate management, was light. Accentuating the problem was the almost complete absence of land stewards. Probably such men were repelled rather

Table 3

DISTRIBUTION OF EUROPEAN CROP ACREAGES BY DISTRICTS : 1845 & 1855

	FIELD CROPS								SOWN GRASS	
	Wheat		Other Grains		Potatoes		Garden			
	1845	1855	1845	1855	1845	1855	1845	1855	1845	1855
Wellington County District										
Town & Sthn District	26	-	31	9	4.5	1.5	73.5	145	164	245
W.Hill & W.Harbour	82	8	16	11	7	6	26.5	57.5	15	775.5
Hutt & E.Harbour	349	184	70	246	98	324	66	105	84.5	2697
NNW & Porirua	134.5	12	30	74.5	23	37.5	26	167	13	2984
Total :	591.5	204	147	340.5	132.5	369	192	474.5	276.5	6701.5
Wanganui	51	193	24	356	12	130.5	-	68	-	787.5
Rangitikei-Turakina	-	54	40	-	32	-	11	-		367.5
Wairarapa -East Coast	-	41	31	-	10.5	-	25	-	-	172
Ahuriri	-	81	-	30	-	-	-	9	-	2

Sources: Wellington Provincial Gazette (1855)
Crown Colony Statistics (1954)

than attracted by the Company's notions. Estate owners, therefore, of necessity, had to abandon management at one remove and to supervise farm development on their own accounts, something for which most were ill-fitted. This created further problems when experienced former tenants and superior agricultural labourers were also in short supply. Thus, in terms of human resources, there were deficiencies both in quantity and quality. The pity of it was that British farming, as brought to Wellington, depended heavily on human capital for its smooth operation. Prior to departure it had been suggested that landowners would require 1 labourer for every 20-40 acres farmed (i.e. 2-3 labourers for every 100 acre section). Contemporary records suggest the actual requirement was several times that number, with seasonal labour also needed. But, with demand for labour also high in the first town, hirings were costly. At a time when experienced 'farm servants' might expect to receive cash remuneration of 13/6 a week in Lincolnshire, or 10/6 per week in Norfolk, the first Wellington rural employers were paying out upwards of 18/- a week to permanent hands and 5/- a day to seasonal workers. Not surprisingly, within a few years the ability of estate owners to maintain permanent staff was being seriously called into question.

While significant modification of the terrain was impossible, it was nevertheless feasible to clear the land surface of vegetation; if with considerably more difficulty than suggested by Wakefield. That considerable energy was devoted to rendering lands suitable for farming in the early years of settlement is suggested by an 1847 return of lands cleared in the Wellington Country Districts [Table 4A]. Three distinct types of vegetation were encountered : swamp growth, fern, and true bush. Initially, it was the bushed areas that presented the greatest difficulties. At first it was believed prospective fields should be completely cut, cleared and stumped, after the British fashion of bringing in woodlands. With this proving prohibitively expensive, however, upwards of £70 per acre, aspiring cultivators were soon compelled to instead adopt the 'bush-burn' system commonly employed in North America. This involved axe-wielding gangs traversing sections, cutting trees three feet from the ground, or, if lesser clearance was acceptable, simply removing crowns. While exclusively European gangs were at first utilised, it became more attractive to employ Maori as costs rose. Ideally, cutting work was carried through in early spring, trunks and branches being stacked to dry for six months before a match was applied. When the ashes were cool, the land was then considered ready for interim farming purposes. Clearing fernland was somewhat easier, more extensive use being deterred by the long embraced myth that lands under bush were more fertile. Again, fire was extensively employed, the growth being first levelled with bill hooks. There were only limited attempts to clear swampland in the first decade. That the rate of clearing slowed as the 1840s progressed was directly related to the expense involved, especially when the likely returns from cultivating sank below projected outgoings. By any measure, and despite local adaptations, land clearance soaked up capital; although a survey of contemporary cost estimates suggests that outlays could vary greatly according to time and place [Table 4B]. For the 1840s, a fair average would probably be around £12-£20 per acre for bush, and in excess of £5 per acre for the full clearance of fern. Such figures compared less than favourably with the £4-£5 per acre being contemporaneously expended on forest clearance in Canada and New South Wales. But, if the land was to be utilised for the forms of farming envisaged, the costs had to be borne.

