DETERMINANTS OF POPULATION - RESOURCE RELATIONSHIPS AT VILLAGE LEVEL: A STUDY OF TWO SOUTH INDIAN VILLAGES

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Abstract

The thesis is based on a study of two villages of contrasting resource bases located in Kambam Valley, Madurai District, Tamil Nadu, India. Field work was carried out in 1978/79, involving the collection of contemporary and retrospective data on population, agriculture and class variables. The thesis seeks to describe and examine the relationships between these three major variable groups, and the extent to which two identified externally operating factors, population increase and technological change, have affected the course of village development generally. Although it is not the primary objective to explain change in the light of the villages' differing resources, the extent to which the distribution of resources within the villages influences change is examined.

The first part of the thesis seeks to describe the contemporary and changing nature of population, agriculture and class variables. Demographic change is traced both with the use of record data and an investigation of patrilineages. The analysis of agriculture involves especially an examination of the changes in intensity of cultivation and labour demand (especially with reference to changing agricultural technology). The investigation of class emphasises changing patterns of landownership and ownership mobility among patrilineages. The organisation of labour in the villages is also examined.

The second part of the thesis examines the relationships between these variable groups, involving, especially, the relationship between land intensification and population growth

within the village, the relationship between household organisation and landownership, and the relationship between land productivity and class distribution.

The final chapter presents a general model of change drawn from data from the two sample villages. The potential weaknesses and relevance of this model to village change in general is examined in conclusion.

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1. Introduction

1.1 Some basic assumptions

The subject of change in rural society, specifically village society in India, is one which has received much attention in the last 50 years, attention which has been increased recently by what is as seen as the essential crisis of developing countries, that of increasing poverty. The analysis of poverty is a wide-ranging subject encompassing both the identification of the social and economic determinants of minimum levels of living, and of the inter-acting processes which serve to bring about variations in the distribution of wealth. Although poverty itself is not analysed in this thesis, inferences as to processes leading to wealth distributions are drawn from observed intra-village relationships.

Because of the dominance of the agricultural sector in the Indian economy, and because of its importance as a base for the economic and social functions of the village the effect of these processes on the agricultural sector is of great importance to the distribution of poverty within the country and the village. Two major factors may be identified which have acted to change the course of social and economic development through agriculture: first, increasing population in relation to available resources, and secondly changing production capabilities brought about by changing agricultural technology.

The two factors are to a certain extent inter-related, but they have the common property of acting largely independently on individual village society, although they may be initially induced by overall societal change. The thesis will atempt to assess the extent to which these external factors have induced social and economic change in two sample villages, located in a region of Southern India, for a period from about the end of the 19th century until the time of the survey in 1978/79, as well as the extent to which the internal relationships of the village have modified change. (Fig. 1.1 shows the location of the villages in relation to South India).

The relevance of the village as a unit of study may be questioned on the grounds that it is impossible to infer from samples (of such widely diverse character as villages) regional or national trends, and that the relevance of the village study is limited to the village itself. Alternatively, the village may not be seen as an appropriate unit of study of processes which may be dependent on supra-village forces, or that the relationships between villagers themselves may be more appropriately envisaged as taking place within larger systems.

The plethora of village studies, especially for India, carried out within a variety of disciplines ranging from anthropology to demography or economics, has brought calls for the changing of the focus of research from the village to the region, for the better analysis of systematic change. The argument that the village remains an appropriate unit of study rests on two assumptions, First, that the village represents a microcosm of rural India; all villages are influenced by similar processes although the importance of these processes may vary with time and other factors. This assumption underlines the study of villages in combination, in order to identify relationships which determine the extent of development of the village from, for example, a "backward" to an "advanced" state (Dasgupta, 1975), or the construction of other village typologies (e.g. Chambers and Harriss, 1977). Secondly it is assumed that the nucleated settlement of population, which is the village, is the focus of inter-acting economic and social forces which receive their outward expressions in the activities and incomes, and the roles and values of the population; the village, if not itself a determinant of processes, acts as a regulator of externally induced processes.

As to the advantages of the village study, it may be argued that the village, taken as an inter-acting unit avoids the "ecological fallacy" of inferring from correlations between values of aggregates to alleged relationships between individuals pointed out by Dasgupta (Dasgupta, 1977). Moreover, the direction of causal links between variables are probably better understood at the micro- rather than the macro-level. The village study also necessitates the personal contact of the researcher with the researched over a longer period than, for example, is the case with a systematic regional survey, thus diminishing the risk that pre-conceived assumptions will imprint themselves with the aid of statistical techniques, onto what Djurfeldt and Lindberg term a "non-falsifiable image" (Djurfeldt and Lindberg, 1975).

As Harriss says of a Sri Lankan village study

> The value of any locality study does not lie in the possibility of abstracting from it statistically generalisable conclusions, for there can be few regions in which localities are not remarkably diverse. The point of a case study is to make possible the analysis of social processes from the focus of one small locality .... to analyse social processes as a totality.

(Harriss, 1977a).

The remainder of this chapter will examine the concepts surrounding the two identified external factors of change, and finally introduce the relevant variables for the analysis of village change in total together with the overall research methodology.

1.2 External Factors of Change

1.2.1 Population Growth

India's population has, with regional variations, generally shown an accelerated growth over the period from 1921 to the time of the survey in 1978/79. This has been generally attributed to a dramatic decline in death rates and increase in life expectancy brought about by effective public health and famine relief measures. As Cool (1975) emphasises,

> Improved nutrition, reductions in subfecundity and sterility, supression of female infanticide, relaxation of restrictions on widow remarriage, altered migration and settlement patterns, and other factors have affected growth, but the heart of the matter is that the death rate has dropped and life expectancy at birth has increased while the birth rate has remained high.

Population before this period was characterised by relatively low rates of growth resulting from the balance of high birth and death rates; mortality was boosted by the Malthusian checks of epidemic disease and famine. Klein, discussing the decline in population in the densely populated canal-irrigated states of Northern India from 1891 to 1921 describes how "malaria, plague, influenza, cholera, dysentery and famine" regularly decimated "the poor and the weak", thus temporarily relieving population pressure (Klein, 1974). Though population in southern India actually increased during this period, largely because an expansion of cultivation was possible, population was still subject to regular epidemic and famine induced checks. Population increase since 1921 has been maintained through continued high birth rates (as recognised by Coale and Hoover, 1969).

It is unsurprising that in the face of this unrelenting and now almost independently-acting factor (although public health measures were responsible for the decline in mortality, and as such were an arm of government influence, to all intents and purposes, in the light of the lack of any significant government influence on birth rates, population itself may be regarded as the independent variable), that there arose a school of population pressure. This school was cultivated, especially among British officials, on the projected aggregated totals of food production capabilities and consumer demands. Klein (op. cit.) points out how British historians and economists concentrated on the negative aspects of population growth, assuming

> that the increasing pressure of population, rather than any fault in British development policies prevented a dramatic increase in the Indian standard of living.

Studies of agricultural production in densely populated areas over the turn of the century (e.g. Mathur and Mukerjee, 1931, for Gorakhpur District from 1871 to 1921) emphasise the evils of declining man-land ratios; fragmentation,[1] the unabated increase in the numbers of agricultural labourers as the pressure of population squeezed them out of their position as landholders, resort to e migration, increases in the prices of grain, decline in wages, and decline in the condition of livestock are all listed as the consequences of a 65% increase in population over fifty years, consequences which occurred despite the intensification of agricultural production.

More recently a typology of population pressure has been put

1 "The fragments of land became so small that the cultivator had to dismiss the cattle and use the spade" (Mathur and Mukerjee, op. cit.)

forward (in the African context) recognising a set of ecological patterns resulting from population increase (Hance, 1970). The emphasis on the independent nature of population increase as a poverty-causing factor in rural areas has led to ill-conceived interventionist policies of family planning. Wyon and Gordon's study of the adoption potentialities of family planning techniques in Haryana was based on such a premise (Wyon and Gordon, 1971).

Mamdani (1972), has discussed the complex relationship between fertility and poverty, emphasising that population controls are likely to be ineffective while present employment patterns encourage the maximisation of family labour.

Thus the concept of population pressure, if viewed as a process of shrinkage, with Malthusian overtones, implying the increase of poverty induced by the geometrical progression of population in the face of the arithmetical progression of food supply, has severe limitations, not merely through its assumption that the growth output must be subject to diminishing returns, but because it views population itself as the causal factor in poverty.

Population pressure, however, may be recognised in the context of the existence of increasing inequality. Schwartzberg (1963) viewed increasing population pressure in the southern states of India from 1921 to 1951 as a function of the proportion of agricultural labourers in the population. Whether or not, as Schwartzberg assumes, population increase by itself necessarily leads to an increasing landless labourer class, is a question which will be examined in this thesis, but Schwartzberg does provide a realistic context for the concept of population pressure.

Steel (1970) accepts the use of the concept of population pressure as a relative term, potentially much more specific than the loose definitions of overpopulation, underpopulation or optimum population,

> meaningful only in the context of natural resources, the organisation of a society, the division of labour, the methods of production, the standard of living, and many other variables. It can never be given a positive numerical value.

It is in this context that the concept of population pressure is used in this thesis.

Population increase, has also, but less often, been viewed as a factor inducing positive change. For Africa especially, Boserup's (1966) hypothesis of agricultural intensification as a response to declining agricultural productivity per unit of labour input as a result of population increase, will be examined as far as possible in the Indian village context.

Thus the extent to which population increase has acted as an independent variable on the agricultural, social, and economic systems of the villages will be examined, as well as the extent to which it induces the negative effects of population pressure or the positive responses of agricultural and economic development.

1.2.2 Changes in Agricultural Technology

Technological change in the agricultural production process has been a continuous process in the Indian sub-continent for over a century, though the spatial nature of its adoption means that for individual villages change is often stuttered through time. Of the various types of agricultural technology, irrigation technology, through the construction and extension of rainwater storage and distribution systems and the improvement of groundwater utilizing technology, has been most important in increasing net cultivable area. Hybrid seeds, chemical fertilizers, pesticides and weedicides have increased land productivity, while the mechanisation of some agricultural operations has, arguably, increased production efficiency through the reduction of costs and waste and enhancing production capabilities.

The imposition of technological change, however, on traditional farming and social systems often results in paradoxes of wealth maldistribution, employment reduction, and even resource depletion. Moreover the stuttered nature of technological change or availability for different regions or villages often means that the resulting change is a fast and dramatic process. And because technologies must often be used in combination this effect is accentuated.

The introduction of irrigation technology (especially large scale canal irrigation) has had wideranging effects on the structure of agricultural production.[1] By enhancing productivity, hastening the switch from subsistence to commercial crops, stabilising output, and increasing land values, irrigation technology has the potential to profoundly affect social relationships in the village, and the external relations of the village. The increasing use of small scale irrigation technology, such as tube-wells or motorised powersets (started before the "green revolution" with the use of diesel powered sets and continued since with the use of cheaply run electric powered sets) have similarly altered the production process and thus effect social relationships within the village. Moreover, the use of

1 See for example Kapp (1959).

powersets may have the effect of concentrating the control of sources of irrigation (Dhavan, 1975).

Much has been written on the effects of the "green revolution" a package[1] of hybrid seeds[2], chemical fertilizers, and pesticides, combined with irrigation improvements and the adoption of new agricultural practices, which was introduced from the mid-1960s as part of a planned government sponsored extension programme. Although the adoption of High Yielding Varieties (HYVs) has resulted in greater output[3], the "green revolution", far from

literally helping to fill hundreds of millions of rice bowls once only half full.

as claimed by Brown (1970), has been criticised for increasing inequalities of income, and increases in poverty.

Although the scale - neutrality of HYV-based technology means that proportionally similar increases in productivity are possible, the extent of its adoption varies with the size of holding, largely because bigger farmers are better able to pay the price of inputs. Frankel (1971), among others, has shown

1 Farmer (1977) has pointed out that though the "green revolution" is often envisaged as a "single transfer able indivisible package", in practice the farmer finds only some part of the package acceptable. However, viewed as a village or regional phenomenon, the package has been adopted.

2 It should be emphasised that hybrid seeds are not the invention of the "green revolution". New varieties, as well as the other inputs of the package, have been available to the farmers since the early part of the century (see Nanjamma Chinnappa (1977) for Tamilnadu). However, it is the enhanced productivity of the new dwarf varieties, with their combined inputs, which has made the green revolution important.

3 For example, Tamilnadu was transformed from a deficit state in the production of rice in the mid-1950s, to a net exporter of rice by the late 1960s (See Mencher, 1974a).

how the distribution of income from agricultural production tends to be proportionately greater for larger farmers. The increased profitability of larger holdings has accelerated a process of social polarisation, the breakdown of traditional patron-client relationships, and increased rural political conflict (a phenomenon also mentioned by Mencher, 1974a)[1]. The effect of the "green revolution" on employment has been mixed. Bardhan (1977) in a review of recent literature on rural employment in India, shows that although labour demand may have increased with the increase in cropping intensity made possible by the combined use of irrigation facilities and HYVs, associated mechanisation (especially tractorisation) may result in labour substitution.

Thus, while it is important to assess the extent to which technology has enhanced production capabilities, equally important are the effects of its introduction on income distribution, on social relationships and on employment patterns.

1.3 The analysis of change at the village level

The analysis of processes within the village necessitates a definition of the village. The village may be defined as the population resident within the administrative boundaries of the village,[2] and the immediate physical and economic factors which serve to perpetuate the settlement of population. Thus the natural resources (land, soil, rainwater, streams, groundwater, fauna, vegetation, etc.) and the resource-controlling systems

1 The extent to which political conflict is a new problem is questioned by Harriss (1977b).

2 A wider definition than that of "population resident within a nucleated settlement" is necessary as the village may comprise hamlets or dispersed isolated settlements.

(of irrigation, drainage, agricultural production, industry, settlement, communications, markets, power supply etc.) if directly regulated by the resident population are considered part of the village along with the population of the village itself. Thus it is population and the support of population which is important here; there is a direct implication of a symbiosis of man and land, which has a physical and a locational identity.

Variations in the distribution of wealth may be brought about by the inter-action of three major variable groups: of population, production, and distribution. If the level of living for a population may be defined by the ratio of production to population, the level of living for an individual or a group within the population is defined by the relationship between production and distribution.

Three major steps towards the analysis of the relationships between these variable groups are necessary:

1. The identification of variables characterising the three major variable groups of population, production, and distribution. As the implication of process is change through time, where possible, variables must be given a temporal dimension.

a) Aspects of population which would ideally be considered include the basic descriptive indices of numbers and composition by age and sex, population dynamics (fertility, mortality, and migration patterns), the social organisation of population (household organisation and caste), and other attributes of population (including occupation, education and income).

b) Production indices necessarily include resources, the use of technology for production, total production, aspects of the production process (including labour demand), and the use of production.

c) The two aspects of distribution which must necessarily be considered are the control of the production process and the relationship of control of the production process with the role of population in the production process[1]. From these considerations arise a series of possible relationships with production and population.

The identified variables all hold close interrelationships within each group which must be identified.

2. The identification of relationships between variables of the different major variable groups. This must be made with special reference to the two major factors of population increase and technological change identified above.

3. The identification, <u>for the sample villages</u>, of the salient features of a total relationship through time.

Thus it is the overall plan of the thesis, after the introduction of the Region, sample villages, and research methodologies used (in Chapter 2), to consider in turn the changing nature of population, production, and distribution[2] (in Chapters 3 to 5 respectively). Next the strengths of the

1 In Marxist terminology, the ownership of the means of production and the relations of production.

2 Re-termed "class relationships" in Chapter 5.

relationships between variables of the three major variable groups, between population and production (Chapter 6), between population and distribution (Chapter 8), will be analysed. Finally chapter 9 will analyse the processes in their totality assessing the potential relevance of this analysis to other villages.

Because the three major variable groups may embrace a wide range of identifiable variables, given constraints of time for data collection, and of data availability, there occurred large gaps in both record and survey data. However, it is often possible to infer the nature of relationships between variables: where there are temporal gaps inference may be made with single time point data, and where variables are totally missing either surrogate variables must be identified and recorded, or the inference must be made through logical analysis[1].

An important feature of the variables under consideration is that they lend themselves to different descriptive scales. While population and production variables are primarily characterised by aggregate description, using quantitative techniques for analysis, the analysis of distribution variables is necessarily concerned with descriptive relationships, such as that between owner and worker, or of the variance of totals. Poverty is a function of both aggregate wealth and inequality.

1 Chapter 2 describes the extent to which it was possible to gather and quantify various data.

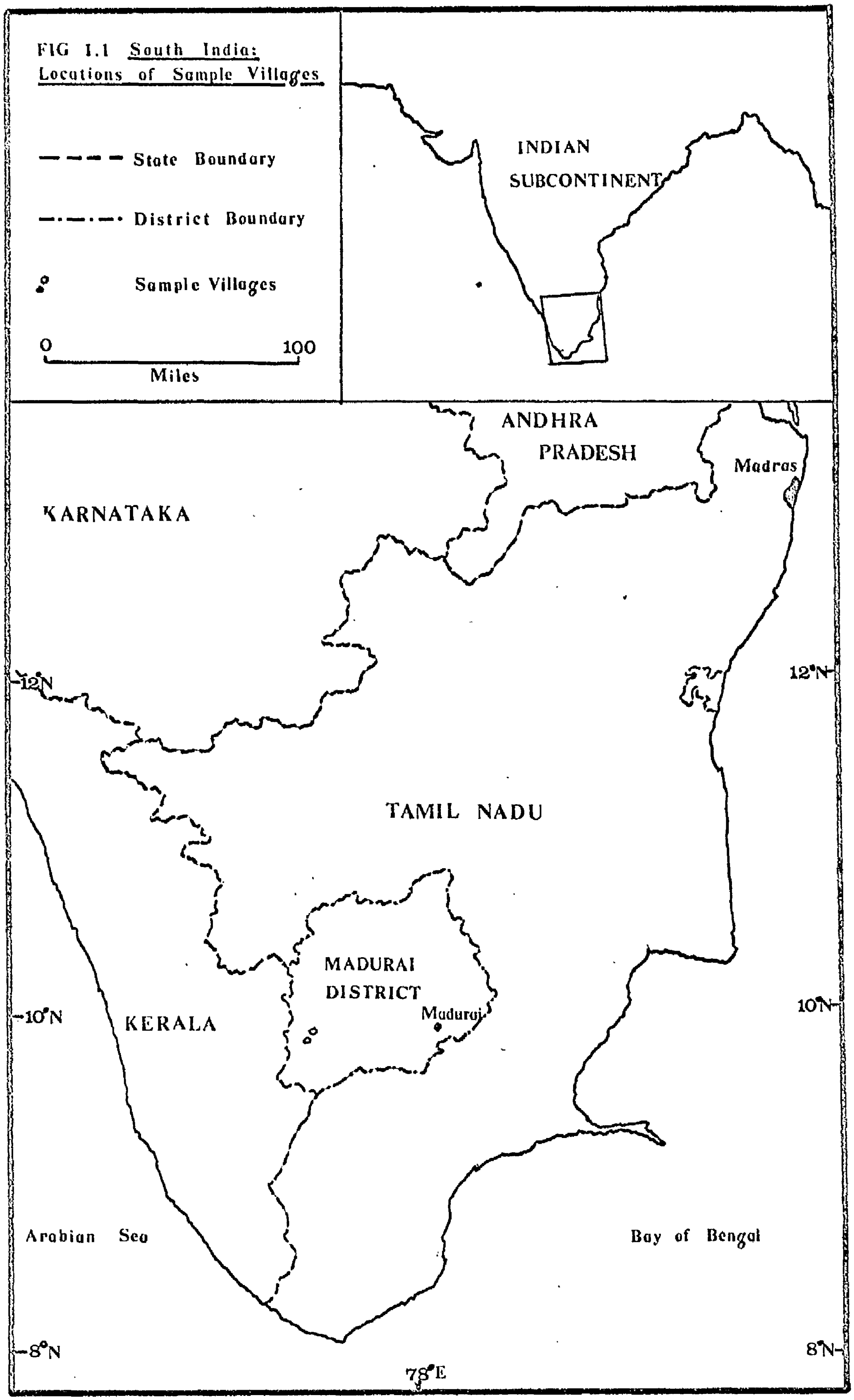


FIG 1.1 South India: Locations of Sample Villages
State Boundary
District Boundary
Sample Villages
0
100
Miles
INDIAN SUBCONTINENT
ANDHRA PRADESH
Madras
KARNATAKA
12°N
TAMIL NADU
MADURAI DISTRICT
Madurai
10°N
KERALA
Arabian Sea
Bay of Bengal
8°N
78°E

Chapter 2

The region, the sample villages, data collection, and data processing

2.1 Introduction

The nature of the region in which the sample villages are located, the criteria for and problems associated with the selection of the sample villages, as well as the methods of data collection and processing within the village, are all interrelated subjects.