Removal of the bush and fern cover did not fully relieve the fledgling estate owners' difficulties. At best, removal of the cover was only partial. Apart from the scatter of stumps, part burned trunks and root residuals above ground, the subsurface was an intricate network of roots. Until these were hand-grubbed, or rotted over time, the driving of ploughs between the stumps was hazardous, if not impossible. Perforce, all early cultivation had to be by chipping with mattock or hoe, a highly labour intensive, and therefore expensive, procedure. Meanwhile, imported agricultural implements rotted or rusted on the foreshores. Sowing brought further problems. Some singularly inappropriate locations were chosen for the first experiments. There was also uncertainty as to the best sowing times, British farming calendars being all that was available. Popular British rotations were found unsuited to the new environment. Actual sowing, moreover, was also far more costly than had been envisaged. With the use of seeddrills curtailed, there was a necessary reversion to the more

Table 4

(A) LAND CLEARANCE : WELLINGTON COUNTRY DISTRICTS

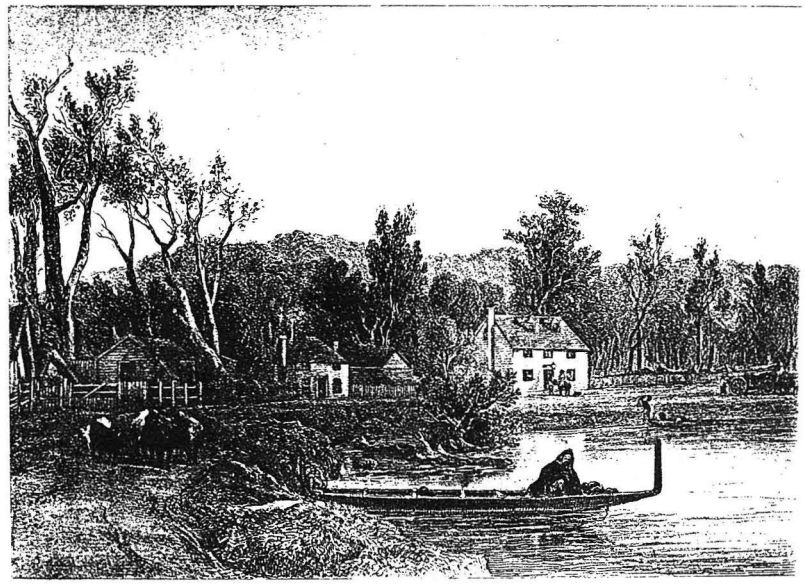
	Clearing settlers 1841 (1)	**Acres cleared 1847 (2)**
Town & Southern Districts	4	365
West Hill & W.Harbour	7	273
Hutt & East Harbour	15	980
N.N.W. & Porirua	6	364

(1) Heaphy (1842) (2) C.C. Statistics

(B) LAND CLEARANCE : COST STATEMENTS (Samples only)

Cost per acre	BUSHLAND	FERNLAND
Revans (1841)	£12	-
Heaphy (1842)	£10–£12	£2.10.0
Molesworth (1844)	£13.10.0	-
Swainson (1846)	£55	£12
Marjoribanks (1846)	£20–£30	£5–£8
Fitton (1856)	£30–£40	£4–£5

wasteful hand broadcasting. And there were inexplicable failures. That the seeds themselves might be deficient was something brought home gradually. Some simply failed to take; others had been damaged in transit. There was no guarantee even with Australian seeds. It was not until the mid-1840s that locally proven varieties became commonplace. There were further testing times once crops had taken, there being up to six months between sowing and harvesting. Heavy rains could wash plants from the ground on steeper slopes, while the risk of flooding was ever present on flatter country. Flooding had the immediate potential to smother grain crops, or to cause potatoes to rot in the ground. The effects of wind were also apparent, while plant diseases became endemic, perhaps carried in with imported seed. There were also hazards arising from the activities of neighbouring settlers and the Maori. It was all too possible for deliberately lit bush fires to rage out of control, or, in the absence of proper fences, for crops to be destroyed by wandering stock. Recall that by 1844 stock numbers around the harbour were at bursting point. The approach of harvesting, if euphoric, nevertheless gave rise to further stresses. Once more, the state of the fields precluded the use of modern techniques. It was necessary to bring in the grain with sickles, and to spade-dig potatoes. This involved augmentation of the farm labour force for weeks at a time. Depending on distance from the town market, the availability of storage and the weather at harvest, there was also potential for post harvest wastage. The all up costs of cultivation are even more difficult to isolate than those for clearance. One Hutt farmer - Molesworth - estimated the cost of putting potatoes in new land as £8.5.0 per acre, the comparative cost for wheat £5.12.0 per acre; but all indications are that this was a gross underestimate, one produced for home consumption.