It was thought necessary to choose more than one sample village, both to verify the assumption that different villages within a region could be subject to similar processes (although reacting to change in a different manner), and to better understand how processes are modified by environment. In order to minimise the possibly differential effects of spatial and temporal change, it was necessary to choose sample villages located close to each other within an identifiable region. The desirability of examining the effects of environmental contrasts necessitated choosing a region which exhibited marked environmental contrasts, thus allowing the proximate location of environmentally contrasting villages.

The need to gather village level data as well as the need to avoid contrasts in the effect of revenue collection on social relationships in the village meant that villages of similar revenue settlement method were chosen.

This chapter will outline the salient features of the region, and the context of the region in Southern India, and similarly of the sample villages in the context of the region. The methods of data collection, and data processing will then be examined.

2.2 The region, Kambam Valley

Kambam Valley (Fig 2.1) is located in Madurai District, in the state of Tamil Nadu, on the state border with Kerala. It is bordered by the scarp slopes of the Cardamom Hills to the west and south and the Varushanad Hills to the east.

This main valley, about 50 miles by 15, is flat floored at about 1000 ft, and from its relations with the surrounding hills would seem structural in origin

Spate (1954).

The valley's flatness is disturbed only by two series of inselbergs which reach up to 1000 ft above the valley plain running south-west to north-east on either side of the Suruli River[1], which drains the valley. The River Suruli is now a perennial stream[2] which acts as the distributor of the stored water of the Periyar Dam in Kerala, which is turned by a tunnel blasted through the watershed down into the Kambam Valley.

1 One of these inselbergs is shown in Fig 2.2.

2 Before the advent of the Periyar irrigation project, the Suruli River was described as "extremely uncertain in flow and rarely fresh for more than a few days at a time", Director of Statistics, Madras (1965).

The climate of the region may be classified as tropical savannah (Köppen Region), with a bimodal rainfall distribution reflecting influence of the South-Westerly and more important North-Easterly monsoons, and largely uniform high temperatures. Fig 2.3 gives average monthly rainfall totals, and maximum and minimum temperatures for Puthupatti, a centrally located village in Kambam Valley. The rainfall totals for the period from 1935/36 to 1964/65, show a yearly average of 701.8 mm. For 5 of these 29 years, rainfall totals fell below 500 mm, a mean of 1 in 5.4 years. During the period immediately before the time of the survey, from 1971/72 to 1977/78, in only one year, 1974/75, a year of general drought in Tamilnadu, did rainfall totals fall below this figure. It was commonly assumed in the sample village that rainfall totals had been falling over time, and popular opinion ascribed the fall in water table in the region during the ten years before the survey to this assumed trend.

The gneissic bedrock of the Kambam Valley gives rise to ferruginous yellowish-red to dark-red slightly acidic loamy soils, usually well drained (Spate, 1954, and Soil Survey and Land Use Organisation Coimbatore, 1979).

> Into these soils the water draining the mountain slopes penetrates very easily, and the soil climate is comparatively humid even in adverse seasons.
>
> (Ramamurthy, 1948)

The agricultural system of the Kambam Valley is profoundly influenced by its irrigation systems. The Periyar Scheme, initiated at the turn of the century, affords the facility of double cropping to a narrow strip of land running on either side of the Suruli River. Water is released in May to wetlands located higher in the valley, successively to villages further north during June,[1] and made available for about 9 nine months. This is sufficient for two crops of paddy, the dominant crop; a third dry crop is possible after the second harvest.

Paddy has for the most part been double cropped on these lands since the inception of the scheme in 1895[2], although there had been a tradition on the part of some farmers, which is caste based, to grow betel vine. Recently from about 1975 to 1978, sugar cane has been cultivated on some lands close to the distribution channels which are able to secure a longer and more reliable water supply.

Elsewhere in the valley well and tank irrigation, often acting in concert, are the main sources of irrigation. Traditionally well water was either extracted with a human operated lever system, the ettram, or a bullock drawn machine, the kamalai[3]. Availability of water was limited seasonally and varied with rainfall; tanks caught the runoff from monsoon rains, while wells filled during the wet seasons as the water table rose. Recently, the increased depths from which water may be extracted with powersets has seen the relative increase in the importance of wells[4] at the expense of tanks,

1 This phased release is reflected in the phased timing of cultivation, and thus of harvests in the Kambam Valley.

2 There were several anicuts on the Suruli River before this but of less reliable supply.

3 Termed "kabalai" or "kavalai" elsewhere in Tamilnadu.

4 That wells were not recognised as important irrigation sources, is seen in the omission of wells as sources of irrigation from the calculation of revenue rates during the first and second permanent settlements (c.1885 and 1915).

most significantly because of the general fall in water table resulting from water "mining" by powersets[1].

Both irrigation sources have their distinctive cropping patterns. Cultivation under well irrigation was traditionally characterised by the polyculture of short duration millets, vegetables, and some cash crops, in contiguous areas of land surrounding the wells, called tottams (gardens). The form of cultivation under tank irrigation depended on the size and supply reliability of the tank. For the "remarkable" number of tanks under 50 acres in the region[2], cultivation was largely of the tottam type, often supplementing well irrigation. For larger tanks sufficient storage capacity allowed cropping of rice during the samba season (July/August to December/January).

Once the canal system had been constructed in the Kambam Valley, physiographical limits were set to its effective expansion. Tanks, similarly, being for the most part pre-colonial constructions[3] already maximising (within traditional limits of technological efficiency) the possible storage of surface water; expanded little during the 20th century. The tanks of villages located close to the Suruli River, which benefitted

1 Although there is no direct evidence for this observation (the Groundwater Department of Tamilnadu have been monitoring changes in groundwater level since the introduction of powersets, but have yet to publish findings) circumstantial evidence is seen in the deepening of wells throughout the region.

2 Statistics, Directorate of (1965).

3 Francis (1906) attributes their construction, and their small size, to the Polygar system of government and revenue collection operating under the Vijayanagar and Nayakka dynasties in the 14th to 18th centuries (but especially in the 17th century). The polygars "did much for the country ..... founding villages, building dams, constructing tanks, and erecting temples."

from the Periyar Scheme, had become storage tanks for canal water, as well as runoff. The area under wells, however, has expanded, first within limits imposed on the efficiency of drawing water from depth using traditional methods, and secondly aided by the increased output of powersets exploiting the artificially high watertable[1] of the central areas of the valley. The scale of some new gardenland estates which border on the canal irrigated lands of the valley (some of 100 acres or more) is out of all proportion to the traditional 7 acre tottam.

Since the introduction of powersets, which allow greater reliability of output, there has been a tendency to concentrate on longer-term cash crops such as banana, cotton or chillis, intermixed with short term vegetable crops to the exclusion of millets.

Drylands within the Kambam valley, which are usually located on the higher slopes of village land where access to groundwater is limited, grow generally one crop of intermixed millets sown in mid-August, following ploughing after the first monsoon rains, and harvested in December or January. Dryland cultivation patterns and techniques have changed little.

Francis (1906) shows how both wet and dryland cultivation were characterised by different intensities of labour and land preparation. Wetland was fertilised with the manure of folded sheep, farmyard manure, village rubbish, and greenleaf manure, while the "careless" (sic) cultivation of dryland, involved the ploughing in of stubble, and the application of manure at intervals depending on the distance of the field from the village.

1 Kept artificially high by the presence of the river and distribution channels.

Thus the use of livestock was important in the old agricultural system. As well as using bullocks for land preparation and irrigation, cattle and sheep were vital for manure. The need for livestock has diminished with the introduction of chemical fertilizers, pumpsets and tractors.

Crops are marketed generally at periodic markets within Kambam Valley, the most important of these being located at Theni (Fig 2.1), where the regional cotton market is located. Bananas are sent to Bangalore for marketing. A recent phenomenon, with the increase in banana cultivation in gardenlands, is the "banana contractor", usually resident in the large market towns, who buys the banana heads at the village, arranging their harvest and transportation.

Table 2.1 shows the indexed growth of population for various years from 1891 to 1971 (taking population in 1901 at 100), for Tamilnadu State[1], Madurai District, and Periyakulam Taluk[2] (the smallest administrative division which most closely corresponds with the Kambam Valley region), and for the two sample villages. It is clear from this table that the population of Periyakulam Taluk increased continually through this period at a higher rate than that of Madurai District, and that of Madurai District at a higher rate than that of Tamilnadu State.

Madurai District was a relatively sparsely populated district in the 19th century, and was generally an area characterised by expanding agricultural land area and production

1 Or its respective constituent districts within the Madras Presidency.

2 Comprising for 1971 Periyakulam and the new Uthamapalayam Taluks.

and high growth rates, maintained by net immigration.[1] From 1871 to 1901 the population of Madurai District grew by 29%, compared with 22.1% for the Madras Presidency (Francis, 1906). In this respect, Kambam Valley was especially prominent. Periyakulam Taluk, which grew 21.6% in population from 1891 to 1901.

> benefitted considerably from the Periyar water, and opening up to the cultivation of tea and coffee of the Kannan Devan Hills in Travancore to the west of it.
>
> (Francis, 1906)

Also important were the cardamom estates being developed in these hills, both through the opportunities for labour and the huge profits of ownership they provided for some valley residents.[2]

Growth within the valley was especially concentrated in settlements located on the banks of the Suruli River, for example Uthamapalayam, (Fig 2.1) which grew by 57% from 1871 to 1901, suggesting that this accelerated growth was principally due to the immigration of labour for work in the newly productive lands of the Periyar project. Growth through immigration during the 19th and early 20th centuries, however, was a continuous process related to the general expansion of agricultural area in the valley.

By the early 20th century, most of the valley floor had been brought under cultivation. Of land considered available for cultivation in Periyakulam Taluk, 78.8% was classified as "occupied", and a further 6.3% as "current fallows", leaving

1 Other parts of Tamilnadu were characterised by net out-migration, especially to Ceylon.

2 The ownership of cardamom estate land was, and still is, concentrated in villages located on the western side of the valley, as well as in the centrally located towns.

14.9% "cultivable waste other than fallows"[1].

During the 20th century population in the valley continued to grow at a faster rate than that of Madurai District and Tamilnadu State. Although the district suffered from epidemics of smallpox, and especially cholera, famines were a thing of the past[2], and plague was controlled by 1940[3]. Mortality may have been reduced further by malaria control and smallpox eradication programme since independence.

The population is dominantly Hindu, though there are isolated significant minorities of Muslims and Christians (mainly Roman Catholics converted by early Portuguese and Spanish missionaries), who adhere to the caste system. Francis (1906) noted the lack of a significant number of Brahmins in the population, and attributed it to the fact that

> large sections of the community regard it as in no way necessary that their marriages should be performed, or their funerals attended by any kind of professional priest.

reflected also in the abundance of non-Brahmanical deities in the region. However, perhaps more significant is that the Kambam Valley, at least until the 20th century, fell below the level of agrarian economy able to support a significant priestly caste, such as existed in Thanjavur District. The lack of any significant development of the division of labour in the region is seen in the relatively high proportion of ownercultivators (87%) among the agricultural population of Madurai District in 1901, and the low proportion of farm servants as a proportion of labourers (10%)

1 The proportions for Madurai District are 79.8%, 10.0% and 10.2% respectively.

2 5 major famines were recorded for Madurai District for the 19th century, the last of which was the "great famine" of 1876 to 1878.

3 Statistics, Directorate of (1965).

(Francis, 1906).

The communciations network of the Kambam valley may be described as a central trunk of communication running along the floor of the valley close to the river connecting with branches of communication to villages on either side of the river. The main road is metalled and carries a mixture of buses, lorries, a few cars, motorcycles, bullock carts and pedal cycles. Roads connecting the other villages with this central band are a mixture of metalled, otherwise made roads, and dirt tracks. The efficiency of communication is thus haphazard, is liable to break down during periods of heavy rainfall, and needs must be constantly repaired. The metal-rimmed wheels of bullock carts accelerate the deterioration of these temporary repairs, and thus an important "off-season" industry is road repair. All villages in the region are connected by the bus routes of independent companies.

Madurai district had been finally annexed by the British by 1801, although they had had some interest in revenue collection from the area before this date. The revenue history of Kambam Valley shows that the government at first thought it profitable to farm out land to palayams, characteristic of the original polygar system, small administrative units, each comprising a handful of villages. Within a few years a pattern of ryotwari settlement in the more profitable parts of the valley, and zamindari settlement for the tankland areas to either side of the river in the north of the valley was established. 49% of the area of Periyakulam Taluk was left under zamindari settlement until the abolition of zamindaries after indeoendence. The machinery of the revenue administration continues to act at district, taluk, and village level, although the real value of payable kist has fallen with inflation[1], as a system of local government, and data collection.

The Community Development Project, launched in 1952, has organised the valley into 5 blocks, and is linked with the revenue administration in an effort to bring about community development at village level. Elected panchayats have limited powers to initiate development at village level, while the organisation of the block with on the one hand its connections with government departments and on the other hand its connections with the village through the Village Level Worker, has the potential to facilitate development programmes.

Thus while the Kambam Valley contains many of the features of rural India, it has its own distinct regional identity. It has a regional economy which is emphasised by its mountain boundaries. Its population is increasing atypically fast largely because of its expanding agricultural production. There are large contrasts of production process within agriculture; while its dryland and gardenland cultivation may be compared with those of large tracts of Salem and Coimbatore Districts, the close coincidence of very productive wetland (which is more highly priced than that of the fertile Cauvery Delta) and gardenland (tank and well irrigated) and dryland, make it perhaps a unique area in southern India. It lacks a history of mirasdar-type exploitation by an elite, while it is not dominated by economic integration with a nearby major urban centre.

1 It had been the intention of the colonial government to resurvey and reassess land every 30 years. The last settlement of 1915 has been allowed to stand.

2.3 The sample villages

The process of choice of the sample villages naturally proved to be an exercise in compromise between seeking optimum research advantages and overcoming practical data collection limitations. Although numerous settlements were theoretically available for study, the choice was eventually narrowed to a handful of cases, even though the chosen region was ideal in affording spatially concentrated environmental contrasts.

The primary consideration was to choose villages which had not been significantly affected by differences within the region of external factors acting on the village. Thus it was necessary to choose villages of similar administration history and access to urban areas of Kambam Valley. (Some of the settlements defined as "urban" in the 1971 Census by virtue of their population sizes were in reality very large villages with a developed tertiary sector.) The large propotion of zamindari land could not be considered for study because of the possible effect of the change from zamindari to ryotwari assessment on the economy of the village and because a continuous series of land revenue data for both the colonial and independence periods would not be available[1]. While similar proximity to urban areas was also a criterion, it was felt that the study of villages which had become physically and economically almost an extension of urban areas would need special analysis outside the scope of the thesis. Therefore it was considered necessary to choose villages located at least three miles from urban areas.

1 Many villages originally under zamindari settlement in the area did not complete ryotwari settlement until 1960.

Secondly, because demographic data were required, only those revenue villages which were single settlement villages, except those revenue villages including only small hamlets or cheris (i.e. less than 200 population), could be considered for study. Many villages contained more than one identifiable nucleated settlement (indeed many nucleated settlements crossed revenue village boundaries) thus making impossible any analysis of census data on population change through time.

Thirdly, because of the skewed nature of land ownership distribution typical of the Indian village, it was felt necessary to make a total survey of households and land ownership and operation. Therefore villages with large populations had to be excluded. A maximum practicable size was considered to be about 2000 (which would contain about 350 to 400 households). The villages chosen both had populations at the time of the previous census (1971) of 1428 and 1584 with 305 and 329 households respectively. These villages were at the lower end of the range of available single settlement ryotwari villages in the region[1], emphasising the narrow range of possible study villages.

(If the rates of population increase for the region and the villages are compared (Table 2.1), it will be seen that the proportional increase from 1901 to 1951 for the region (57%) is similar to those of the sample villages (62% and 54%). Thereafter the rates of increase for the region are faster. The implications of this trend will be discussed in the thesis.)

1 This level of population is, in fact, higher than that of most other village surveys conducted in India (See e.g. Dasgupta, 1975). The real average size of the Indian village is perhaps impossible to gauge because of the differences between revenue villages and nucleated settlements already mentioned.

Fourthly, because of the importance of land record data, villages where the access to records with the aid of interpretation by the village karnam (accountant) or other village officials seemed a reasonable possibility, and where the records could reasonably assumed to be accurate[1], had to be chosen. In this I was perhaps lucky.

The final choice was made of two villages quite close to each other (4 miles), which generally satisfied these conditions. These shall be termed Village A and Village B; their locations within Kambam Valley are shown in Fig 2.4.

Both are approximately equidistant from Chinnamanur, the nearest periodic market town, and their effective access to Theni, the important regional market is not dissimilar. The fact that residents of Village A are linked to Theni (9 miles away) directly by bus is balanced by the fact that the Theni road is in poor repair and buses infrequent. (During the months of March to May, when the river is low, Village A residents may cross it on foot to have direct access to the Chinnamanur-Theni road.) Both villages have their own panchayat, though Village B is classified as a minor panchayat, and each shares a village level worker with adjacent villages. Both villages are electrified (Village A in 1967 and Village B in 1968). Their similar population sizes through time and areas (Village A 1163 acres, and Village B 1217 acres) facilitate contrasts. Although, perhaps, this contrast is not the most appropriate one for Kambam Valley as a whole, the villages are to be analysed here as separate entities, and the region seen only as a backcloth to change.

1 By normal standards of accuracy.

2.4 Data collection in the villages

Chapter 1 gave a list of the identifiable variables within the three major factors of change, production, population and distribution (or class). Ideally data representing change over time in all identified variables of these factors would be collected and the results analysed within a framework of change over time.

Although this high ideal was impossible, using both village records and survey techniques, data were collected on a large proportion of desired variables for both single points in time, and through time.[1] A number of methods of data collection was used, allowing a synthesis of the best advantages of records, observation and interview techniques. As Djurfeldt and Lindberg (1975) have observed

> If the aim is to avoid construction of artificial realities, data must be multiplex and complementary, i.e. collected with a variety of techniques.

A list of data sources is given below. (Where relevant in the course of the thesis the technique is outlined more fully. Otherwise Appendix A details more exactly the technique used.)

A. Systematic Survey Techniques

1. The count. A total survey of all resident individuals as grouped into commensal households, giving basic details of age, sex, occupation, caste, as well an estimate of land ownership.

1 The unit of time varying, but usually representing one (agricultural) year.

2. Family Lineage Survey. A total survey of the patrilineages of resident households[1], going back in time as far as memory would permit (usually to about 1920), giving approximate dates of family partition, dissolution, and the migration of lineage members. For a sample of patrilineages, data on changing landownership was collected.

3. Land Survey. A total survey of lands within the village ownership zone (a zone of contiguous land containing the majority of land owned by village residents[2]), giving details of landuse type, cropping patterns within drylands, and irrigation technology.

4. Well Survey. A questionnaire answered by the operators of wells identified in the landuse survey, and supplemented by observation and the use of land records (see below), on changing technology, and well depths, and the changing gardenland area irrigated, and area owned, as irrigated by individual wells.

5. Sample Household Survey. Random sample survey of households (17% of households in Village A, and 18% of households in Village B), asking details of cultivation practice, including labour demand within the three main landuse types, data on seasonal migration and on the labour activity of the household at the paddy harvest.

B. Record Data.

1. Census Material. Village level aggregates of population,

1 98.7% of households in Village A, and 97.2% of households in Village B were surveyed.

2 A more complete definition of the village ownership zone is given in Appendix A.1.

households, and sex ratio, for decennial censuses available from 1891 to 1971.

2. Settlement Records. Detailed surveys by the revenue department of village lands for 1885 and 1915, giving assessment of rent calculated from average soil fertility and irrigation capability. The detailed map (16 miles to the inch) gives physiography, field boundaries, landuse and irrigation facilities. The 1885 settlement gives a list (the chitta) of land title (patta) holders for the revenue village for the revenue village. Also given at both settlements are crop totals. The 1885 register gave a survey of well depths. The 1915 register detailed assignments of previously unowned land from that date to the time of the survey.

3. Adangal (crop record). This gives for each surveyed field the area of cultivation of crops for each month of the year. Only the adangals of some of the early 1960s, and 1968/69 to 1978/79 inclusively for both villages were available[1].

4. Chitta (list of patta holders). This gives for land of the revenue village the names of patta holders, the survey number of the fields owned, and the dates of previous transfers of land for each patta. As this record refers only to the lands of the revenue village, rather than lands owned by residents of the village, data referring to non-residents had to be identified and subtracted from processing. Also the chittas of other revenue villages had to be examined to discover land owned by sample village residents. Generally data were available for Village A residents from 1947 to 1978, and for Village B residents from 1926 to 1978.

1 I had arrived 2 years too late to use records from the adangals of previous years, which had been destroyed to make space at the Taluk record office.

5. Tenancy Register. A list of wetland tenants on the (revenue) land of village A, drawn up in 1972 and unrevised.

C. Other Sources.

Apart from general observation, and occasional interviews, two other sources of identical data proved useful. First, the personal accounts of Selleya Pillai, a self-taught bookkeeper, a wetland and dryland farmer of Village A. Amongst numerous other sets of accounts he had kept records of expenses and income of his lands from 1953 to the time of the survey, which gave exact details of all financial transactions. These included the dates and details of payments to labourers, and thus the production process. Secondly, a list of persons contributing to the harvest pongal after the second paddy harvest in Village A, who had taken part in the harvest under the organisation of Sinnadore, a kottukarin (labour contractor).

2.5 Data Processing

The aim of data processing was to gain as complete and accurate as possible a picture of the changing values of variables identified within the three factors of change within the village (as defined in Section 1.3).

Population indices were derived from the Count, Family Lineage Survey, and Census material. Categorised data were available from the Count for population composition, social organisation (caste and household), occupation and education (viewed as an occupation). No data were collected for income. Thus the quantitative analysis of income is omitted from this thesis. The form of data collection allowed the crosstabulation of various population attribute categories, and the use of population as a base for the subsequent analysis of the agricultural system of the village. Some aggregates for the Count (total population, males and females, and households) formed an extension of past Census record totals (though past age and occupational compositions could not be derived from Census records). The estimated household totals from Family Lineage information could be checked against Census record totals, allowing the use of Family Lineage information for migration estimation. No systematic survey of fertility or mortality was carried out, and, as no past data existed at the village level, the analysis of growth relies on available decennial aggregates, combined with the use of migration estimates.

Production indices were derived from the Land Survey, the Well Survey, the Sample Household Survey, the Adangal, and the Chitta, supplemented by information from other survey and record data. Bearing in mind the definition of the village, it was necessary to collect information relating only to the resident population, and thus data could not be related to a fixed area through time, but to a continually fluctuating area related to the relationship of production with population. However, because of the difficulties of correlating past resource and population data for the whole village, aggregate change for some production indices for the village had to be defined according to a village ownership zone within the village,[1] justifiable because of the close past and present relationship between population and

1 For the sample of patrilineages, however, no such restrictions were necessary.

and production within that zone. The definition of this zone was indeed a "multiplex and complementary" process.

Spatial variations of resources were surveyed in the Land Survey, and the distinctive combinations of the use of resources, in the context of irrigation technology allowed the definition of landuse types. The distinctive production processes of the different landuse types allowed inferences to be drawn as to the changing nature of production in the villages. Information on production processes was derived from the Adangal, giving crop area for individual fields for different months (thus allowing, within certain constraints, the compilation of aggregates for village-operated land, and the assumption of past cropping patterns). This information was supplemented by data from the Sample Household Survey, which also gave information on the use of production.

Correspondingly, the changing area under different landuse types could be calculated from the Adangal (because of known[1] past cropping pattern combinations for different landuse types), from the Land Survey (; it was possible to see where previous changes in landuse type could have been possible), from the Well Survey, and from other record data including the chitta[2].

No reliable information on exact production totals could be derived from the records. Nor was a systematic survey of production totals possible at the time of the survey. The

1 From the Sample Household Survey.

2 Although, except for the distinction between wetland, and dryland the Chitta carries no information on landuse types, the locations of owned land give clues as to its use.

quantitative analysis of production, therefore, like income is omitted from the thesis.

Distribution variables analysed included necessarily landownership, categorised into landuse types giving a simple but meaningful[1] context of productivity and value to the analysis of landownership. Past and present landownership were calculated using the multiplex techniques already outlined for population and production indices. The basis of the calculation of "present" ownership was the Chitta, as interpreted by the village officials and informed residents, for ownership of land by households en umerated in the Count. Supplementary information from the Land Survey, the Sample Household Survey, and the Family Lineage Survey gave this interpretation a more accurate form. Past ownership was calculated (using present ownership as a necessary base) from a combination of the Family Lineage Survey and the Chitta, checked against other sources.

Indices of labour organisation were derived from the Sample Household Survey. The changing proportions of population in various roles in the production process could be deduced from the observed relationships between landownership and occupational patterns, extended to past ownership totals.

The analysis of the co-distributions of "processable" data was carried out both for the time of the survey, and over time. The nature of available data precluded a wholly systematic

1 More meaningful than aggregate area, a "rogue" variable which is often used in village studies, having the disadvantage of overestimating the importance of less productive and valuable land.

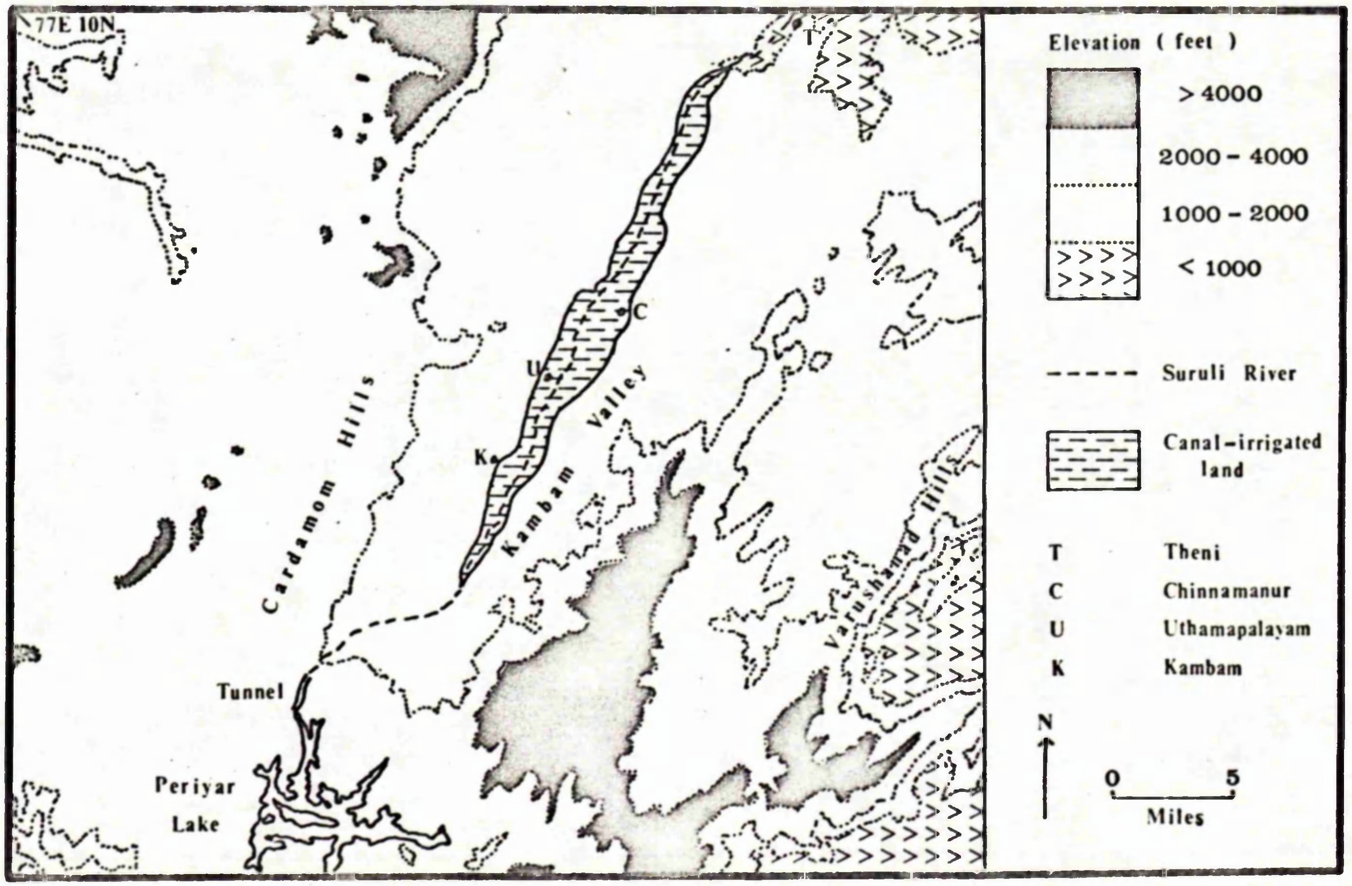
time-series analysis of change; data are increasingly unavailable and unreliable with receding time. The earliest data concerning either village is the population total in 1881. Aggregate time-point data were available at the 1885 and 1915 Settlements, which show the changing nature of agricultural production, but it is not until 1926 for Village B and 1947 for Village A that any systematic quantitative analysis concerning distribution, as well as population and production variables is possible.

However, no definition of the period of analysis is made . It seems likely that significant change where it has occurred in the production process has been recent (i.e. in the period of 20 years before the survey, and therefore inferences as to the past (before 1926 in Village B and 1947 in Village A) relationships between distribution and production, and distribution and population variables may be drawn from available data after these dates.

Yearly aggregates, where available, refer to the Fasli, a year of the Muslim calendar used by the Revenue Department for accounting, which corresponds as closely as any definition to the agricultural year[1]. In the text, the convention of referring to agricultural years as, for example 1972/73, will be modified to a single date, 1972.

1 From July to June.

FIG 2.1
KAMBAM VALLEY



2.2 View southwards from Village B, chillis drying ground in foregound, inselberg in background.

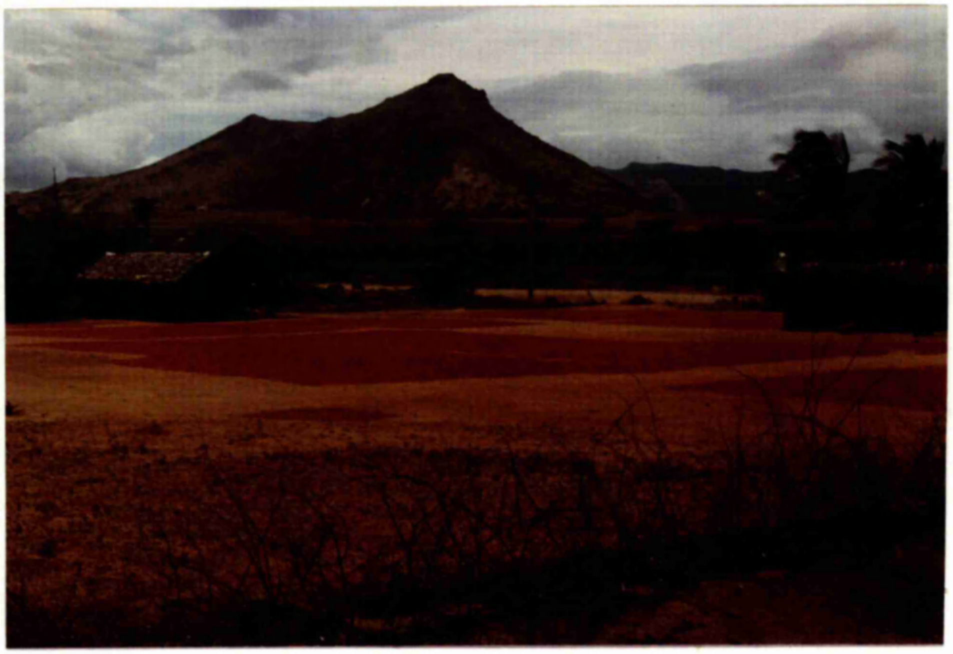
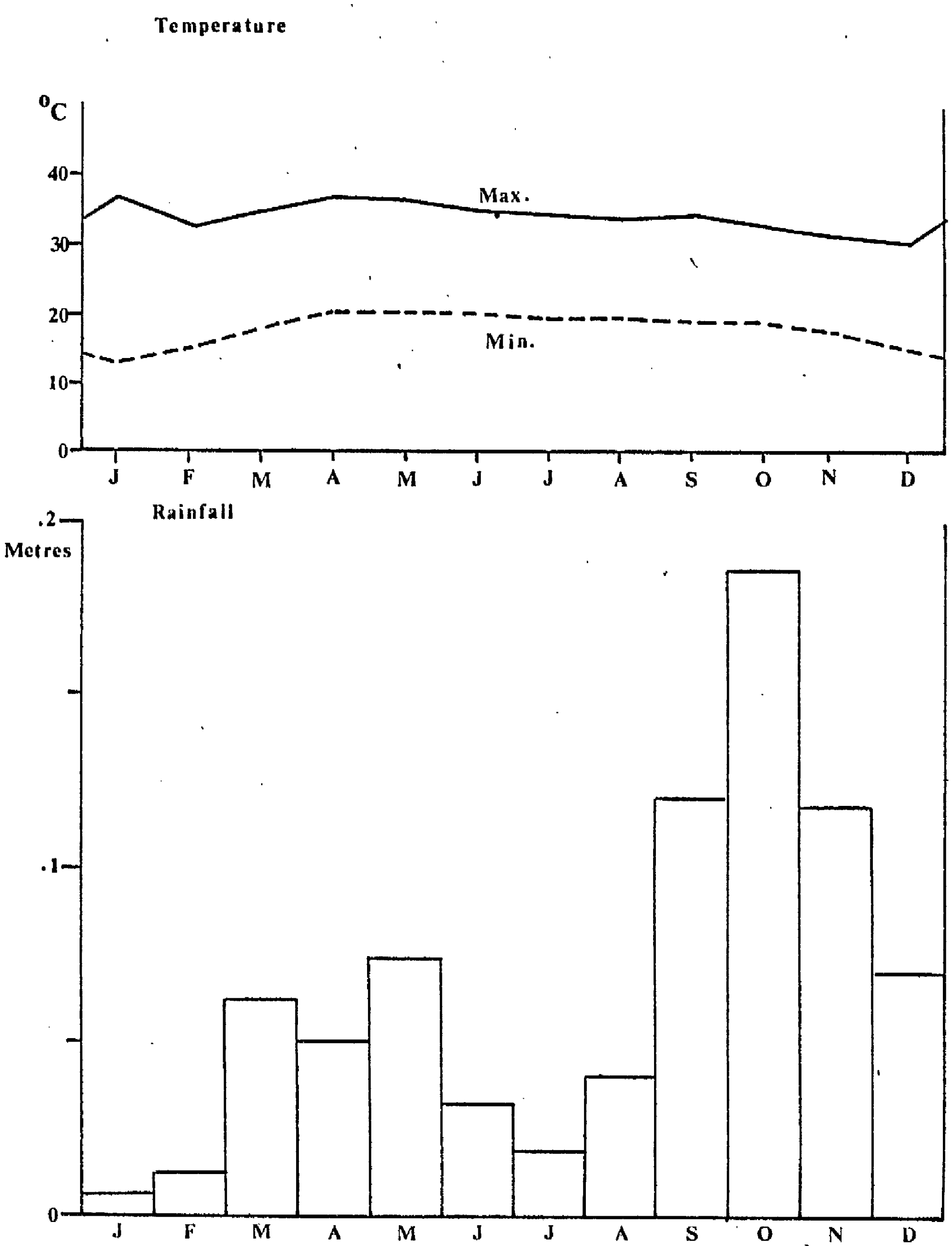


Fig. 2.3 Climatic Features of Kumbum Valley
Source : SSLO, Coimbatore 1979



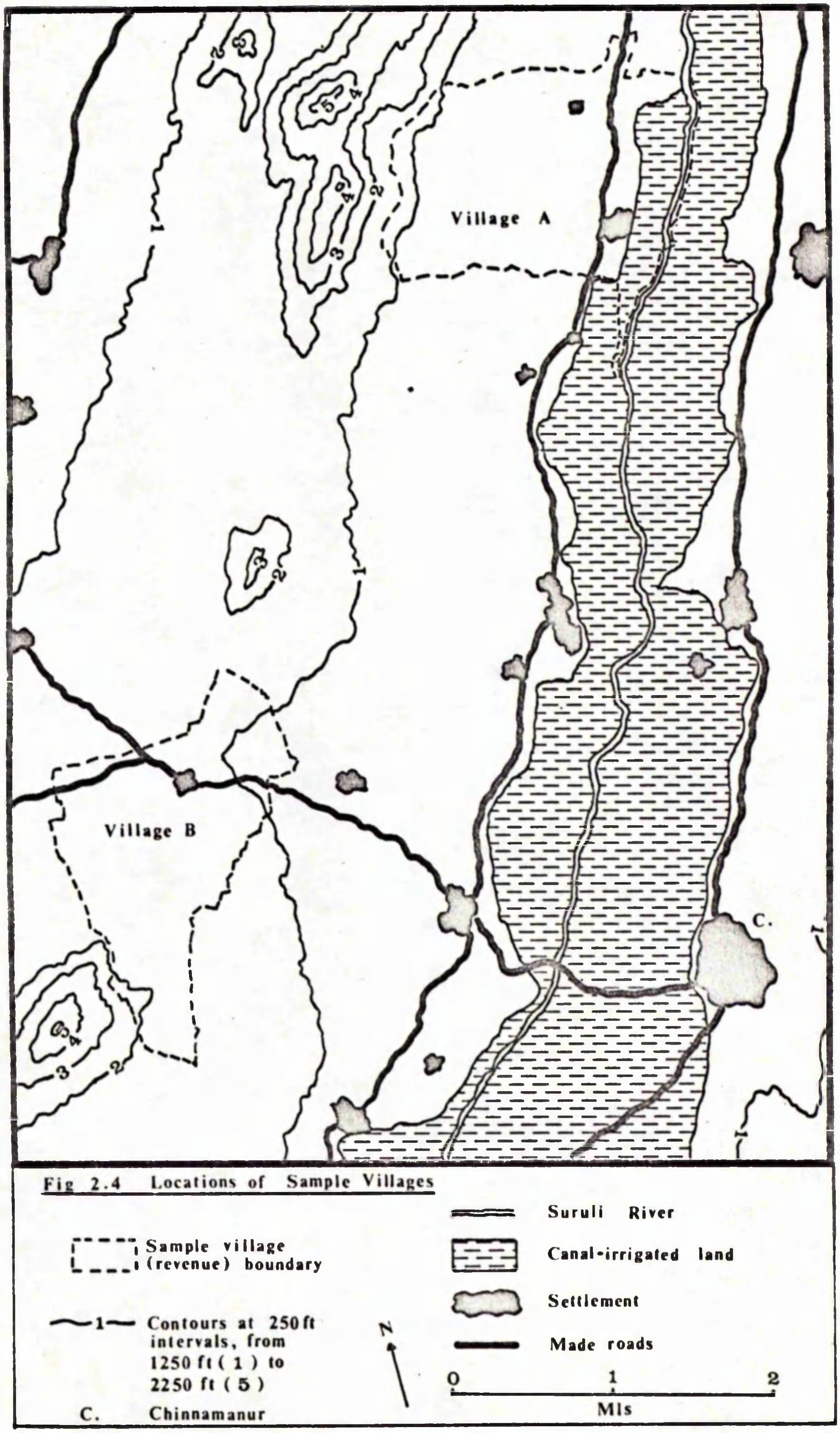


Fig 2.4 Locations of Sample Villages

Table 2.1 Indexed population growth, Tamilnadu, Madurai District, Periyakulam Taluk, and the Sample Villages (1901 = 100)

Year	Tamilnadu	Madurai District	Periyakulam Taluk	Sample Villages A	Sample Villages B
1901	100	100	100	100	100
1921	112.4	117.6	119.7	128.6	118.9
1951	156.4	170.0	156.7	162.4	153.6
1961	175.0	188.9	204.4	149.8	174.8
1971	214.0	231.8	253.3[1]	185.7	191.5

1 Including Uthamapalayam Taluk

Chapter 3

Population

3.1 Introduction

a. This chapter will outline the changing nature of population in both sample villages, and attempt to analyse relationships between demographic variables. Demographic indices have been selected to represent aspects of the villages' populations which may potentially effect the agricultural processes of the village, and the social structure of the village, subjects which are covered in succeeding chapters. These are: numbers, sex, age, household organisation, occupation and caste. As well as descriptive indices, this chapter will outline patterns of migration to and from the village from 1948 to 1978. No evaluation of changing fertility and mortality in the villages was possible, however, because of the lack of reliable records and time to undertake an investigation.

b. Data are available through various periods of time from 1891, the date of the first available village level census, to the time of the survey, depending upon the methods of data collection. Data were gathered from three main sources:

1. Village level Census of India material, giving decennial figures for total population, sex ratio, houses and/or households, and for varying categories of occup ation in different years.

2. A Count carried out by the author in both villages for all residents, collecting data on numbers, sex, age, household organisation, occupation and caste[1].

3. An investigation of the geneaologies of the heads of resident households, which, as well as yielding important information on changing patterns of household evolution, and numbers of households, gave information on migrational patterns from 1948 to 1978.

c. The three succeeding sections will deal with the results of the Count, an investigation of changing population indices, and an analysis of migrational patterns for both villages.

d. Caste and occupation are grouped with number, age, sex, and household organisation as demographic indices, because, although they reflect the economic and social organisation of the village, they are also closely related to demographic process. Castes, although they are units with distinctive, if changing, characteristics of social status and religious organisation, are endogamous units, and therefore define groups acting demographically within different recognisable patterns. Occupational groupings may be closely related to indices of age, sex and household organisation for the village as a whole.