'The Aglionby Arms (Burchams) River Hutt': clearings in the bush. ['S.C. Brees Pictorial Illustrations', London, 1847]

Clearly then, calls on estate owners' capital were regular and heavy. A preliminary totting up may be enlightening. At the beginning, each aspiring estate owner had a mandatory £1 per acre land purchase price to pay (i.e. £100 per section). This represented no more than a baseline for future calls. Conservatively, the cost of clearing prospective grainland could amount to £12-£20 per acre, even more where there were extra difficulties. The expense of putting in a preliminary potato crop, considered essential to prepare lands for grain, generally exceeded £8 per acre. Thus, before even a bushel of seed went into the ground, the expense of bringing in a hypothetical 100 acre parcel could involve an investment of £2500-£3000, with the calculation taking no account of expenditure on residences, fencing, plant, nor even the hireage of casual labour. While theoretically a proportion of this initial investment might be offset through sale of the preliminary crop, a further investment of £6 per acre was required before the first wheat, oats or barley could be harvested. If, as was common, an individual owned several 100 acre parcels, he stood to outlay £8000-£10,000 before the whole of his rural acreage became remunerative. Here lay the rub. Such investment was beyond the capacity of most. Examination of early financial records suggests that most had funds of substantially less than £5000, while, when money was available in the settlement, it was at exorbitant interest rates, up to 20%. An inevitable conclusion is that by the mid 1840s estate owners were experiencing severe cash flow crises. Having invested heavily, they had exhausted the funds at their disposal. Yet, until the outstanding lands were brought in, they were producing insufficient to cover immediate operational costs, much less to cover ongoing charges. It was an acute dilemma, and one in which the only apparent way was backwards. It was also this which was to eventually lead to the pattern of semi-abandoned part clearings. There must be suspicion, however, that there were inappropriate early investment decisions, scarce funds being frittered away on what amounted to conspicuous con-

sumption. While stumps in the fields might be tolerated, this did not necessarily mean lowered habitational horizons. Depictions of estate houses suggest extensive early expenditure. By rumour, several of the country seats cost over £500. It is also recorded that one prominent Hutt landowner spent as much developing the grounds surrounding his homestead as he did on preparation of his fields. Moreover, the necessity for agricultural development in no way lessened the demand for the flood of luxury goods passing in over the settlement's wharves in the experimental years.

The problems so far outlined accepted, for the favoured arable to have been even marginally profitable it was essential that there be high, preferably ever increasing, yields. On the basis of the first minuscule crops, some extravagant claims were to be made. For instance, it was stated in the settlement that 90 bushels of wheat per acre had been harvested from one Hutt farm. Returnees to Britain equally fallaciously claimed that 90 tons would be brought in from the Hutt Valley in 1842, and that three times that quantity could be expected in 1843 with the same level of inputs. Things were never that good, but there were *prima facie* grounds for initial cautious optimism. About Port Nicholson wheat production peaked at an average 45 bushels per acre in 1845 season; a figure well above the average 28 bushels per acre recorded on all but the most efficient of British farms. Oats peaked at 65 bushels in the following season, while potatoes consistently averaged 10 tons per acre through the early 1840s. What settlers ignored, or did not understand, was that this early success was founded on the pent-up fertility of virgin soil. Yet what appeared a permanent state was easily depleted. Clearance firings, while providing potash, inevitably robbed the soil of some of its richness. When this was coupled with monocropping, both on grounds of the unsuitability of British rotations and the lure of immediate returns, the likelihood of depletion problems was immense. There was little thought that to maintain fertility something had to be put back, or even the ability to do much about it. The inadequacies of the cultivation methods applied to the colonial soil were all too soon evident. From the mid 1840s the trend was inexorably downwards [Table 5]. The decline in yields was a crushing blow. In the most favourable of circumstances it would have been imperative that peak early yield levels be at least maintained. When this proved impossible, the *raison d'être* for large grain farms was effectively removed.