3.2 The 1978 Count

A preliminary count was undertaken in both villages to

1 The close correspondence between the numbers of individuals and households in both villages allows numerical comparisons (rather than proportional) comparisons to be made in graphical or tabular form.

obtain basic demographic data on numbers, age, sex, household organisation, caste and occupation. This also provided the data base for subsequent surveys on migration, landownership and landuse.

This section will present the results for both villages and crosstabulated the demographic variables using both interval and nominal scales. Tests on the relationship between variables are made with the Chi-squared distribution, a non-parametric statistic which makes it unnecessary to assume a normal distribution. The value of the Chi-squared statistic, the total of functions of the difference between the observed and expected frequencies of the co-distribution of two variables, indicates the strength of a relationship between the two variables. The level of significance[1] of the Chi-squared statistic measures the probability that the two variables are inter-related.

3.2.1 Basic Demographic Characteristics

Table 3.2 shows the total population of both villages, with male and female numbers. There is a significant difference between the villages in terms of their sex ratio (99.5%), the reason for which is not immediately apparent, and may result from a combination of factors, the analysis of which is beyond the scope of this thesis. However, the difference in sex ratio is

1 Five levels are used: not significant at 95%, and significant at 95%, 97.5%, 99% and 99.5%. The level of each test is shown for this section in parentheses in the text, not significant at 95% being shown thus: (N).

important in that it is consistent with migration trends and demand for labour in both villages, both of which are discussed below.

Fig 3.1 shows the composition by age[1] and sex of population in both villages. Assuming a constant ratio between the death rate of either sex for any age, proportional differences between numbers of either sex at different ages (in this case as grouped into classes) would illustrate differential migration rates between the sexes. For Village A, there is no significant difference between the composition of males and females by age, and there is no significant difference between the composition of females by age for both villages. However, there is a significant difference between the composition of males and females by age in Village B (99%) and between the age composition of males of both villages (95%), which is consistent with the greater proportional outmigration of males now between 13 and 22 from Village B. (The composition of population by age and sex for the hamlet of Village A is not significantly different from that of the village site.)

Fig 3.2 shows the composition of households by numbers in both villages. (There is no statistical difference between villages.) The average number in households in Village A is 5.13 and in Village B 5.22. The mode for both villages is 6. There are very few households of greater number than 9 in either village. Similarly the frequency distribution of the ages of heads of households of either sex (Fig 3.2) shows no significant difference between the villages. Most obviously there is a great difference between the numbers of male and female heads of household in both villages. The average age of heads of household for both

1 Intervals are geared to whole number responses, becoming greater with age, eliminating the inaccuracies of guessed ages, as far as possible by divisions between expected approximations to multiples of 5 and 10.

villages is close (44.0 in Village A and 43.7 in Village B), and the mode the same (33 to 42).

Table 3.2 shows the relationship between the age of the head of the household, which may be taken as a surrogate variable for the age of the household itself[1], and the household number. Although there are variations within different age groups, there is an overall curvilinear relationship between the age of the head of household and household size which may be seen to correspond to a cycle of household evolution. This is characterised by the expansion of the household through additions by birth during its early stages, and by contraction in later stages as the household splits up to form new family units. While for the highest age group, the greatest proportion is to be found in the 1-2 group for both villages, the greater spread of the distribution reflects the tendency of a limited number of households to develop into extended units with more than one set of married partners.

3.2.2 Caste

Table 3.3 shows the distribution of population by castes and numbers as grouped into endogamous castes. It can be seen that in both villages there are two numerically dominant castes, the Kulla Thevas and Pillais in Village A (forming 62% of households), and the Telungu Chettiars and Kurumba Goundas in Village B (forming 76% of households). Both villages have the same number

1 This concept is further expanded in Section 7.2.2.

of endogamous castes, 13,9 of which in Village A and 11 of which in Village B number less than 20 households.

The age composition of each of the numerically dominant castes (Kulla Thevas, Pillais and also Pallars in Village A, and Telungu Chettiars and Kuruma Goundas in Village B), compared with that of the rest of the village combined show no significant differences. The age composition of males and females of other castes show no significant differences with the age composition of males and females of the numerically dominant castes combined.

3.2.3 Occupation

Occupational categories and numbers are shown in Table 3.4. The numbers shown are not exclusive, and there may be duplication between (but not within) the various categories, except between "farmers" and "labourers", which is given a separate category, "farmers and labourers". Occupations were defined according to the employment providing the major source of income for any individual, although there may be multiple sources of income. Most occupation titles explain the nature of employment, but it is necessary in some cases to give a more complete definition, and indeed to outline the characteristics of each category.

The first category, "farmers", includes individuals receiving income from the net profits of owned or leased-in land, or livestock[1]. Thus this category includes agriculturalists (land farmers), and shepherds. The third category, "labourers", includes

1 "Farmers" also includes the dependents of heads of households defined as farmers, who work on the land, or with the livestock, which is owned or leased in by the head of household.

all those individuals who are generally available for daily paid labour of any kind, whether directly related to agriculture or not. As a coolie, an individual may be engaged for a specific job of work, or for a limited amount of time, and paid on completion in cash or kind. An attached labourer, however, works for one employer, generally a farmer, is available for work at all times, and is paid a salary, usaully in monthly instalments of cash. A kottukarin is a labour contractor, who organises labour for intensive operations at different times of the year, who receives an equal share of the wages given, as well as some extra payment from the farmer[1]. A minority of coolies also have another more specialised form of labour, such as shepherding, cattleherding, working as a stone cutter (in Village A), as a village menial[2], or transporting work with their own buffalo cart, but the majority of income is derived from daily wage labour.

The third category, "farmers and labourers", includes individuals who derive major sources of income from both types of work as defined in the first and third categories.

The majority of those in the fourth category, "Agriculture-related occupations", are involved with marketing. The cotton and chilli merchants buy local produce, and sell it at the regional market, at Theni. Vegetable merchants buy produce and sell it at local town markets. Banana contractors buy, and arrange the harvesting, transport and sale of bananas. The sale

1 The role of the kottukarin is discussed in Chapter 4.

2 "Menial" is the term used in the village.

of bananas. The sale takes place at Bangalore, Karnataka State. The one banana agent in Village B acts as a go-between between the farmer and prospective contractors, receiving a commission from the contractor. Rice merchants operate in the same way as cotton and chilli merchants. Cardamom and spice merchants operate outside the village, cardamom merchants operating seasonally, spice merchants being itinerant, and having stalls at local market towns. Sprayer operators, the fertilizer salesman, and the powerset mechanic, owe their occupations to new methods and technology introduced with high yielding varieties from about 1967.

"Caste occupations", the fifth category, includes three occupations common to both villages: barber, dhobi, and carpenter. The Arsari caste in Village A includes, as well as carpenters, six stone masons and a blacksmith. The Bangle merchants of Village B (Karvera Chattiars) trade in the nearest market town.

"Other businesses and services", the sixth category,are provided by individuals of various castes, and include a combination of traditional occupations and modern enterprises. The seventh category, "Professional occupations", includes a wide variety of occupations, which are usually unrelated to the economy or needs of the village itself. Most school teachers resident in either village work outside the village itself. (Conversely the majority of village school teachers are non-resident.)

The eighth category includes all those in full-time employment, whether at school or college. Care was taken to ensure that this category included only those who actually attended school or college, and not all of school age.

The final category, that of "No paid occupation", includes housedwellers, the permanently sick (either those whose illness was sufficiently debilitating to prevent work - e.g. tuberculosis or the disabled) and the self-confessed unemployed (seeking a professional position, and taking no part in the agricultural activities of the village).

For the purposes of crosstabulation, occupations may be grouped into six mutually exclusive categories:

001. Farmers - all individuals undertaking farming as in category one, Table 3.4, including those also having occupations four to seven.

002. Farming Labourers - all individuals described in category two, Table 3.4, including those also having occupations in categories four to seven.

003. Labourers - all individuals described in category three, Table 3.4, including those also having occupations in categories four to seven.

004. Non-agricultural occupations - individuals described in categories four to seven, Table 3.4, who do not also have occupations in the first three categories.

005. Students - those described in category eight, Table 3.4.

006. Housedwellers - category nine, Table 3.4.

Table 3.5 shows male female and total numbers in each category. The crosstabulation of total numbers in each category for both villages shows a significant difference (99.5%), as does the crosstabulation of occupational category for each sex for both villages (99.5%). Generally the proportion of female farmers is less than that of males, while that of labourers is greater. Males are composed of greater proportions of non-agricultural occupations and students, and of smaller proportions of housedwellers than females. There is a strong relationship between the village and occupational category for females (99.5%), but the male occupational categories of each village are less dissimilar (99%). In general Village A has more farmers than Village B, while Village B has a greater number of farming labourers and labourers than Village A because of greater female numbers in these categories. Village B has a greater number of individuals in non-agricultural employment, more students and a smaller number of housedwellers than Village A. However, there is no significant difference between employment in the employed sector, OCs 1 to 4, and the non-employed sector, OCs 5 and 6, between villages for either sex and for total population.

3.2.4. Relationships between demographic characteristics, caste and occupation.

1. Fig 3.3 shows the age-sex composition of OCs 1 to 6, on equal scales. There are obvious and significant differences in the age composition of occupational categories for both males and females of both villages (all 99.5%). This is largely

due to the concentration in the 0-2 age group of housedwellers, and in the 3 - 12 age group of students and housedwellers.

When the employed sector (OCs 1 - 4) is considered, the relationship between age and occupational category is less apparent. However, for Village A males and Village B females there is a significant relationship between age and occupational category (95% and 99% respectively). This is because of a greater proportion of younger labourers and a corresponding greater proportion of older farmers than expected, while the proportions of farming labourers and those in non-agricultural occupations are normal for the employed sector.

2. Comparisons of the age compositions of the occupational categories between the sexes in both villages show that there is no significant difference between the composition of farmers, farming labourers, and those in non-agricultural occupations for both villages. However, male labourers in Village A are proportionally younger than female labourers (95%), and proportionally older in Village B (97.5%). The age composition of housedwellers in both villages differs significantly with sex, there being proportionally greater numbers of females over 7 years (both villages 99.5%). The age composition of students, too, differs significantly with sex, there being proportionally greater numbers of older male students (99.5%).

Comparison of the age composition of occupational categories between different villages for the same sex shows no significant difference for farmers, farming labourers, those in non-agricultural occupations, and housedwellers of either sex.

Similarly the age composition of female students shows no significant difference between the villages. However, the age composition of male students in Village B is significantly different from that of Village A (99.5%), there being proportionally greater numbers of older students in Village B. The age composition of labourers shows significant differences between both males and females of each village, there being proportionally greater numbers of younger male labourers in Village A (99.5%), and proportionally greater numbers of younger female labourers in Village B (95%).

3. Table 3.6 shows the numbers in each occupational category of males and female in numerically dominant castes and other castes combined for both villages. The crosstabulation of caste with occupation for each sex showed that these two variables are strongly related. Occupations among males and females of each of the numerically dominant castes and <u>all</u> other combined castes in Village A showed significant differences from all other grouped castes; for males: Kulla Thevas (99.5%), Pillais (97.5%) Pallars (99.5%), and for females: Kulla Thevas (99.5%), Pillais (99.5%), Pallars (99.5%), and other combined castes (99.5%). This reflects the proportionally greater numbers of both sexes of farmers, farming labourers and students in the Kulla Theva caste, and the proportionally greater numbers of both sexes in non-agricultural occupations among the Pillai caste and other combined castes, and of housedwellers (particularly for females) among Pillais.

When the agricultural sector alone is considered, caste and occupation are also strongly related, all male caste groups in Village A showing significant differences from all other castes; Kulla Thevas (99.5%), Pillais (95%), Pallars (99.5%), and other combined castes (99.5%). This reflects the proportionally greater numbers of farmers and farming labourers in the Kulla Theva caste, and to a lesser extent in the Pillai caste. Occupations among female caste groups in the agricultural sector, except among Pillais, also show significant differences from all other grouped castes: Kulla Thevas (99.5%), Pallars (99.5%), and other combined castes (99.5%).

The relationship between caste and occupation in all categories is again strong in Village B. Occupations among males and females of numerically dominant castes, and other combined castes show significant differences from all other grouped castes; for males: Telungu Chettiars (99.5%), Kurumba Goundas (99.5%), and other combined castes (99.5%). As with Village A, the most numerically dominant caste, Telungu Chettiars, have proportionally greater numbers of male and female farm labourers than other castes, as well as students. Other combined castes similarly show greater proportions in non-agricultural occupations. For the agricultural sector alone, Telungu Chettiars show significant differences with all other grouped castes for both males (99.5%) and females (99.5%), reflecting the proportionally greater numbers of farmers and farming labourers. For Kurumba Goundas there is less significant differences for females (97.5%), reflecting the proportionally greater numbers of labourers, and none for males. For other combined castes males show a less significant difference (99%), and females a greater significant difference (99.5%), reflecting the proportionally greater numbers of labourers. Thus the relationship between caste and agricultural occupation is stronger for males in Village A, and for females in Village B.

3.3 Population 1891-1978

Table 3.7 shows the changing population totals according to the Census of India village-level data for the years 1891, 1901, 1911, 1921, 1951, 1961 and 1971 with figures for houses and households where available. The missing decennial figures[1] for 1931 and 1941 have been projected from the 1921 and 1951 village figures using growth rates for Madurai District. Household totals for the missing years have been projected from the assumed population totals and the changing mean household size.

Through the documentation of family lineages, it was possible to trace the course of household evolution for the great majority of households present in the village in 1978/79 from 1947 in Village A and from 1926 in Village B. These dates were chosen principally to coincide with the availability of chitta records on landownership change, and data were gathered principally to analyse the relationship between household evolution and landownership. However aggregate information on household evolution may be used as an alternative source of information on changing household numbers and changing proportions of various castes.

The documentation of family lineages of households

1 The relevant village lists were missing from the Tamilnadu Archives.

existing in 1978/79 allowed collection of data on three types of lineages according to the relationship with the present household, but information could not be collected on two types of lineage not present in the village in 1978/79. A diagramatic representation of sources of data on household evolution is shown in Fig 3.4. Information was collected from existing households first on their own respective lineages, secondly on lineages vertically related[1] to lineage existing in 1947 (or 1926), but which have ceased to exist in the village through death or migration, and thirdly on lineages related in parallel[2] (usually brother of father or grandfather). The data gathered from these respective types of lineages is progressively less reliable, tending to rely increasingly on second-hand information. Information could not be collected on lineages present in 1947 (or 1926), which had ceased to exist by 1978/79 through death or migration, and which were unrelated to present households, or from lineages not present in either 1947 (or 1926), or 1978/79 and which were unrelated to present households.

Estimated yearly figures of past household totals (Table 3.8), derived from family lineage information, are calculated from total dominant households* for each year multiplied by a function of dominant households as a proportion of the total documented households for 1978/79, and documented households as a proportion of total households[3].

1 Having the same lineage for 1947/1926.

2 Having the same lineage before 1947/1926.

3 The proportion of dominant to documented households was 1:1.130 in Village A and 1:1.141 for Village B.

* See p. 214 for definition of dominant households.

Thus there are two independent sources of information on changing household totals in the village; the census and family lineage information. Fig 3.5 shows the two estimates of changing household size for available years in both villages from 1921 to 1978/79. While the two estimates for Village B household numbers are largely similar, there are important differences in totals and trends of growth between the two estimates for Village A especially between the years 1947 and 1960. It is necessary to obtain figures of changing household numbers for subsequent analysis of relationship between demographic and agricultural and social variables. For the purposes of the thesis, a figure of 240 households as a revised estimate of the 1961 census has been chosen. There are two reasons for an upward revision of the original census figure. First while the estimates of total households from family lineage data may omit information on lineages not present in 1978/79, and not related to present households, and thus may be an underestimate, it tends not to overestimate the number of households present at any time. While this estimate is lower than census data totals for the years 1947 to 1956, and this difference may be explained by the total absence of related lineages of those migrated or deceased households by 1978/79, it is greater than census data totals after 1956, and greatest in 1960/61. Therefore the census figure for 1961 may be considered an underestimate. Secondly, while the ratio of total houses to total households is 1:1.1638 in Village B and 1:1.1870 for the whole Periyakulam Taluk for 1961 census figures, the figure for total houses and households in Village A is exactly the same, thus suggesting that an e numerating mistake has been made[1].

The reduction of population from 1951 to 1961 in Village A is consistent with a similar reduction in population of other villages in the Periyakulam Taluk, which are situated by the Periyar river, and may be explained by a cholera epidemic reported between those years[2].

The caste proportions among total dominant households in both villages is given in Table 3.9. Village A figures show that the proportion of the Kulla Theva caste within the Village site increased from 26.1% in 1947 to 30.8% in 1978/79, and the proportion of the Pillai caste decreased from 29.6% to 21.7% over the same period. Other castes have remained largely unchanged as a proportion of total village dominant households. In Village A, the proportions of Telungu Chettiars and Kurumba Goundas have increased consistently from 1926 to 1978/79, while those of other castes have generally decreased, particularly Naidus (from 9.8% in 1926 to 3.3% in 1978/79).

Census of India data are available on occupational categories at village level, but the changing description of the various categories, the uncertain definition of these categories[3], and reasonable doubts about the varying interpretation of these definitions, limits their relevance to any historical analysis of individual village change.

1 Several other villages in Periyakulam Taluk seem to have the same "mistake" for 1961.

2 Villagers remembered a cholera epidemic in the Kambam Valley "about 20 years" before the survey.

3 Especially with regard to the description "cultivator".

No Census information is available on changing age composition at village level.

3.4 Migration

Using the method of gathering data from family trees on household evolution, information was collected on changing migrational[1] patterns for both villages. Where the migration of a member of the family had occurred within the 30 years immediately preceding the time of the survey, the approximate time of the migration, details of the migrant or migrating group at the time immediately preceding and immediately succeeding the migration, and details of the destination or origin of the migrant were taken. Thirty years was considered to be the maximum time over which reliable data on basic migration characteristics could be taken. The setting of this limit does not of course mean that the dates of migrations are accurate. However, for respondents over 50 years old (which was most often the case), the migrations would have occurred during their adult life. Moreover the close-knit nature of Indian family relationships often meant that out-migrants were still very familiar. In-migrants were more reliable respondents about their own migrations).

A case of migration is taken to be a permanent change of the location of residence for an individual or group led by an individual, other than that occurring in the normal pattern of marriage and subsequent migration of the wife to the Husband's place of residence. Thus where a female of the family was married outside the village, no "migration" was noted (assuming

1 This chapter will deal with permanent migration alone; other forms of migration will be discussed in Chapter 6.

an equal exchange of marriages, no difference in the growth rates of villages which had families which were involved in such arrangements would occur). However, where the husband migrated to his wife's place of residence, or where the wife re-migrated with her children to her birthplace after the death of her husband or the dissolution of the marriage, such an occurrence was noted as it ran contrary to normal cultural practice.

Migration was gathered with reference to any group of migrants under the "charge" of a single migrant termed the principal migrant, although some data refer to the principal migrant alone. Information on 11 variables relevant to each case of migration was collected: the age and sex of the principal migrant, whether the principal migrant was accompanied by a spouse, the total number of migrants in any case of migration, the migrants' caste, the occupation of the principal migrant at origin and destination, the general family connection of the migrant to the origin (for in-migrants) or destination (for out-migrants), the location and size of the origin or destination, and the time of the migration within the 30 year period before the survey. These will be termed Age, Sex, Spouse, Total Migrants, Caste, Occupation at Origin, Occupation at Destination, Mode of Migration, Location, Size and Time respectively.

Figs 3.6 and Table 3.10 show the distribution of these variables for four groups of data: out- and in-migration for both villages. The distribution of Age, Sex, Spouse, Total Migrants, and Time is either bimodal or interval in scale. Each caste is shown. Occupation at Origin and Occupation at Destination are each divided into seven identical categories. "Farmers" represents the occupation of principal migrants of the agricultural sector corresponding to 001 and 002 of Section 3.2 (Farmers and Farming Labourers)[1], "Labourers" corresponding to 003 (Labourers), "Businessmen", "Wage Earners", and "Caste Businessmen" to 004 (Non-Agricultural Occupations), "Students" to 005 (Students), and "No Occupation" to 006 (Housedwellers). The threefold division of 004 for migration analysis was considered appropriate because of the relatively greater numbers of migrants with occupations in this sector at destination. A businessman may be defined as a self-employed entrepreneur, and thus covers a range from confectionary salesman to industrialists. Wage earners are defined as those earning weekly or monthly wages, and are usually employed in industry in an urban environment, while caste businessmen are those following the traditional caste occupation, whether or not it may strictly be defined as a business.