Table 5

YIELDS IN BUSHELS PER ACRE OF PRINCIPAL FIELD CROPS WELLINGTON COUNTRY DISTRICTS 1842 - 1852

	WHEAT	OATS	BARLEY	POTATOES
1842	40	30	30	10
1843	30	48	38	10
1844	45	40	30	10
1845	40	65	38	10
1846	40	52	35	10
1847	35	55	42	10
1848	30	55	40	8
1849	-	-	-	-
1850	30	40	35	8
1851	30	40	35	8
1852	-	40	35	8

Yet, even if the early yield levels had been maintained, another debilitating reality would have had to have been faced. Irrespective of theory, there was very little demand for Wellington produce, particularly grain; or not at the prices expected by producers. Despite the heralding of the settlement as 'the granary of the Pacific', supplier of its own wants, supplier of the Australian colonies, and, ultimately, exporter of bread grains to Britain, adverse cost structures precluded full assumption of any of these roles. Failure to command the home market was most immediately damaging. In the early 1840s a bushel of wheat might entail an expenditure of upwards of 3/- to produce from sowing to harvesting. To this had to be added cartage costs to the settlement hub, often upwards of 1/- bushel. Overheads on land purchases, clearance and improvement then had to be taken into consideration. When the product was fetching only 5/- to 10/- a bushel at the harbour township, with brokers ' fees to be paid, there was little margin for error. But errors there were, crop failures being commonplace in the experimental phase.

It was at this point that competitors stepped profitably into the void. In the early and mid-1840s the effect of Maori competition was devastating. With few overheads, able to transport produce themselves, the Maoris provided grain to the wholesale merchants at rates considerably less than the settlers' actual on-farm costs. There was also increasing pressure from 'foreign' producers as the 1840s progressed. While it had been postulated that Wellington would supply the Australian colonies, the reverse in fact occurred. By the mid-1840s good quality grain could be sourced from New South Wales and Van Diemens Land at little more than 4/- and 3/- a bushel respectively. The cost of shipment from Australian wharves to the settlement was substantially less than the conveyance of similar quantities from farms just a few miles distant. It was even possible to import grain from Chile at around 2/- per bushel base price. In the face of such competition, local capitalist producers were simply unable to establish firm market footholds. And, beyond reliability of supply, there was also the question of quality

of product, local grain being generally condemned as 'poor stuff', as was that from Nelson. Even then settlement bakers were mixing local flour with imported grindings.

Given the inability of estate owners to compete in the local market, the intent that grains constitute an export staple was never more than an idle dream. Even if quality crops had been available, at competitive prices, it is likely trade would have been constrained by the inability of merchants to guarantee shipping tonnage at acceptable costs. Until January 1850 the British Navigation Acts confined carriage to ships of British registry. It was one of the irritants of the 1840s that there was no scheduled packet service to Wellington. Crops could have waited months in warehouses, vulnerable to deterioration or pest attacks. Moreover, even if immediately loaded, there was little likelihood of expeditious conveyance to the British market, charter vessels habitually calling at Australian and more exotic ports. There was thus the further prospect of spoilage in the course of long overseas voyages. The cost of such voyages further raised the endcost of the product, grain being a low value commodity relative to weight. To local on-wharf costs had to be added a further premium of around £6 per ton, with disposal costs also having to be met at destination. There was thus little prospect of more than part costs being recouped. To cap things off, while British grain prices fluctuated in the 1840s, there was a general trend downwards following the mid-decade repeal of the Corn Laws. The result was that, with the exception of a few speculative cargoes, carefully selected for demonstration effect rather than with profit margins in mind, the lack of export potential was soon acknowledged.

In the face of such a catalogue of adversities, that the vision of an intensive arable future rapidly withered should not surprise. By the early 1850s not a single estate survived, save in vestigial form. A number had been abandoned, others reduced greatly in size, and yet others parcelled out, for sale or lease, in sections of a size considered attractive to settlers of limited means. Where intensive agriculture was still practised, it bore little resemblance to the cultivation forms at first envisaged. Much of the acreage laboriously prepared for grain had been converted to grass and, where cropping persisted, the crop mix had drastically altered. Potatoes and garden crops now held greater attraction than grain. These were scarcely the foundations upon which an Antipodean Squirearchy could be built. The majority of the estate families decamped.

For some the removal was temporary, until conditions improved or until new strategies had been devised, but for others the break was total. Of the latter, several sold up, returning defeated to Britain. Others resumed residence in the main town, turning their attention to other ways of making a profit. A few, an enterprising few, immediately altered their personal success strategies, seeking new lands, and fortunes by other means, in the outdistricts of the settlement. (In other words, the graziers discussed in the earlier paper).

Those remaining, largely resigned themselves to growing their own food, and to producing just sufficient to exchange for household necessities. Needless to say, the English-style landscape was not created. Indeed, by the late 1840s there was an obsession with the apparent desolation of the formerly favoured agricultural districts. By an 'enormous and almost incredible expenditure of labour and money', to use one settler's words, tall trees had been felled and extensive patches denuded of vegetation - but for what? To now critical eyes the 'charred stumps in all directions' were considered 'a great eyesore'. Far from the delight initially expressed at the rigours of the pioneering life, there was now fastidious distaste for a life spent 'scratching amongst the stumps'. Yet, however, distasteful the scene to gentle sensitivities, the virtual abandonment of the first agricultural districts by major capitalists represented opportunity for lesser settlers.

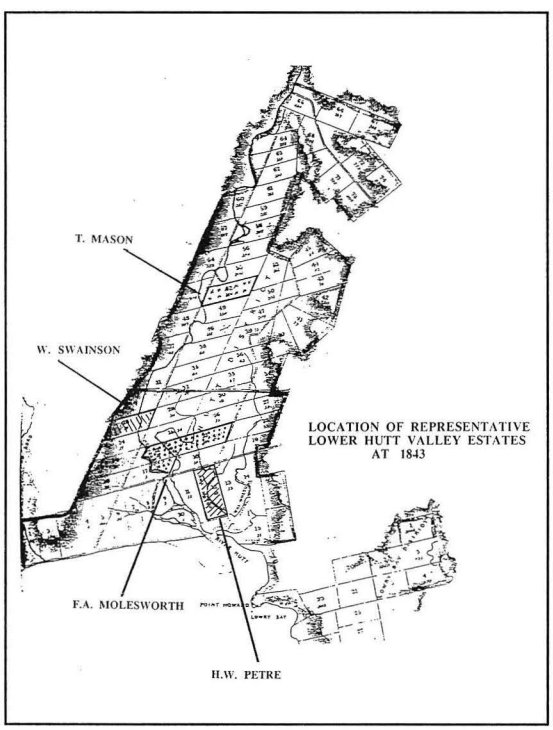
WELLINGTON'S EARLY AGRICULTURAL CAPITALISTS: THE SIGNIFICANCE OF CASE-STUDIES

The present paper has been principally concerned with the presentation of what might be termed the 'systematics' of pioneer arable farming. There has been an attempt to provide explanations of why the promotion of arable was faltering in the Wellington settlement; and of why the switch to pastoralism by the settlements' leading capitalists was inevitable. What has been lacking so far is people. Yet in the larger study of which this paper forms part, there has been every endeavour to provide a human face, or rather faces. This stems from a firm conviction that, as D.W. Meinig has written, 'ultimately, all generalisations must be grounded on what actually happened when a particular group of people colonised a particular part of the earth, in a particular manner, at a particular time'. In a community as small as 1840s Wellington it is particularly important not to lose sight of individuals, their ideas, their experiences, not least their foibles. Hence analysis based on extant contemporary statistics, returns and reports has been consistently supplemented by the extensive compilation of representative case-studies. It is thus possible to amplify, some times qualify, more general findings. At the very least, the case-studies afford a valuable verification mechanism.