The variable termed "Mode of Migration" distinguishes between migrations according to the family connection of the principal migrant with his destination. The practice of the husband migrating to the wife's birthplace is an important method of migration, and the most immediate course of migration within the system of caste relations. A less immediate method is seen in migration to a location with family connections. The

1 The unification of categories OC1 and OC2 was considered appropriate as the narrow conceptual division between them would probably have been blurred in the memory of time.

(re-) migration to the place of birth of the principal migrant often occurs in the case of a widow or divorcee.

The location and size of the destination or origin is significant in terms of the extent to which the migration may be seen as a "drastic" measure. It is probably less likely that a migrant would prefer to travel to locations outside the immediate region, or to urban rather than familiar rural situations. The immediate region is defined as the "Periyar Region" or area of the Periyakulam and Uthamapalayam taluks[1]. Within this region, locations may be divided according to whether they have wetland within the Periyar scheme, and thus being richer, likely to afford greater employment prospects within the agricultural sector.

Time is divided into 5 year periods centering on years which are multiples of 5.

The distribution of the age of principal migrants shows a mode at 23 to 32 for all groups, dominantly male principal migrants (few single females migrating), the largest proportions of migrating groups containing married couples, and an average of between 2.62 (for Village A out-migration), and 2.93 (for Village B out-migration) total migrants for all groups. Most out-migrants at origin, and in-migrants at destination tend to be in agricultural occupations, while the occupations of in-migrants at origin and more especially out-migrants at destination tend to be more diverse, greater numbers being in non-agricultural occupations (especially business and wage-earning). While for an important proportion of out-migrants the mode of migration involves

1 The administrative divisions most closely representing Kambam Valley.

some family connection, the dominant mode of migration is through no family connection, while for in-migrants the opposite is the case. A larger proportion of out-migrants have destinations outside the Periyar Region, while in-migrants tend to have origins inside the Region itself. Such a distinction for Size is more difficult to make[1], though many out-migrants go to large urban locations. Time shows that there have been significant increases in the volume of migrations in the period of 30 years before the survey for all groups, although out-migration from Village B has increased especially rapidly.

The migrating group, whether from or into the village, is not always a complete household, and where this is the case, the process of migration involves the separation of an individual or a group of individuals from the household to create an independent unit, if only in the process of transit. These independent migrating groups, whether they represent complete households, or are the result of a process of household division, may be compared with the household of the village (of origin for out-migrants, and destination for in-migrants), in order to analyse the effect demographically and socially of their migration on the village as a whole.

Table 3.11 shows the results of Chi^2 tests for the difference of distribution of two groups of comparable variables: those of the household as defined by the 1978 Count, and those of the migrating group. While the comparison of distributions which are interdependent, and not coincident in time (migration

1 This is partly because many essentially rural settlements in the Periyar Region are classified as urban according to the Census of India by virtue of population size.

variables being applicable to a 30 year period before the time of the Count) must assume that the distributions of the variables of total population have remained relatively unchanged while there has been little change in the distribution of migration variables during this period[1]. For certain variables, Age, Sex, Total Migrants, Occupation at Origin (for out-migrants), and Occupation at Destination (for in-migrants), valid comparisons may be made, as the demographic and economic processes producing the equivalent total, village distributions of these variables may be assumed to tend towards equilibrium over such a time span.

For all groups the distribution of Age is significantly different from the distribution of the age of the head of household of the relevant village, reflecting the lower ages of principal migrants. Sex does not differ greatly from the sex of the head of household, except for one group, Village B out-migrants, where there are proportionally greater numbers of men out-migrating. Total migrants for all groups is significantly different from household size, with smaller numbers in migrating groups. Occupation is for all groups significantly different from the distribution of the occupations of the heads of household of the whole village, reflecting lower proportions of migrating farmers (OCs 1 and 2 of the total population) for all groups, and that while migrating labourers are in similar proportions to labourers of the whole village, for out-migrants there are greater proportions of no occupation or students, and for in-migrants there are greater proportions in non-agricultural occupations.

1 The crosstabulation of migration variables shows that Time is not systematically related to other migration variables (Ch 7).

Chapter 6 will extend the discussion of the differences between migrafing groups with reference to the resources of the village, and relationships between the distribution of migration variables will be analysed in order to examine migration processes with reference to social relationships in the village.

3.5 Summary

From the analysis of the demographic characteristic of the village, it may be concluded that age and sex composition is strongly related to occupation. However, while caste is also a dominant factor explaining occupation, relationships between caste and demographic variables at the time of the survey were weak. While occupational patterns seem to be determined by age/sex structures, the individual composition of occupational categories for the villages must act as a regulator of total composition. Evidence for this assumption is seen in the differences of age structure of occupations (Fig 3.3, especially for OC3, Labourers) between the villages for either sex, and the age/sex structures of the villages as a whole (Fig 3.1), which for Village B show a marked "gap" for the 12 to 32 age group.

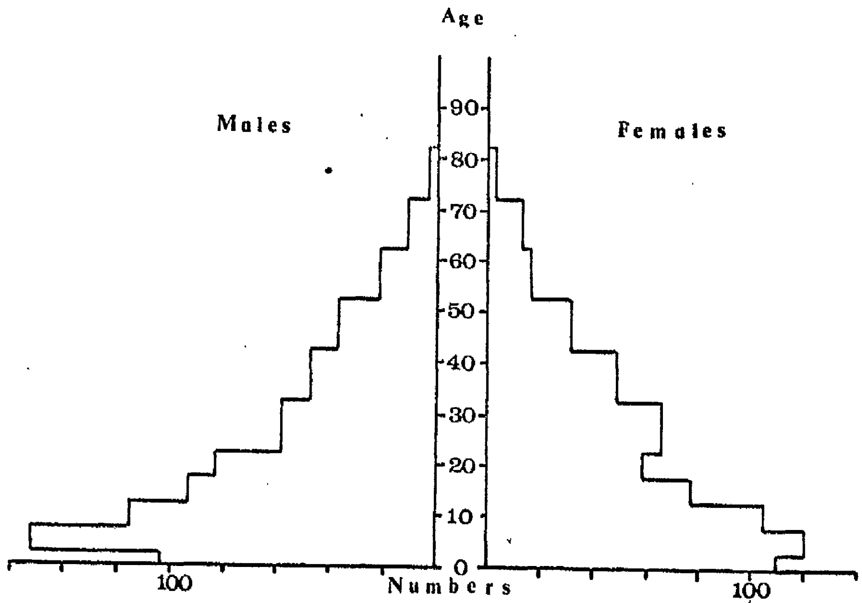
The village populations have been steadily increasing since 1891, although the proportions of different castes within the village household totals are constantly changing[1], suggesting that migration plays an important part in determining village caste composition. That out-migration is probably increasingly important is seen in the slower growth rates of the villages as compared with the region from 1951, a datum which appears to confirm the view that significant out-migration started only after this date.

1 The close correspondence of family lineage and Census estimates allows the use of the former as a base for the analysis of changing landownership and migration characteristics.

From the initial examination of the basic characteristics of migrating groups, and their comparison with total population, it may be concluded that out-migration, which is increasing at a faster rate than population in general, is closely related to the rate of population expansion, as a reaction to increasing population, acting as a regulator of increasing population, migrating groups being characterised by younger, more fertile members of the population.

Fig 3.1 Age Sex Composition, Sample Villages
(Numbers/ 5 Yrs)

Village A



Village B

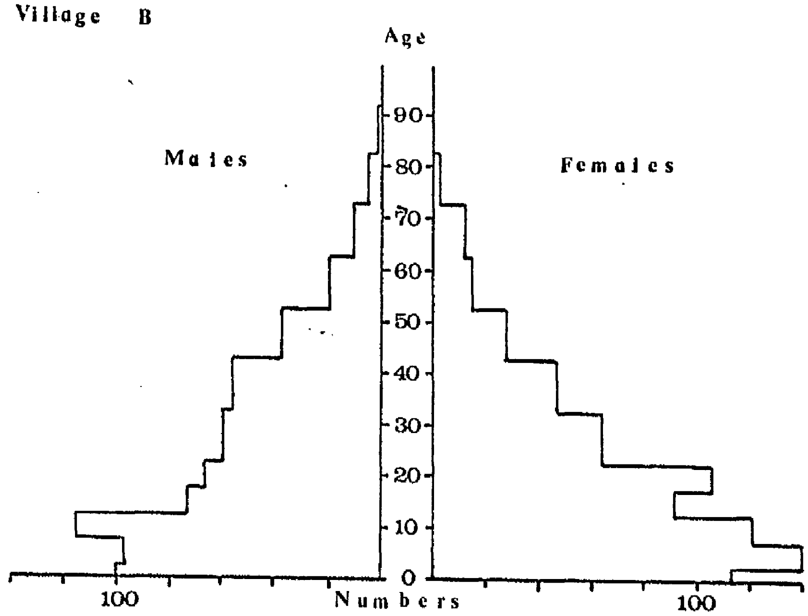
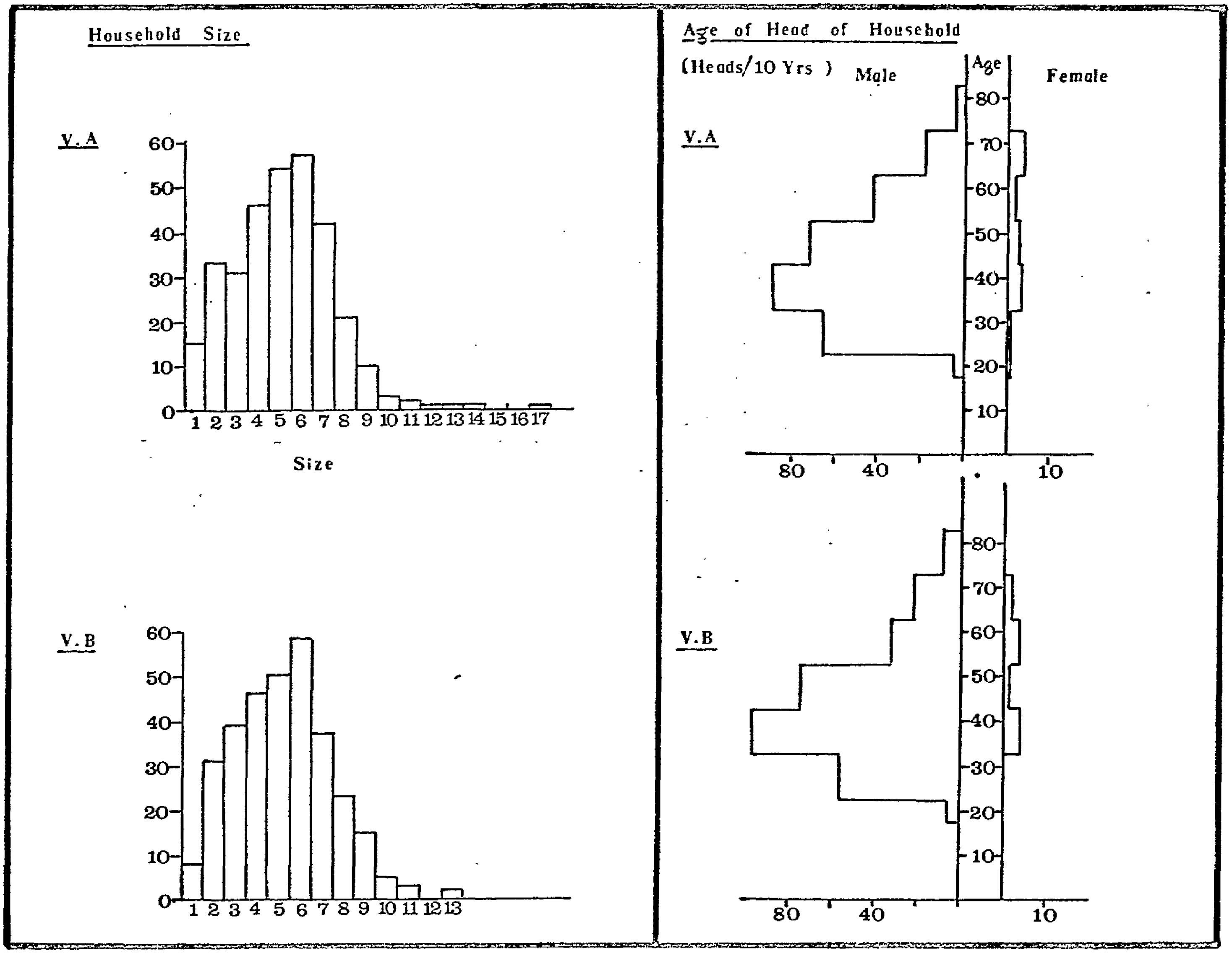


FIG 3.2
Household
Organisation



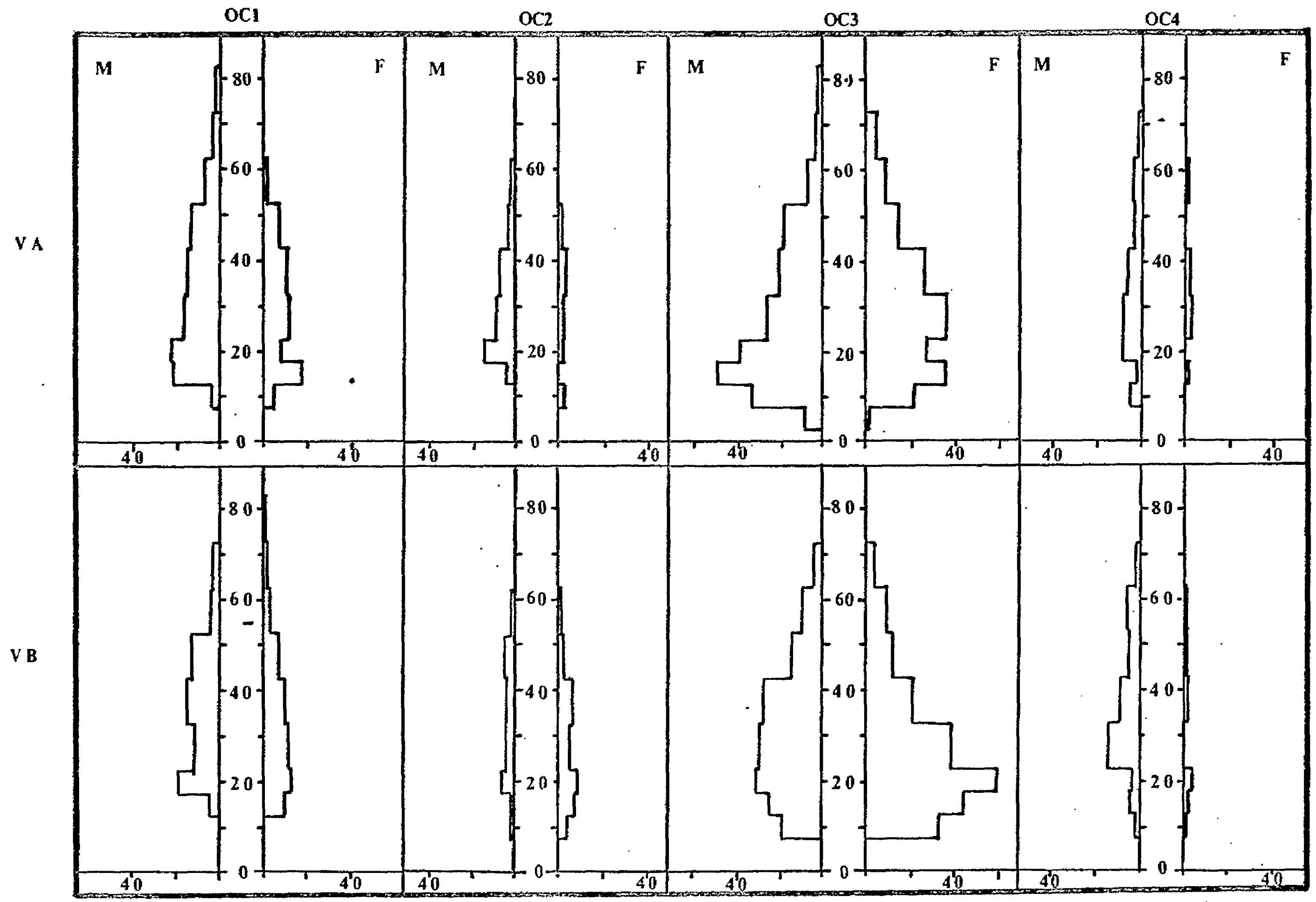


Fig. 3.3(a) Age/Sex Composition of Occupational Categories (1 to 4). Source : The Count (Numbers/5 Yrs)