The Hutt Valley, for instance, was indisputably the principal projected grain growing area, although this designation was on the basis of but fleeting resource evaluations. Throughout the 1840s the Hutt was extolled as 'a very fertile district', one of 'incredible beauty', even in the face of difficulties. It took unprejudiced eyes, in this case those of visiting naval officer R.E. Malone, to discern

that the Hutt was 'anything but pretty or interesting in appearance, except to the easily pleased minds of the Wellington people who appear to think it Paradise'. He complained that he had been subjected to a cacophony of '"Be sure you go to the Hutt"- "Oh, you must see the Hutt" - "So English-like"'. To Malone's mind, this was 'truly ridiculous when alluding to a partly drained, sparsely populated swamp'.

To test the relative accuracy of these apparently conflicting statements the development of estates agriculture in the district has been reconstructed, both using Company land records, other semi-official documents and newspapers, and by the assemblage of short histories of representative properties from surviving private papers. The findings from the first sources have already largely been laid out. They form the kernel of the present paper. The only additional finding is that estates farming was confined to a select few. Despite 80 sections being presented in the Lower Valley, no more than six were occupied as estates at 1845. A further four had been briefly occupied between 1841 and 1845. A second set of findings, on the basis of the case-studies, is that, while there were many common points, there was no one overall estates farming experience at the Hutt. Individual responses varied, according to the backgrounds, aptitudes and very characters of those involved; as well, of course, as the natural endowments of sections occupied. This can be demonstrated by focusing on the efforts of four settlers.



Though scarcely scientifically selected, the chosen quartet of Hutt farmers (F.A. Molesworth, Hon. H.W. Petre, William Swainson, Thomas Mason) constitutes a reasonably representative sample of the agricultural capitalists. Two, Molesworth and Petre, were genuinely aristocratic, while Swainson was from the minor gentry. Mason, a Quaker, was representative of new urban money. In terms of age, Molesworth, Petre and Mason were all in their early 20s, Swainson being 52 on arrival. Prior colonial experience was restricted to Petre and Swainson, though in the case of the former it was short, in the latter confined to a naturalist's wanderings in South America. Not one had first hand farming experience, though all shared Swainson's conviction that "he Agricultural profession was not incompatible with the status of Gentleman'. They also all embarked with the intention of making colonial fortunes through the cultivation of grain. In working their properties, these being spread through the Lower Valley [Fig.5], each experienced, to greater or lesser degree, the vicissitudes earlier outlined : clearance difficulties, cultivation problems, the threat of natural hazards. In the case of Swainson and Mason there was the added tension of conflict with the Maori.

While detailed comparison of the quartet's efforts is informative, the prime interest lies in the end results. Although Molesworth's was the Company's 'model farm', being shown off to all who visited the settlement, there must be suspicion its prospects were never as rosy as claimed. Regardless of its owner's ceaseless toil, by the mid-1840s there were heavy operating losses. Following Molesworth's death, the result of a tree-felling accident, the property was subdivided and sold off in five parts by his executors, much of the land being converted to grazing. Petre was never likely to make a success of estates farming. Indeed, although he occupied sections, or part sections, for 13 years, he only seriously cultivated for two seasons, recording heavy losses in both. It seems more likely he was always more interested in his blood racehorses and imported pheasants. Certainly, an allowance from his family apart, his bread came not from his fields but from service as a public official. Swainson, though far more committed, actually cultivated little longer than Petre. Less than two years after taking up land he was deliberately scaling down his operations, stating his intention to do no more than grow his own food. 'Enormous outlay and great risks' would thus be avoided. Nevertheless, while withdrawing from attempted commercial pro-

Left: *Figure 5. Location of representative Lower Hutt Valley estates at 1843.*

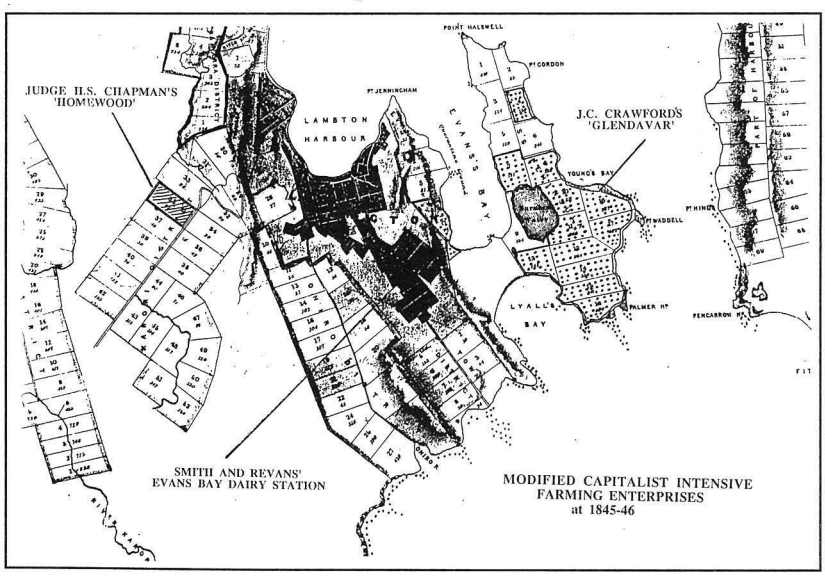
Opposite above: *'Residence of Wm. Swainson Esqr. at the Hutt'. Swainson's Hawkshead Farm.. ['S.C. Brees Pictorial Illustrations', London, 1847]*

Opposite below: *Figure 6. Modified capitalist intensive farming enterprises at 1845-46.*

duction, Swainson continued to ponder, and pontificate, throughout the 1840s. It was to little effect. By the early 1850s, practically destitute, he was claiming that New Zealand had been 'near fatal' to him. His holding had been reduced to a mere nine acres. And, finally, Mason. After battling through the early 1840s, anticipating an outbreak of inter-racial hostilities, he gathered his family and took ship for Van Diemen's Land in 1845. He was to remain there for six years. The general findings are thus reinforced. Not one of the four successfully surmounted the adversities of the 1840s. Not one succeeded in making an arable fortune. What the case-studies suggest is that there were several routes to the same destination. What the case-studies also suggest is that, in their own ways, both promoters of the Hutt and the acerbic Malone may have been right. Utopian views of the Hutt probably date from the heady establishment years, before the enormity of the problems to be confronted was realised. Later there was reluctance to accept the dream was unsustainable. By the time of Malone's 1854 visit, however, the evidence of collapse was clearly to be seen.

From the failure to establish grain estates beyond the Hutt it cannot be concluded that there was little other capitalistic agricultural endeavour prior to 1855. Once the initial traumas induced by transportation to the alien environment had been overcome, those staying were compelled to re-evaluate their surroundings. If the available lands were unsuitable for commercial grain farms, their true potential had to be assessed. Sheep apart, the 1840s witnessed the emergence of more modest forms of capitalist intensive farming in the settlement. Taking advantage of unforested lands close to its urban nucleus, several enterprising individuals set up 'dairy stations', intensive livestock units bearing little resemblance to the extensive runs of the outdistricts. For them, butter, rather than corn, was to be the key to the future. In a category slightly apart was a small corps of 'gentleman farmers', generally prominent settlers, often with other means of support, who, while prepared to invest capital in the development of their properties, were less dependent on immediate returns. In their case the goal became self-sufficiency plus a little extra, full exploitation of their lands being deferred. Altogether records for eight alternative capitalist properties have been located, three having been selected as representative: Smith and Revans' Evans Bay dairy station; Judge H.S. Chapman's 'Homewood' (Karori) property; and J.C. Crawford's 'Glendavar' (Miramar) farm [Fig.6].

Smith and Revans' dairy station, one of the first alternative capitalist ventures, was established in late 1841. As the latter wrote, intimating his intention to forswear corn, he had 'other fish to fry - in the form of cows and milk' As much as 5/- lb. had been locally paid for butter, and at least 3/6 lb. could be confidently expected. For several years it appeared that the decision had been a shrewd one. Within 12 months the original 22 head of cattle imported had been boosted to a herd of more than



100. In 1843 and 1844 the still growing herd spread on to adjacent rented lands. But the partners, particularly Revans, overstretched themselves. By mid-decade troubles were looming. Although these were partly attributable to other shaky business deals, the difficulty was that the partners had employed credits to purchase cattle at speculative prices. Combined with heavy investments in plant, and even heavier outlays on renting additional lands, the costs were simply too high. When stock prices fell, the outcome of increased livestock shipments from the Australian colonies, and when the emergence of competitors reduced the returns from dairy and associated products, they were unable to meet the interest bills on their debts. By mid 1845 Revans was in Court, the debts of the partnership exceeding £4000. By doubtful manoeuvres Revans was able to sidestep severe sanctions, but his attention turned firmly to Wairarapa flocks.