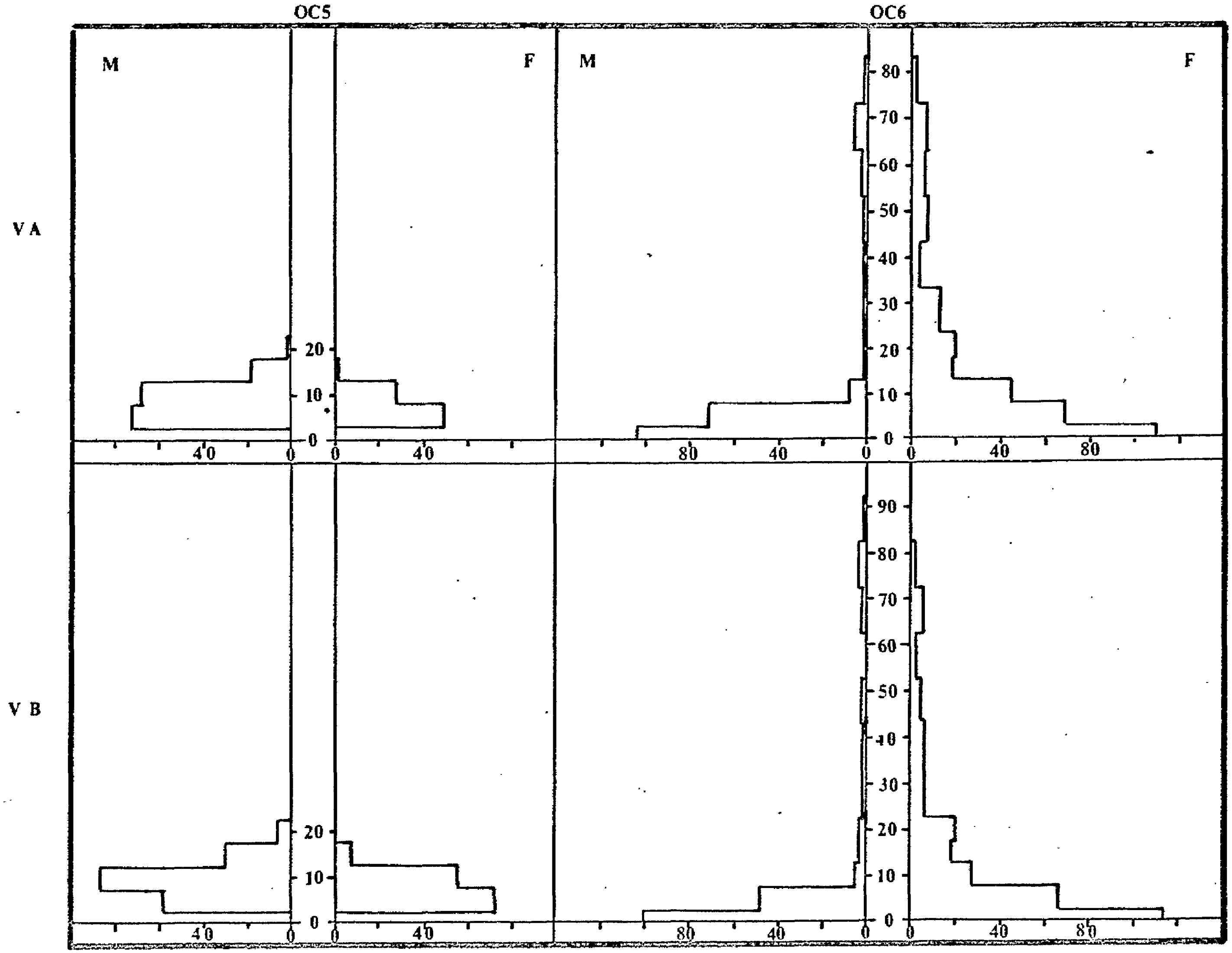
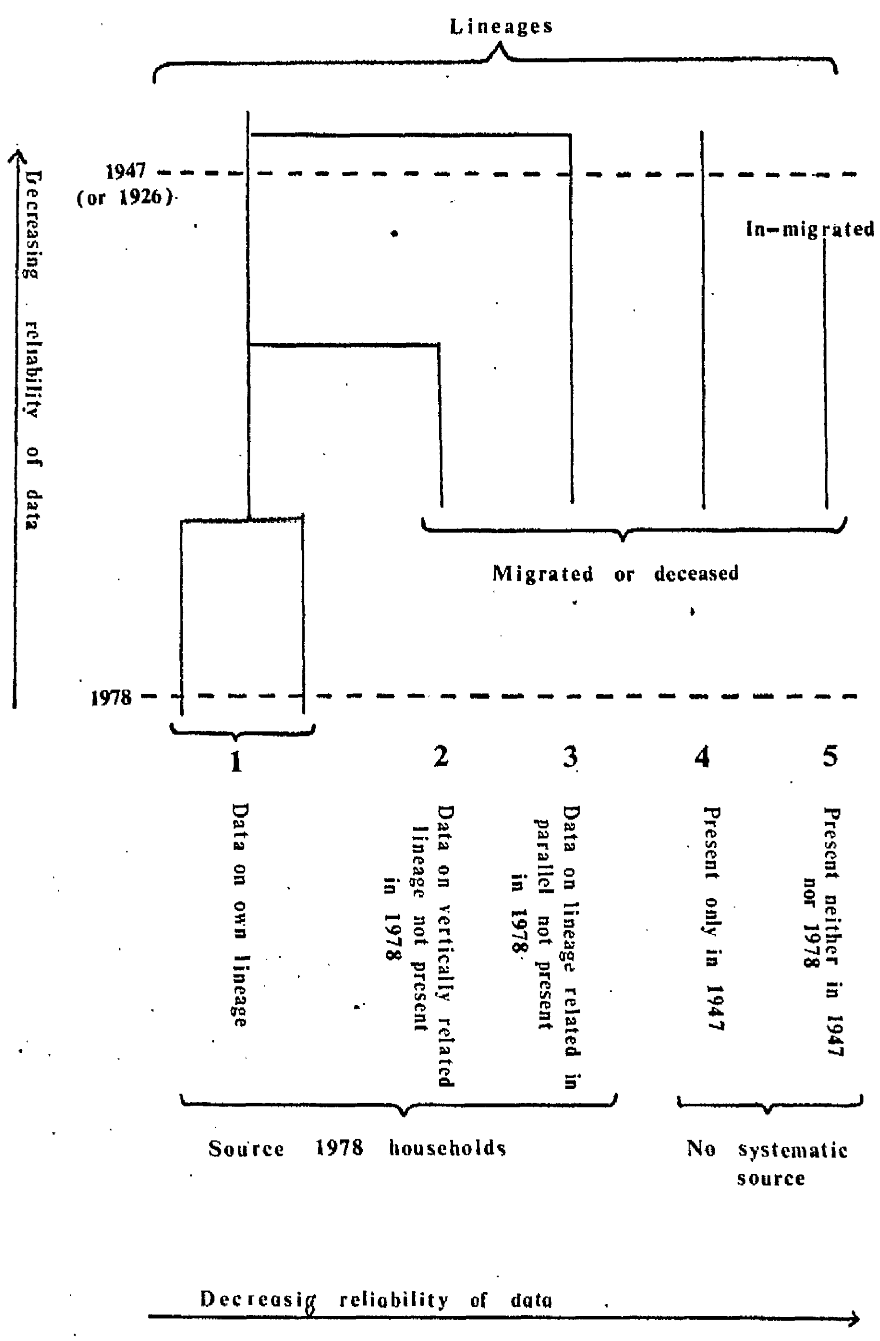
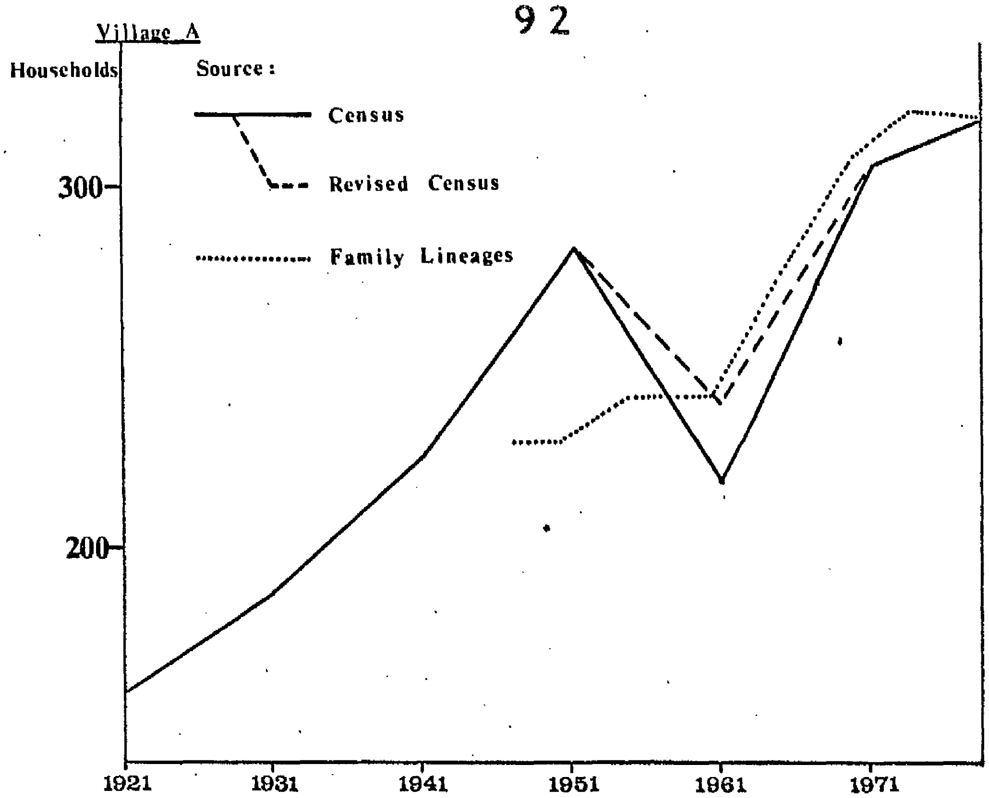


Fig. 3.3(b) Age Sex Composition of Occupational Categories (5 and 6)

FIG 3.4 Sources of Information on Household Evolution





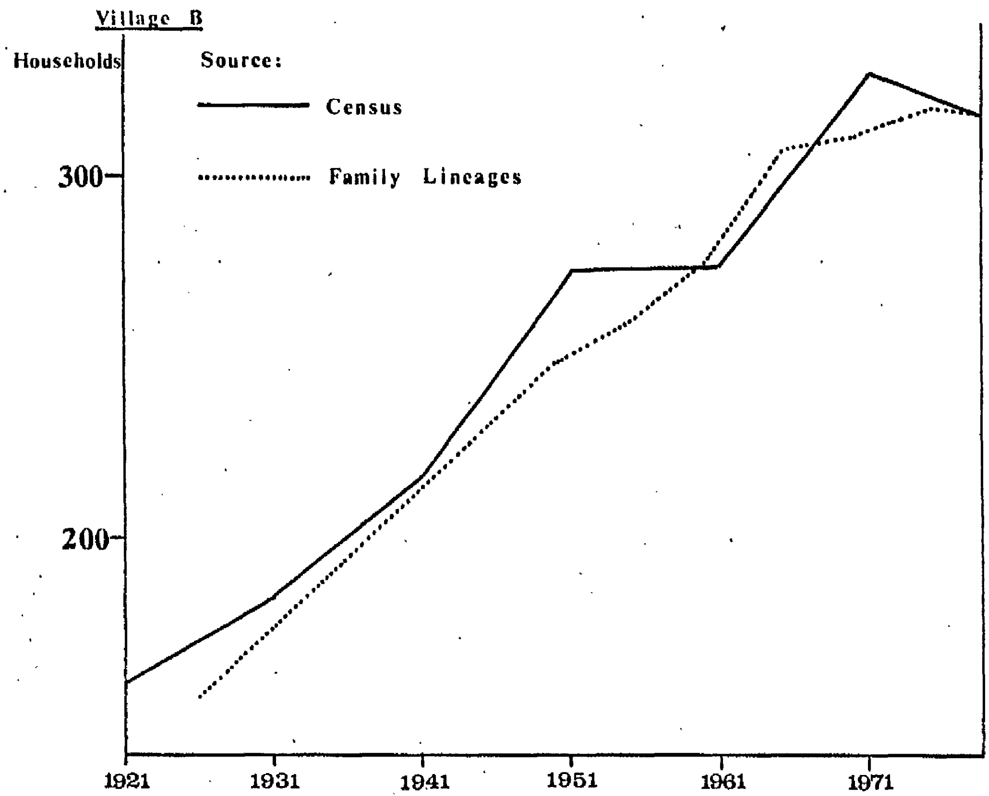
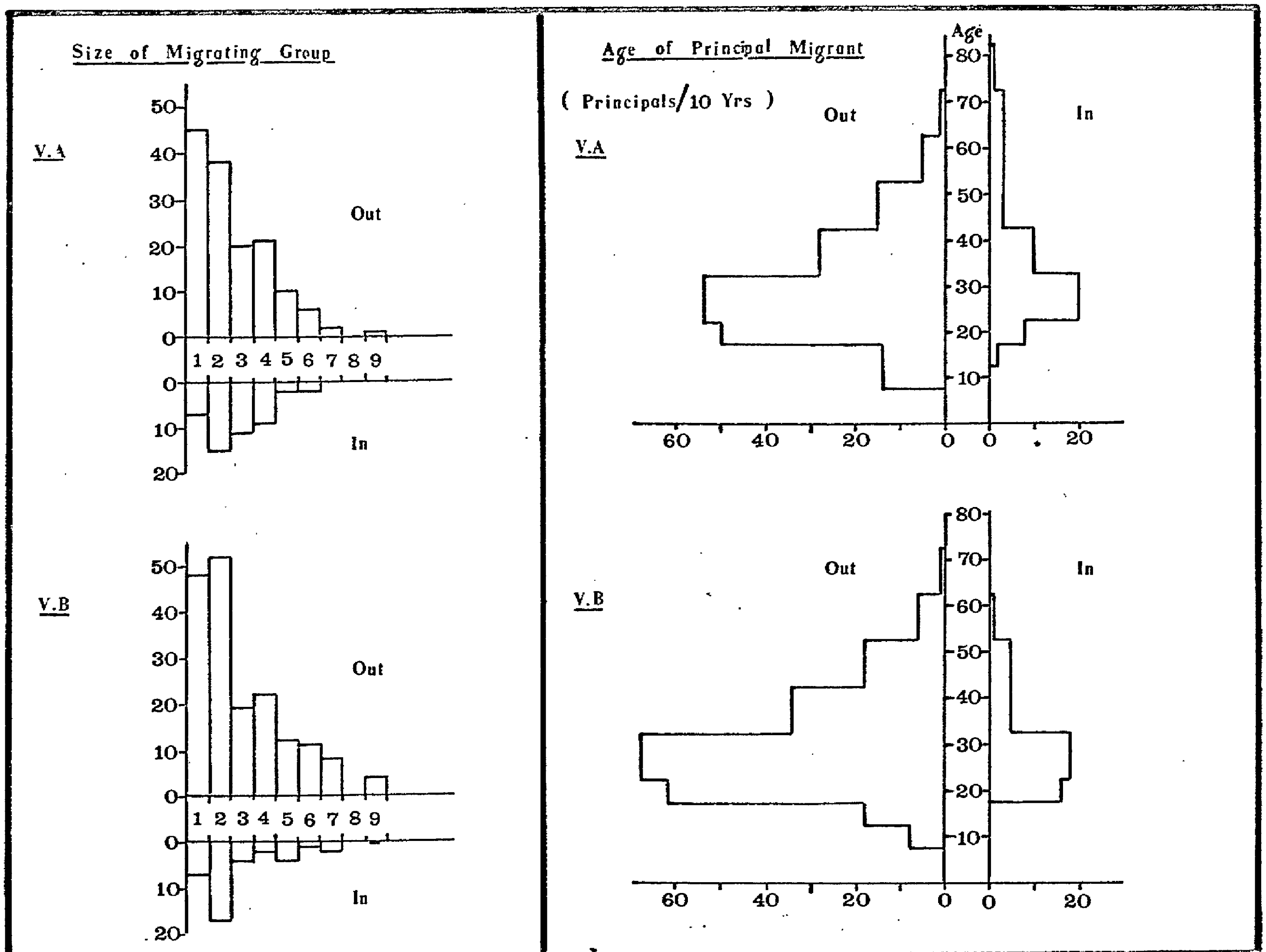


FIG 3.5 Estimates of Household Numbers, 1921-78

FIG 3.6

Organisation of Migrating Group



3.7 Marthari family, Village B.

3.8 Telungu Chettiar family, Village B.

Table 3.1 Male and Female Numbers, Sample Villages

	Male	Female	Total
Village A	849	772	1621
Village B	776	864	1640

Table 3.2 Household Size by Age of Head of Household

Village A

Household Number	0-32	Age of Head of Household 33-42	43-52	53-62
1-2	8	5	8	27
3-4	27	18	17	15
5-6	31	43	23	13
7-8	4	24	23	12
≥ 9	0	5	5	9
Total	70	95	77	76
Average	4.44	5.68	5.51	4.67
Standard Deviation	1.44	1.88	2.12	3.34

Village B

Household Number	0-32	Age of Head of Household 33-42	43-52	53-62
1-2	8	6	4	21
3-4	35	22	12	17
5-6	18	44	29	17
7-8	2	22	24	11
≥ 9	0	10	8	7
Total	63	104	77	73
Average	4.00	5.73	6.08	4.33
Standard Deviation	1.28	2.16	1.95	2.46

Table 3.3 Caste Numbers

Village A Castes

		Households		Population	
Kulla Theva	Village A site	106	130	553	687
	Village A hamlet	24		134	
Pillai		67		343	
Pallar		38		203	
Asari		29		141	
Karpillai Gounda		16		74	
Marthari		13		64	
Devanga Chettiar		9		39	
Pandaram		7		27	
Vellan Chettiar		5		24	
Barber		1		5	
Dhobi		1		5	
Valluvan		1		6	
Brahmin		1		1	
		318		1619	

Village B Castes

	Households	Population
Telungu Chettiar	138	710
Kurumba Gounda	104	553
Vellan	16	89
Devanga Chettiar	12	60
Marthari[2]	10	54
Naidu	9	41
Asari	8	41
Karvera Chettiar	6	28
Pillai	4	19
Dhobi	4	20
Theva	4	17
Barber	1	9
Christian	1	1
	317	1642

[1] A Telungu Chettiar Family is shown in Fig. 3.8

[2] A Marthari Family is shown in Fig. 3.7

Table 3.4 Occupations (Not Exclusive)

Category	Village A			Village B		
	M	F	Total	M	F	Total
1. Farmers						
Agriculturist	133	95	228	108	91	199
Shepherd	0	0	0	2	0	2
Agriculturist and Shepherd	0	0	0	3	0	3
	133	95	228	113	91	204
2. Farmers and Labourers						
Agriculturist and Coolie	52	21	73	36	52	88
Agriculturist, Shepherd and Coolie	3	0	3	1	0	1
	55	21	76	37	52	89
3. Labourers						
Coolie	203	262	465	116	311	427
Coolie and Shepherd	1	0	1	21	0	21
Coolie and menial (watchman/Sweeper)	3	0	3	3	0	3
Attached labourer	2	0	2	7	0	7
Kottukanin (labour contractor)	1	0	1	2	0	2
Coolie; mainly cattle herding	35	7	42	0	1	1
Coolie and buffalo-cart work	2	0	2	0	0	0
Coolie and Channel watcher	7	0	7	0	0	0
Coolie and stone cutter	10	2	12	0	0	0
	264	271	535	149	312	461
4. Agriculture Related Occupations						
Cotton/Chilli Merchant	4	0	4	9	0	9
Banana Contractor	0	0	0	2	0	2
Banana Agent	0	0	0	1	0	1
Cardamam Merchant	0	0	0	1	0	1
Vegetable Merchant	1	0	1	4	0	4
Spice Merchant*	0	0	0	7	0	7
Rice Merchant	1	0	1	1	0	1
Sprayer Operator	2	0	2	5	0	5
Fertilizer Salesman	1	0	1	0	0	0
Powerset Mechanic	0	0	0	1	0	1
	9	0	9	31	0	31
5. Caste Occupations						
Barber	1	0	1	1	0	1
Dhobi	3	2	5	7	10	17
Carpenter	4	0	4	7	0	7
Blacksmith	1	0	1	0	0	0
Stonemason	6	0	6	0	0	0
Potmaker	1	0	1	0	0	0
Bangle Merchant	0	0	0	4	0	4
Brahmin Priest	1	0	1	0	0	0
Fortune Teller	1	0	1	0	0	0
	18	2	20	19	10	29

(Continued)

* Caste occupation

Table 3.4 (cont)

6. Other Businesses and Services						
Slaughterer	1	0	1	2	0	2
Tailor	3	1	4	3	0	3
Shopkeeper	7	6	13	9	3	12
Hotel worker	7	7	14	7	3	10
Cycle repairing and Radio Operator	0	0	0	1	0	1
Radio Operator	2	0	2	0	0	0
Timber Merchant	1	0	1	1	0	1
Builder	1	0	1	1	0	1
Cement Pot Maker	0	0	0	1	1	2
Cloth Merchant	0	0	0	2	0	2
Contractor for Public Works Department	0	0	0	1	0	1
Stone cutting Merchant	14	0	14	0	0	0
Thatcher	1	0	1	0	0	0
Milk Seller	1	0	1	0	0	0
	38	14	52	28	7	35
7. Professional Occupations						
Government Servants[1]	9	2	11	9	0	9
School Teacher	3	0	3	8	2	10
Electrician	1	0	1	2	0	2
Mechanic (Motor & Radio)	0	0	0	2	0	2
Bus Driver	0	0	0	1	0	1
Bank Clerk	1	0	1	0	0	0
	14	2	16	22	2	24
8. Students	158	78	236	181	135	316
9. No paid Occupation						
House dwellers	154	288	442	108	253	361
Permanently sick	4	0	4	4	2	6
Unemployed	0	0	0	4	0	4
	158	288	446	116	255	371

1 Water-supply Operator, Accountant, Panchayat Board Clerk, Taleyari, Nattarme, Midwife, Sanitary Inspector, School Cook, Co-op Shop Keeper, etc.

Table 3.5 Occupational Categories

Occupational Category (Exclusive)	Village A			Village B		
	M	F	Total	M	F	Total
OC1 Farmers	154	97	251	126	92	218
OC2 Farming Labourers	54	21	75	38	52	90
OC3 Labourers	269	272	541	239	313	552
OC4 Non-Agricultural Occupations	56	16	72	76	17	93
OC5 Students	158	78	236	181	135	316
OC6 Housedwellers	158	288	446	116	255	371

Table 3.6 Occupational Categories for Caste Groups

(For numerically Dominant and other combined castes, male and female. Occupation shown as a percentage of Total Caste Population)

OC / Caste / Sex	Village A								Village B					
	Kulla Thevas		Pillais		Pallars		Other Combined Castes		Telungu Chettiars		Kurumba Gounda		Other Combined Castes	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
OC1 Farmers	29.3	23.5	17.6	6.0	3.8	3.3	5.5	4.6	20.5	14.8	17.4	9.2	6.8	4.9
OC2 Farming Labourers	6.2	3.1	9.1	0.6	6.7	5.4	4.0	2.6	6.0	8.7	5.6	6.0	1.7	1.0
OC3 Labourers	25.0	31.7	23.3	27.5	50.5	52.2	41.5	39.7	24.1	29.1	40.0	47.7	28.4	33.5
OC4 Non-Agricultural Occupations	1.3	0.9	18.1	6.0	1.9	0.0	15.0	1.5	6.6	0.3	1.5	0.4	29.0	7.4
OC5 Students	22.3	12.9	18.2	5.4	13.3	7.6	15.0	10.8	27.1	19.8	19.6	11.7	22.2	13.3
OC6 Housedwellers	15.8	27.9	21.0	54.5	23.8	31.5	19.0	40.7	15.7	27.2	15.9	25.1	11.9	39.9

Table 3.7 Population Indices, 1891-1978[1]

Village A

Year	Population	Males	Females	Sex Ratio[2]	Houses	Households	Mean House/Household Size
1891	510	251	259	0.969	123		4.56
1901	769	387	382	1.013	146		5.27
1911	883	455	428	1.063	154		5.56
1921	989	489	500	0.978	160		6.18
1931	1042*					186**	5.69
1941	1122*					224**	5.19
1951	1249	646	600	1.071		282	4.70
1961	1152	586	566	1.035	218	218	5.22
1971	1428	731	697	1.049		305	4.81
1978/79	1628	849	772	1.100		318	5.19

Village B

Year	Population	Males	Females	Sex Ratio	Houses	Households	Mean House/Household Size
1891	703	352	351	1.003	154		4.14
1901	827	405	422	0.960	157		5.26
1911	924	421	503	0.837	166		5.73
1921	983	480	503	0.954	159		6.18
1931	1042*					183**	5.60
1941	1132*					218**	5.01
1951	1270	652	618	1.055		276	4.43
1961	1446	728	718	1.014	238	277	5.28
1971	1584	779	805	0.968		329	4.68
1978/79	1640	776	864	0.898		317	5.14

1 From Censuses of India 1891-1921, 1951-1971, and preliminary Censuses 1978/79

2 Males/Females

* Projected totals for missing years using Madurai District Growth Rates.

** Households projected from assumed population totals and changing mean household size (direct line change from 1921 to 1951)

Table 3.8 Household Numbers 1926-78, calculated from family lineage information

Year	Village A	Village B
1926	-	156
1947	229	-
1950	229	249
1955	241	260
1960	242	276
1965	276	308
1970	308	311
1975	322	320
1978	318	317

Table 3.9 Caste Proportions*, 1926-78

Village A castes	1926	1947	1950	1955	1960	1965	1970	1975	1978/79
Kulla Theva Village A site	Not available	26.1	26.1	27.3	28.1	30.1	32.1	31.7	30.8
Village A hamlet		8.5	8.5	9.1	8.1	7.9	7.8	8.6	8.7
Pillai		29.6	28.6	28.2	26.7	25.1	22.4	21.8	21.7
Pallar		10.6	10.6	11.5	13.3	13.0	12.3	11.1	11.9
Asari		10.1	10.1	10.5	11.0	10.5	9.0	8.6	8.7
Karpillai Gounda		4.5	4.5	3.8	3.3	3.8	3.4	4.3	4.7
Marthari		2.5	2.5	2.4	2.4	2.5	3.7	3.9	4.0
Devanga Chettiar		3.5	3.0	2.9	2.9	3.3	4.9	4.3	3.3
Pandaram		2.0	2.0	1.9	1.9	1.7	1.9	1.8	1.8
Vellan Chettiar		2.0	2.0	1.9	1.9	1.7	2.2	2.1	2.2
Barber		0	0	0	0	0	0	0	0
Dhobi		0	0	0	0	0	0	0	0.4
Valluvan		0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4
Brahmin		0	0	0	0	0	0	0.4	0.4
Village B castes									
Telungu Chettiar	34.0	Not available	40.6	41.2	40.4	42.2	42.6	42.5	43.0
Kurumba Gounda	20.5		28.3	28.5	29.8	30.0	30.2	33.3	32.2
Vellan Chettiar	6.8		4.7	4.5	4.3	5.7	5.3	4.8	4.8
Devanga Chettiar	3.0		3.8	3.6	4.3	3.8	3.4	3.7	3.7
Marthari	5.2		5.7	5.4	6.0	5.3	4.5	3.7	3.7
Naidu	9.8		5.7	5.0	5.1	4.2	4.5	2.9	3.3
Asari	3.0		1.4	1.4	1.3	1.9	2.3	2.2	3.0
Karvera Chettiar	4.5		3.3	3.6	2.1	1.1	1.1	1.1	1.1
Pillai	0		0.9	0.9	1.3	1.5	1.5	1.5	1.5
Dhobi	3.8		2.8	2.7	2.6	1.1	0.7	1.5	1.5
Kulla Theva	1.5		2.4	2.7	2.6	2.3	2.3	2.2	1.5
Barber	0.7		0.4	0.4	0.4	0.3	0.8	0.4	0.3
Christian	0		0	0	0	0.3	0.4	0.4	0.3

* Given as a percentage of total dominant households.

Table 3.10 Distribution of Migration Variables

Variable	Categories	Village A Out	Village A In	Village B Out	Village B In
Time	1948 - 57	17	2	11	3
	1958 - 67	40	8	39	9
	1968 - 77	86	36	126	25
Sex	Male	135	37	171	34
	Female	8	9	5	3
Spouse	No	54	14	53	10
	Yes	89	32	123	27
Occupation Origin	Farmer	39	9	38	3
	Coolie	64	15	74	15
	Student	3	0	18	0
	Businessman	7	4	3	6
	Wage Earner	4	5	5	5
	Caste Businessman	2	4	14	0
	No Occupation	23	7	12	1
Occupation Destination	Farmer	19	10	16	6
	Coolie	58	15	58	14
	Student	1	0	1	0
	Businessman	14	5	30	7
	Wage Earner	25	4	39	5
	Caste Businessman	2	4	11	4
	No Occupation	14	7	8	1
Mode of Migration	No connection	86	6	88	15
	Wife's place of residence	34	28	57	17
	General Family Connection	20	5	27	3
	Birth Place	3	6	3	2
Location of Destination/ Origin	Periyar Region (dry)	37	19	46	23
	Periyar Region (wet)	48	19	55	8
	Elsewhere Tamilnadu	37	6	53	4
	Other State	12	0	18	1
Size of Destination/ Origin	Village	68	35	107	25
	Town	65	10	58	10

Table 3.11 Crosstabulation of Count and Migrating Group Variables, using Chi^2

(Significant Differences shown; "N" indicates Not Significant at 95%)

Count Variable	Migrating Group Variable	Village A In-Migrants	Village A Out-Migrants	Village B In-Migrants	Village B Out-Migrants
Age of Head of Household	Age of Principal Migrant	99.5%	99.5%	99.5%	99.5%
Sex of Head of Household	Sex of Principal Migrant	N	N	N	0.05
Household Size	Total Migrants	99.5%	99.5%	99.5%	99.5%
Occupation of Head of Household	Occupation* of Principal Migrant	95%	99.5%	99.5%	99.5%

* At destination for In-Migrants, at origin for Out-Migrants.

Chapter 4

Agriculture: Resources, Production, and Production Characteristics

4.1 Introduction

This chapter will examine the physical variables which determine the nature of agriculture in the sample villages. The spatial and temporal availability of land, water and other resources for production are examined, as is the nature of technology for agricultural production. The changing relationship between physical resources and agricultural technology is shown to determine the changing nature of three main indicators of production and production methods: land use types, cropping patterns and labour demand.

The villages are treated as isolated units of agricultural production, environmental and technological changes and constraints acting at the village level. Although this method of analysis does not allow the complete picture of interrelationships between variables within the agricultural sector, to be fully explained, it provides the framework within which sub-village variables, such as demographic structure, political organisation, land ownership, and relations of production may be analysed (Chapters 6 to 8).

For the purposes of this chapter, therefore, a definition of the agricultural village is necessary. The agricultural village may be defined as the set of physical objects (resources and technology) for agricultural production, which are operated by resident members of the village. Thus the extent of the village is ultimately determined by the agricultural activities of resident population rather than being permanently defined by spatial factors alone. It is clear from this definition that the content and extent of village resources must continually change.

4.2 Resources

4.2.1 Land

Land, the use of which is the basis of the village economy, has three attributes: soil fertility, slope, and distance from the village, which have an important effect on the agricultural system, and which act largely as independent variables on agricultural production, but which are to a large extent interdependent. A fourth attribute, the nature of the parent rock, is important in relation to potential accessibility to groundwater, and will be discussed in Section 4.4.2.

Soil fertility is largely determined by the soil's suitability for different types of cultivation in relation to its content of essential elements, pH value and soil structure. Because of the complexity of factors determining soil fertility values it was impossible to make a survey on soil fertility.[1] However a useful indication of the spatial variation within the village of soil fertility can be gained from the 1915 Settlement classification of soil types (See Figs 4.1 and 4.2), which based revenue _tarams_ or rates, on the differential productivity in irrigated and dry land.

The soils of the sample villages are similar, being based on parent weathered gneiss or colluvium. They are generally loamy and, occasionally, sandy soils suitable for the production

1 A systematic sample survey of the soil content of the essential elements of Nitrogen, Potassium and Phosphorus of village soils, and their suitability for production of major crops, carried out by the author with the aid of the Tamilnadu Soil Survey Department was found to yield very indeterminate results.

millets, pulses, paddy, and cash crops such as cotton, chillis and groundnuts. Within the villages the spatial variation in soil fertility tends to some extent to be related to distance from the village and thus slope (Fig 4.3 shows aerial views of the sample villages, illustrating the relationship between slope and distance from the village site). This pattern is especially true for Village B (Fig 4.2) where the best loamy soil is found around the village site, and progressively sandy, and inferior soils away from it on the base slopes of surrounding inselbergs. Although this pattern may not be strictly applied to Village A, where better loamy soils are found to the west of the village site, and the soils to the east, which are irrigated by canal, are generally inferior, within the dryland area, soil fertility is generally related to slope and distance from the village site. The poorer soils fertility of what is canal irrigated land does not greatly affect its productivity.

Given that the villages were both sited at locations of maximum advantage for irrigated agriculture, in the case of Village A next to the river which provided canal irrigation[1], and in that of Village B at the optimum point for groundwater accessibility, the factors of soil fertility, slope and distance from the village, are interrelated in the context of the development of the village from its initial agricultural base, which has taken place from the more fertile land around the village site towards less fertile, steeper and more distant land.

4.2.2 Water

Rainfall, shown in average weekly totals for a location

1 For a limited area and for only one crop per year before the Periyar Scheme's inception.

about 2 miles from Village A, and 5 miles from Village B for the years 1973 to 1978 are given in Fig 4.4. They reflect the great variability of rainfall, and low seasonal totals in a rain-shadow area (see Chapter 2). Because of the marked peaks of rainfall, there are no locally fed permanent streams or rivers flowing through village lands. Runoff is drained through a system of gullies (see Figs 4.1 and 4.2).

The River Suruli represents the major fluvial source of water for the Kambam Valley, and before the advent of the Periyar Scheme was diverted from this river to Village A lands for irrigation purposes. Periyar water, with its greater discharge, has become the most important source of water for Village A.

Groundwater, too, is an important source of irrigation water for both villages. The relationship between groundwater availability and rainfall and altitude is discussed in Section 4.3.1.c.

4.2.3. Livestock

Estimates of livestock populations at the time of the survey may be made by projecting the totals owned by sample survey households (for Village A 53 of 318 households, and for Village B 57 of 317 households were surveyed). The totals for each sample survey, together with projected village totals are given in Table 4.1. There is a marked difference between the villages in that Village A has a significantly greater number of bullocks and milch cattle and a smaller number of goats than

Village B.

While no data on past livestock totals is available except for the 1885 and 1915 Settlement registers, which state that the total of cattle in Village A was greater than that for Village B, while the total of sheep and goats was less[1], an indication of the changing demand for bullocks for gardenland irrigation in either village may be seen in the changing numbers of operational kamalais[2] from 1915 to 1978 (Fig 4.5), as presumably two bullocks would be needed to operate each kamalai. Bullocks are also required for ploughing; figures for labour demand for land preparation suggest that in dryland and gardenland there has been a substitution of bullock ploughing by tractor ploughing, though this process is limited in wetland (Section 4.6). Thus the larger total population of bullocks is consistent with both their greater use on wetland and their continued use for kamalai irrigation.

No information is available on the changing population of milch cattle, though this is to some extent positively related to that of bullocks. The populations of buffaloes in Village A and of goats in Village B have been boosted in the year before the survey by government sponsored loan schemes[3]. The large

1 For 1885: In Village A 190 sheep, 450 cattle, in Village B 758 sheep, 127 cattle.
For 1915: In Village A 164 sheep, 574 cattle, in Village B 359 sheep, 393 cattle.

2 A bullock operated well irrigation system (A well may have more than one kamalai).

3 The Small Farmers Development Programme has supplied capital for the launching of a small scale buffalo dairy co-operative, and the Canara Bank in Village B has given loans for the purchase of goats to some families.

estimate for the goat population in Village B reflects the fact that 27 members of the <u>Kurumba Gounda</u> caste are employed as either full- or part-time shepherds (Table 3.4) a traditional caste occupation.

4.3 Irrigation Technology

Over the period from 1885 to 1978 there have been major changes in the irrigation systems of the villages, during which three different types of irrigation, canal, tank and well, have been used.

4.3.1 Canal

As described in Chapter 2, the lands of Village A overlap the area under the Periyar Scheme, a major traditional canal network. Water is diverted from the River Suruli, which distributes water to Kambam Valley, via a distribution channel (see Fig 4.1) and to individual fields via smaller distribution channels. Water is made available constantly, though at varying rates of discharge over an eight to nine month period from June to March. Water is bunded into level fields on the eastern side of the channel for paddy cultivation. There has been no change in the methods used within this system since the inception of the Periyar Scheme in 1895. The First Settlement Register of 1885, however, shows that while there was sufficient water for a second crop in the southern section of the canal irrigated land, the northern section comprising 21% of this land received canal irrigation for only one crop. Canal water is government owned, and the sluice-gates of the distribution channel to the village are controlled by Public Works Department officials. Farmers pay a relatively high land revenue for the use of this water on lands classified at settlement as "wet", and progressively higher fines for the continued illegal use of canal water on lands classified as "dry" or on occupied government land.

Canal water has in some cases been diverted from the distribution channel to government-owned lands, having been drawn off from the channel by underground pipes into wells acting as reservoirs for water which is subsequently pumped overland to gardens in the west of the village.

The presence of the distribution channel, too, keeps the water-table to the west of the channel at an artificially high level for a large part of the year, a factor which has been important to gardenland cultivation, especially with the increased output associated with powersets.

An important part of the canal irrigation system has been the Karuvelan Tank, which is now filled in and used directly for agriculture.[1] Its purpose was to act as a reservoir for canal water received through the distribution channel in order to ensure a sufficient supply of water for wetland in the northern section of the village, especially during the second crop. It was also the village pool, and acted too as a barrier to erosion, collecting the runoff from gullies flowing from west to east through the village. The encroachment of the tank took place over a period of about two to three years from 1969.

4.3.2 Tank

Tank irrigation has been used in both villages, although

1 16.50 of its 24.33 acres are under agricultural land.

in a secondary role in conjunction with both well and canal irrigation. In Village B there are four tanks which trap the runoff of rainwater flowing from west to east through the village (Fig 4.2). Thus the level of water in the tank varies annually and seasonally with rainfall. The tanks do not exist primarily for the purpose of directly irrigating land, their role being mainly to act as reservoirs of water, helping to maintain water levels in wells located on their eastern perimeters. This function is well appreciated by villagers in Village B, who have an as yet uninitiated scheme to build a dam in the South-West of the village to trap runoff flowing from south-west to north-east through the village (see Fig 4.2). One of the tanks (T4), has been used directly as a source of irrigation in the past, irrigating a limited area of land[1], which was at the same time under well irrigation, through a small outlet channel for three to four months annually, sufficient for a single crop of paddy. However this is now dry. Another of the tanks (T2), was classified as a second class source of irrigation in the 1885 settlement register, irrigating some 2.64 acres of land. It has not performed this function, however, within living memory.

The tanks, as well as acting as reservoirs for irrigation water, have been important in limiting surface erosion through runoff (the four tanks in Village B form a chain in a section of the drainage network). Tanks also perform the function of acting as the village pond (T3 is the most important in this respect),

1 Reports suggest this varied between 7.26 and 25.71 acres, implying that it was a minor irrigation source depending very much on rainfall for its effect, and probably supplemented by well irrigation.

which is of importance to the life of the village, as well as offering the important facility for washing cattle. The tank in Village A, as described above, has ceased to exist, but the river may perform many of the functions of the tank. While tank levels have declined in Village B, so has the demand for their use, with declining numbers of draft cattle.

4.3.3 Well

Wells are independently controlled sources of irrigation built to act as reservoirs of ground water as well as points of access to groundwater. They are generally of a width and breadth of about 25 feet by 25 feet. The depth of operating wells must reach below the level of the water table during the rainy season, and its supply of water depends upon the length of time during the year during which the base of the well remains below the groundwater level. Water flows into the well through underground aquifers which are tapped either by the well itself or by boreholes added to the well.

The extent of well irrigation in either village depends, therefore, on the spatial extent of access to groundwater. There are some local variations within the village in the hardness of the parent rock[1], and thus the ability to sink wells, and also in the courses of underground aquifers because of geological structure. However, the main determinant of access to groundwater is the level of the water table, which varies positively with seasonal rainfall, and negatively with altitude.

1 This constraint on powerset adoption is noted for North Arcot District, Tamilnadu by B. Harriss (1977).

Idealised water table levels for wet and dry seasons are shown for both villages in Fig 4.6. The spatial extent of well-irrigated land is clearly defined in both villages; wells have been sunk outside areas of possible access to groundwater, and are thus physical proof of unsuccessful ventures, and help to mark the boundary of possible access.

The direct seasonal relationship between groundwater availability, as measured in well water levels, and rainfall has been demonstrated by C.M. Bandara (1974) for North Arcot District, which has a largely similar rainfall regime and geological structure. Unfortunately it was not possible to collect data from within the village on changing seasonal groundwater levels, or for the Kambam Valley[1].

Since 1885 there have been two major methods of drawing water from wells. Until the introduction of powersets in Village A in 1967 and in Village B in 1963, the traditional method of drawing water was the kamalai, a bullock operated machine. (The ettram, an ancient method of drawing water by a lever system, was in operation in one well in Village A from 1915 to 1925). Some wells had the facility to operate more than one kamalai at a time. The kamalai is only able to operate up to a maximum depth of about 50 feet, as increasing depth from which water is drawn necessitates increasing effort over increasing time for diminishing output.

1 The Groundwater Directorate, Madras, have been collecting data on changing groundwater levels throughout Tamilnadu since 1971, but thought analysis was premature until at least 1981.

Both oildriven and electrified powersets were introduced to both villages. However it is electrified powersets which have become dominant. Electric power was brought to Village A in 1967, and to Village B in 1968[1]. The output of pumpsets is significantly greater than that of the kamalai. Mean extraction rates, in acre feet/well/year, for all development blocks in Periyakulam and Uthamapalayam taluks indicate for 1974/75 a ratio between the extraction rates of electrically driven and bullock powered wells of 3.55 to 1 (Sample survey, Office of the Chief Engineer, Groundwater, Madras, 1979). This increased capacity for output would be expected to have significant effects on the balance of water supply and the amount and method of use of groundwater in "dry" farming areas.

Palanivelu (1974) analysed the relationship between area irrigated by wells, depth of wells, number of wells, and numbers of powersets over time in a dry farming village in Salem District, Tamilnadu. While he found a nonsignificant correlation between increasing numbers of wells and gross area irrigated over time, and between increasing depth of wells and gross area irrigated over time, there was a high positive correlation between increasing use of powersets and depths of wells, but a low positive correlation between wells without electric or oil power (presumably either kamalai driven or out of use)[2] and depth of well. Moreover Bandara (1974) in North Arcot District showed an increasing disparity between observed and expected seasonal groundwater levels in a situation of increasing use of electric powersets.

1 For Village B, electric power was available for a few wells at different times because of their locations in different revenue villages; one well received power in 1963, and two others in 1970.

2 My parenthesis.

There are two other aspects of well irrigation technology which have influenced the villages' irrigation systems. First, bore holes have in some cases traditionally and increasingly recently been attached to wells in order to increase their tapping power. Before the advent of powersets, boreholes, which are of about 5 - 8 mm in diameter, were excavated by a handdriven machine, but are now excavated by a powerdriven machine. The possible range of boreholes has thus increased from about 20 feet to over 100 feet. By this means the range of the well may considerably be increased without the relatively high expense of deepening the well. In some cases, water is drawn directly through the borehole (not through the well itself) to irrigate the land.

Secondly, there has been the introduction of overland or underground piping systems, which extend the range of well irrigation. This has been made possible by the greater output of powersets. Piping systems may either be used for directly irrigating the land or for filling wells which later irrigate land.

4.4 Landuse types

The varying qualities of land resources combine with the availability of water for agricultural production to limit the potential areas of three basic landuse types: dryland, gardenland, and wetland. These are associated with separate and distinct modes of agricultural production. The extent of the landuse types varies over time with changing demand for their use within the village, while the potential for change is limited by environmental, sociological, technological and economic constraints.

Figs 4.8, and 4.9 illustrate the spatial variation within the boundaries of the revenue village of landuse type, and within the dryland type of cholam cropping. Land unsurveyed falls within the non-resident ownership zone (See below).

There is no single factor which defines or divides areally these landuse types; rather they may be distinguished by their respective unique combinations of types of land resources, water resources, and production patterns, and in turn different characteristics of productivity, value, management, and labour demand. The extent and proportion of operational landuse types within the village is an indicator of the stage of development of the agricultural system of the village. Table 4.2 and Appendix 1 in more detail show changing areal cultivation under dryland, gardenland and wetland from 1885 to 1978 in both villages[1].

1 Yearly totals are taken to represent a year of the Muslim calendar from May to April, a <u>fasli</u>, which is the basic unit of the Department of Revenue Accounts.

It was necessary to make assumptions about the validity of land records before making realistic estimates of landuse extent within the village.

For both villages the <u>chitta</u> was available for 1885, giving government classification of land into <u>tarams</u>, or rates of assessment for revenue collection based on soil classifications and irrigation availability. There was also a list of land awarded by government (termed <u>inam</u>) to individuals, whether village officers or artisans[1].