If Revans' enterprise was brought down by his speculative inclinations, there was never any such danger in Judge Chapman's farm building efforts. Between 1844 and 1850 he meticulously brought in his 100 acre 'gentleman farm', proceeding sedately, further investing only as his resources permitted. It too came to be regarded as a model property, one commented upon and visited by dignitaries through the later 1840s. It was hailed as a practical expression of Cobbett's 'cottage economy' principles. Almost certainly 'Homewood' was conceived as a farm that would eventually switch to a fully commercial production basis, but the reassurance for such as Chapman was that, if premature disposal became necessary, handsome returns from capital gains might be expected. Yet, in finalising his accounts prior to quitting the settlement in 1851, Chapman was to be disappointed. He identified losses in the order of 33% on expended capital over seven years. In the vicinity of £1200 had been outlayed on development. Against this had to be offset between £250-£300, the savings from self sufficiency in food, rent, and small profits from the sale of surplus stock. The only offer forthcoming, however, was £550, this leaving a deficit of £350-£400.

The final alternative capitalist property, Crawford's 'Glendavar', is harder to classify. Much bigger than either of those previously cited, it was neither a true gentleman farm nor an intensive livestock unit; nor was there any attempt to grow grain within its boundaries. Yet in concept it was probably nearer the estate ideal than any other property. Having earlier secured a foothold on Watt's Peninsular (Miramar), Crawford floated an ambitious mid-1840s plan to cut the whole of it up into tenant farms. It was envisaged that more than 40 such tenancies might be so created, the occupiers specialising in dairy stock, gardening and poultry. The plan was in three parts. The first was land improvement, the central valley of the Peninsula being dominated by a lake and swamps. The second was the consolidation of Peninsula land holdings, thereby ensuring maximum return from land improvement investments. If these two steps were successfully carried through, the third, apportionment, followed logically. In 1846-47 over £3000 was outlayed on improvements, the most notable feature being drainage of Burnham Water. It soon became clear, however, that consolidation would be impossible, at least in the short term. To be sure, there had been a promising start, six southerly sections being acquired from the Molesworth estate, but three critical central sections continued to elude the erstwhile subdivider. One, integral to complete success of the drainage works, stood in the name of the Rev. Vesey Hine, and the British cleric obstinately clung to the conviction that it would be the site of future docks. The other two had fallen to Edward Jerningham Wakefield, the son of Gibbon being adamant that he could not be expected to 'part with a lottery ticket which may someday turn up a prize'. Chagrined at his inability to progress, Crawford departed for New South Wales. By estimate he had already spent well over £5000 on Glendavar. Yet in an 1849 letter he instructed his agent to accept £2500, if that could be got, with his town acres thrown in as a bonus. 'What is to be done with this castrated and humbugged estate', he wrote, 'God knows, for I am sure I do not'.

The lesson from the last three case-studies is this : even the promotion of more modest forms of capitalist intensive farming was fraught with difficulties, and there was little prospect of handsome profits. It is therefore possible to concur with Lieutenant T.B. Collinson R.E. who, describing what he had seen, wrote home in early 1848 that 'despite much hoo-ha ... the result of all the Great Agricultural Experiments, from which a great deal had been expected, was that the labouring man, he who puts his own hand to the plough, could make a living ... but the Gentlemen could not'. 'No gentlemen', he continued, had 'succeeded in anything save beggaring themselves'. Yet, as earlier suggested, the failure of the larger intensive farming capitalists provided opportunities for others. That small farming, tolerated by the Company but largely dismissed as of any great economic significance, should have so quickly emerged as the real alternative to the preferred forms of intensive agriculture, the true counterpoint to grazing in the outdistricts, owed much, of course, to the peculiar circumstances of the Wellington settlement. But discussion of how the small farmers responded to their challenge is properly the subject of another paper.

The material in this article was presented in a Stout Research Centre Seminar on 15 April 1992 and will form part of a forthcoming publication in which detailed references will be given.