The 1915 Settlement Register showed a similar land classification, though no chitta. The chitta itself was only available for Village A from 1947 and for Village B from 1926. However, the 1915 Settlement Register listed unowned land, and over the period from 1915 to 1978 showed the course of areal extension of agricultural land through assignments of land to farmers for cultivation. As well as the Settlement Register, the <u>adangal</u> gave evidence of the extent and type of land cultivated during most <u>faslis</u> from 1960 to 1978 for both villages.

The 1915 Settlement Maps, on which the accounting of revenue assessment is based, apart from delineating wet and dry land according to the Settlement Register, gave no information as to landuse type, other than the locations of existing wells. These wells can be assumed to have been operating at the time of Settlement. Using the field boundaries as delineated in the 1915 Settlement Map, and taking the 1978 physical juxtaposition of fields with regard to slope and relative altitude, in conjunction with chitta records and farmers'

1 For the 1915 Settlement, the amount of Inam land was significantly reduced for both villages.

memories, it was possible to map retrospectively the area under gardenland in general, and individual gardens in particular. It was also necessary to delineate the extent of land which had been "encroached" illegally[1] by farmers, and land transferred from dry to wet without permission. Also, account had to be taken of patta land (e.g. the village site, and threshing floors) which was not suitable for cultivation.

The 1978 areal definition of land owned by residents of both villages showed distinct zones of ownership by village within the lands of the revenue village. It was possible to delineate a "Village Ownership Zone", and a corresponding "Non-resident Ownership Zone"[2] within each village. The Non-resident ownership zone is a zone contiguous with the boundaries of the revenue village within which there was no or very little land owned by residents of the village. The fact that these zones should exist within each revenue village illustrates the territorial integrity of individual villages regarding agricultural land. While calculations were made as to the extent of land cultivated through the whole revenue village, it was possible to distinguish between types of landuse only within the Village Ownership Zone.

Patta land, unless shown by survey to be unsuitable for cultivation, was assumed to have been taken into ownerhsip for cultivation purposes. In the 1885 chitta, land which was either within the present Village Ownership Zone, or which conjoined (within a patta) other land in the present Village

1 Government-owned land taken over by farmers without Revenue Department permission, the "possession of which is liable to incremental fines".

2 As illustrated in Fig 4.3.

Ownership Zone, or with housing or threshing floor land was assumed to be owned by residents of the village. For the period from 1915 to 1978 the exact extent of land owned or cultivated by residents of the village was not known (the exact extent of owner ip by residents of both villages of gardenland was known from 1915 to 1978, and by residents of Village A of wetland from 1947), but a suitable substitute is taken to be the Village Ownership Zone itself. This is considered suitable, even though there is land owned outside this zone residents of the villages, and land owned inside this zone by residents of other villages.

4.4.1 Dryland

Dryland receives rainwater only, and one crop is cultivated per year, usually of millets, cholam being the main crop, which are intermixed in standard combinations with pulses. Lands are ploughed periodically before the rains and sometimes manured. The crop is weeded once or twice but is otherwise left largely untended until harvest. Millets traditionally have generally been grown for consumption by the farmer or within the village. Although there has been little change in dryland production patterns since 1885, dietary habits have changed with the increase in rice production associated with the green revolution. More rice is available to the village on the open market, through earnings in kind, and through rice production by members of the village (in Village B there has been the purchase of Periyar riceland in the period of 10 years before the survey). Therefore the importance of dryland for subsistence production is decreasing both in relation to marketing changes and production increases characterised by the other landuse types.

The Sample Household Survey suggested that in 1978 while 60% of households in Village A and 63% of households in Village B owned dryland, that 73.3% of dryland in Village A and 79.9% of dryland in Village B was cultivated. Of the produce from the dryland crop, 68% of farmers in Village A and 83% of farmers in Village B kept all the produce for home consumption[1], while the amount kept for home consumption was calculated to be available for a part of the daily diet for an average of 3.82 months per household, or 4.09 months per person in Village A, and 3.11 months per household, and 2.76 months per person in Village B. This would suggest that farmers who own dryland alone cannot rely on it to produce anything more than a small proportion of their dietary or cash needs throughout the year. Thus, in spite of the fact that dryland covers a far greater area than other landuse types, because of its low and seasonal production and demand for labour, its relative importance to the village economy, and its influence on other aspects of village life has been traditionally very small, and, with the increase in production and change in technology and production methods associated with the other two types of landuse, is decreasing.

4.4.2 Gardenland

Gardenland is characterised primarily by well irrigation,

1 Millets, which are assumed to have strength giving properties, are consumed in conjunction with rice and other vegetables. This parameter is designed to be no more than an approximate guide to the relative importance of dryland produce for consumption.

although some gardenland in Village A is irrigated by canal water. Gardenland is used to grow a variety of crops of different durations, often intermixed, for either commercial or subsistence use. Water is drawn from the well or lifted from the canal at regular intervals and allowed to soak into the soil. The field is divided into a maze of squares, about ten foot by ten foot, separated by small ridges, and the water is systematically channelled into these squares via narrow ridges.

Wells form multiple points of access to a single if spatially expanded source of water, groundwater, and the number of wells, the area irrigated by wells, and the method of control of well water are crucial factors determining the changing nature of gardenland cultivation. The changing extent of cultivated gardenland, and area under wells is shown in Figs 4.10 (Village A) and 4.11 (Village B), and the numbers of different types of wells compared with depth of wells is shown in Table 4.3[1]. Areas irrigated by individual gardens for Village A are mapped for 1966 and 1978 (Figs 4.12 to 4.13), and for Village B for 1952, 1970 and 1978 (Figs 4.14 to 4.15).

Each garden, when irrigated by kamalai, was a contiguous unit, the potential area of which was largely controlled by the output from the well, but limited too by the existence of other contiguous gardens. The limited efficiency of the kamalai was an important factor in keeping gardens to a relatively small individual area before the introduction of powersets. However,

1 Appendix 2 shows the Depths of Operating Wells for Kamalais and Powersets, together with the standard deviation of depth for these methods, 1885 and 1960-78.

it is not simply because of the increased output of the powersets that average areas irrigated by wells have increased; rather because of a combination of ecological and technological factors which are of differing importance to each village.

The adoption of powersets in both villages seems to show a classical pattern (Table 4.4), with an initial steady state, followed by a take-off which becomes self-sustaining, and later again reaching a steady state. The relevance of this model is limited, however, not only because of the economic difficulties and pressures associated with the adoption of powersets, but because adoption was mainly of electric powersets which would obviously not have been possible without the development of power supply to both villages. However, the relatively short time over which powersets were adopted (largely with the aid of loans from government banks) meant that the consequences of change were initiated at a rapid pace. It is significant that adoption of powersets has been both faster and in greater numbers in Village B where there was initially greater area under gardenland, and where gardenland was the most important landuse type.

With the greater output of powersets, the greater utilisation and competition for available groundwater, as a result of their use in Village B, led to a dramatic fall in the water table, as reflected in the increase in average depth of operating wells through deepening. As the watertable fell below the maximum depth of 50 feet for the efficient operation of kamalai sets, they became obsolete. Farmers who had not adopted powersets in the early stages were compelled either to deepen their wells and use powersets, altogether an expensive operation, or to stop irrigating land. There was a fall in the numbers of wells operating, though because of the greater output capacity of powersets, this was not directly reflected in area irrigated. It was possible to extend the areal range of a well's capacity for irrigation not only by irrigating land adjacent to the garden of the well, but also by pumping water to discontiguous land either via small temporarily constructed overland channels (possible if the direction of flow was consistent with slope) or through overland or underground pipes. Water thus became a far more flexible resource for production, although the control of water became concentrated into a smaller number of outlets.

In Village A, adoption proceeded at a slower pace in what was a secondary method of irrigation for the village. Nor did the adoption of powersets result in any significant lowering of the water table. This is kept at an artificially high level by the presence of the distribution channel. Before the adoption of powersets, gardenland was limited to a small band of land adjacent to the distribution channel on its western side. The increased depth from which powersets could draw water meant that new wells to the west of this band in areas of lower water table were possible.

The frequency and depth of well excavation from 1962 to 1978 is shown in Table 4.5: the Well Survey asked for dates of first deepening, and last deepening of wells during the 20 year period from 1959 to 1978, and also total amount deepened. Where no further detailed information was volunteered, where there were more than two deepenings, the total depth was divided equally by the number of occasions of deepening, and the dates of deepening assumed to have occurred at regular intervals.

In Village B the greater initial and continued frequency with which wells were deepened reflects the view that the problem of local falling water tables was seen as both an urgent and perhaps permanent problem. There was also a perception of of the greater water demand for certain new hybrid varieties of commercial crops which were gaining acceptance in the region, especially cotton and banana, and of their demand for water in months previously unseasonal for gardenland farming, as well as the potentially greater output of powersets. That the greater output itself could be a cause of decreasing water availability was recognised by only a few farmers. In fact the lack of water in village wells was attributed mainly to an assumed lack of rainfall in recent years, a theory which is supported to a limited extent by low rainfall totals for the years 1974 to 1976[1], or on a local level to the stealing of water by adjacent wells. The theory that groundwater availability was directly related to rainfall is perhaps partly explained in that there was a realisation of the seasonal relationship between the level of water in the well and rainfall, and also of the relationship between the level of water in the village tanks and that in the wells, and at the same time an awareness of the role that tanks played in conserving surface runoff from seasonal storms. If there was no water in the well and none in the tank, it was simply because there was a lack of rainfall.

In Village A, however, the deepening of the wells reflects the general recognition that powersets afforded the opportunity to extend areally gardenland cultivation. A large proportion (57%) of the depth excavated from 1963 to 1978 in Village A

1 See Section 4.2.2.

was for the initial excavation of new wells, which were subsequently driven by powersets. Of the 15 new wells dug from 1963 to 1978, 9 were dug from 1967 (the year of electrification) to 1970. As the watertable was kept at a constant level by the presence of the distribution channel, there was no compulsion to deepen existing wells.

The effect of electrification and the adoption of powersets on the deepening of wells in both villages is further illustrated in that the average amount removed per excavation from existing wells increased from 5.92 feet before electrification to 7.81 feet after electrification in Village B and correspondingly from 4.83 feet to 5.31 feet in Village A.

Deepening of wells after electrification was carried out not only to retain accessibility to groundwater in a situation of falling water tables (in Village B), but also to improve the waterholding capacity of wells needed with the potentially greater output of powersets. Boreholes were also dug for this dual purpose. Table 4.6 shows the frequency with which farmers sought to extend the tapping power of wells after electrification. Again there is evidence of more competition for water by this method in Village B, and the excavation of boreholes reached a peak shortly after electrification, and was still in progress in 1978. In Village A, however, the construction of boreholes has proceeded at a slower rate, largely because there has been less competition for available water.

Piping represents an important method whereby water has become a more flexible resource. The courses of recently constructed permanent piping systems are shown in Figs 4.13 and 4.16. Piping systems represented a substantial investment in both villages, but while in Village B piping systems were used to irrigate gardens whose wells had become obsolete, and were generally very small scale enterprises, farmers in Village A were able to irrigate land which had previously only been used for dryland cultivation, and which was usually specifically required for the development of gardenland cultivation. Water was pumped from wells having a greater assurance of water supply next to the distribution channel, either directly to irrigate land or to existing wells to keep their water supply consistent. In some cases water is taken directly (and illegally) through boreholes connected to the distribution channel. Because of the relatively large supply of water, gardens which are irrigated indirectly through this chain tend to be of comparatively large sizes.

The changing availability of gardenland irrigation technology combined with the varying spatial availability of land and water resources in both villages has thus had important effects on the development of gardenland cultivation. Until the introduction of powersets, the most important factor limiting the area of cultivated gardenland in the context of the spatial variation of groundwater availability was the maximum depth from which water could be drawn using the kamalai. However, while electrification, and the associated greater output, possibilities of deepening wells, attaching boreholes and construction of piping systems has allowed Village A to extend gardenland through the greater utilization of groundwater, it has resulted in increased competition for available groundwater in Village B, which led to a temporary decrease in gardenland area, and a permanent decrease in the numbers of operating gardens.

4.4.3 Wetland

Wetland, which exists now only in Village A may be defined as land irrigated for paddy cultivation. Paddy is double cropped followed by a dry crop either for green manure or for cattle fodder. Paddy cultivation requires flooding for a large part of the growing period, and, as a result of this and the abnormal amount of soil mixing which occurs in land preparation, soils develop their own characteristic profile.

As the technology of irrigation and methods of cultivation have remained largely unchanged since the inception of the Periyar scheme in 1895, changes which have occurred in the of wetland cultivation are largely due to economic and political factors, and to technology associated with the introduction of hybrid varieties. Because the village is situated on a west to east slope, water from the main distribution channel must generally flow through smaller channels back towards the river in order to irrigate land for paddy cultivation. Unless the course of the distribution channel is altered, therefore, the potential for change in wetland remains small. The most significant change in area under wetland has occurred as the result of the encroachment of the village tank as described in Section 4.3.1.a. Other marginal changes have been possible in areas close to the distribution channel, which were classified as "dry" in the 1915 Settlement.

4.5 Cropping Patterns

Cropping patterns, although they do not directly reflect land production and productivity[1], provide a useful reflection of production and planning decisions, and the demand for production both for consumption within the village and for sale outside. Thus, totalled acreages under different crops, within certain limitations, act as surrogates for production and productivity. Therefore crop data are considered both as totals in themselves, and as reflections of the intensity of production. The environmental and technological determinants of cropping pattern changes are outlined as well in this section, while the threefold division of landuse types is maintained as a basic framework for cropping pattern types. Most of the discussion of cropping patterns is concentrated into the period of about 20 years before the survey, largely because most change has occurred during this period. Data on previous years is limited to Settlement Account data, the available Adangal years, and to data collected from interviews. The Settlement Accounts data, in total yearly acreages under crops in the years of settlement, are shown in Table 4.7.

4.5.1 Dryland Cropping Patterns

Dryland cultivation is limited to one crop per year,

1 Land records (the adangal) state the percentage of normal production for all cultivated land, but not only can this norm vary, but it is also often an arbitrary figure decided upon for all crops in the village for one particular year or season.

which lasts for about five months from the time of sowing (mid-August). This varies with rainfall, the optimum time being after a heavy shower. The dryland crop takes advantage of the main monsoon for rainfall (Fig 4.4), and the fact that the final ripening and harvesting of the crop is not usually hindered by rainfall. There are eight crops which are usually sown on dryland: red cholam, samai, karnam, varugu, tovarai, parcipayir, tattanpayir and kallupayir. These are intermixed in standard combinations, although red cholam is the dominant crop in any combination of which it is a part, and occurs in most combinations. The standard combinations in use in both villages in 1978 are shown in Table 4.8.

4.5.2 Gardenland Cropping Patterns

Gardenland cropping patterns are by far the most complex of the three landuse type cropping patterns, being characterised by a great variety of short and long duration commercial and subsistence crops, grown singly or intermixed. As with dryland and wetland cropping patterns, however, possibilities of production are limited by seasonal variations in water availability, and also by the immediate cropping patterns tend to fall into flexible regimes of crop combinations, crop rotations and seasonal timing of production.

However, in contrast to the largely static cropping patterns of the dryland and wetland areas, cropping patterns in gardenland areas have changed dramatically during the period of twenty years before the survey. Although changes have been largely associated with the introduction of new irrigation technology in gardenland areas, also important is the introduction at about the same time of a mix of new inputs: pesticides, fertilizers, and hybrid seeds. Appendix 3 gives areas under major crops grown in gardenlands in both villages for the years available in the village records. Decisions about production for the gardenland farmer have been determined by a combination of factors, the relative importance of which are constantly changing. Because of this and the multiplicity of possible decisions about crop cultivation which are open to gardenland farmers, it is unsurprising that there is a great amount of fluctuation in crop areas. However, general trends which may be identifed are the increasing area under banana and cotton from about 1970, and decreasing area under millets, rice and ragi.

Water availability has influenced cropping in two main ways. First the amount of water available determines the extent of possible cultivation, either by the duration of cropping or the proportion of land cropped in a garden per year. Table 4.9 shows the proportion of 3-, 6-, and 12-month[1] irrigated crops cultivated by resident farmers according to village records for the years available from 1960 to 1978. Also shown is the total area irrigated annually (shown as a factor of area and months of cultivation of irrigated crops), and the intensity of cultivation (shown as a percentage of maximum possible cultivation)[2]. While the

1 Banana is taken to be a 12-month crop, although this is the minimum period required for cultivation, bananas often being harvested after 14 or even 16 months.

2 All figures are adjusted for gardenland data not available in the adangal.

proportion of 3-month crops cultivated has decreased since electrification, that of 6-month and 12-month crops has increased (12-month crops especially in Village B). The total area irrigated (which may be taken as a surrogate variable for water output)[1] has increased since electrification, as has the intensity of cultivation, although there are large annual fluctuations. This suggests that since electrification, not only has output for gardenland irrigation increased, but water is available more consistently throughout the year.

Secondly seasonal differences in both groundwater and rainwater availability have brought about standard times of cultivation which limit possible periods of cultivation, depending upon the varying demand and drought tolerance of crops. Chillis are grown from April to September because they are more tolerant of water shortage than ragi, which is traditionally grown from August to December. White Cholam consistently grown from February to April because it demands less water than other irrigated crops, while onions and tomatoes are short term crops which can be grown at any time of the year subject ot water availability. The increasing reliability of water availability through out the year has lessened the importance of seasonal factors in decision making, and there is greater scope for long-term planning, and greater flexibility of planting times, although certain crops retain traditional seasons.

While consistency of water availability has facilitated the change from short- to long-term crops, the generally

1 There are, however, differences in water demand of various crops which weaken this link.

greater irrigation demands of long-term crops have probably increased the rate of the lowering of the watertable. The monthly frequency of demand for irrigation of the major crops and combinations of crops cultivated in both villages in 1978 is given in Table 4.10. Banana, which has become a very important crop in Village B, makes especially high demands on groundwater supply.

Rotation of crops takes place to the extent that certain rules about successions of crop combinations and intermixes of crops are adhered to. The length of the fallow period has been traditionally very important, though its effect in limiting crop production is decreasing with the increasing use of chemical fertilizers. Rotation and diversification are important in that while they tend to minimize the risk of crop failure, they also tend to even out inputs of labour throughout the year.

An idealised pre-electrification seasonal cropping practice diagram is shown in Fig 4.17. Gardenland farmers of the Sample Household Survey were asked to give typical "traditional" gardenland cropping patterns, with the proportions allocated to different crops during Tamil months (see section 4.6 for the respective timing of the Tamil and Roman calendars). It is a simple amalgamation of volunteered information in this respect. While it illustrates the dependence of most crops on seasonal groundwater availability, it also reflects the individual seasonal norms of certain crops and the potential omniseasonal cultivation of others.

It was possible to construct from the Sample Household

Survey an estimation of the 1978 seasonal concentration of crops for both villages. (See Table 4.11). It reflects the tendency in gardenland cultivation towards greater seasonal diversification of total crop production and indeoendence from seasonal constraints.

4.5.3 Wetland Cropping Patterns

While the 1885 Settlement Register for Village A shows a considerable diversity of crops under wetland cultivation, with cholam. cumbu and ragi, as well as paddy being the most important crops, the importance of paddy had increased considerably by 1915 when paddy covered 355 acres and the total second crop for the village was 194 acres. Given that the total acreage under wetland at that time was 174.57 acres (Table 4.2), and assuming that paddy was grown only on wetland, the figure of 355 acres for paddy may be interpreted as a slightly erroneous statement of the fact that wetland was double cropped with paddy in 1915. The adangal for years available from 1960 to 1978 shows that this has been consistently the case during this period. No change has occurred in this pattern within living memory of village residents. It would seem therefore that this pattern has been unchanged since at least 1915, and probably since 1900 when increased discharge through the Periyar schemes made double cropping of paddy possible. There has been no move to cultivate sugarcane in wetland as has been the case in other villages in Kambam Valley from 1975 to 1978.

The two crops grown, <u>kodai</u>, traditionally a short-term crop, followed by kalam, a longer-term crop, are dependent for their timing on the water supply controlled by the Public Works Department-operated sluice gate. Water is usually made available from June, so seedbeds are prepared during this month, seedlings transplanted in July, and the kodai crop harvested over a period of one month from the last week in November. The kalam crop is transplanted about 15 days after the kodai harvest, and is itself harvested over a period of one month from the last week in March, leaving about 2.5 months for the growth of a short-term dry crop, either a green manure or a pulse. Because of the schedule imposed by the limited time over which water is available, consideration has to be made for seedbeds (if seedlings are not bought) in order to minimise the time between the kodai harvest and the kalam transplantation. Therefore a shorter term crop is grown over a small area in order to make sufficient space for a seed bed at least 30 days before the kalam transplantation.

The greatest change within a pattern of double-cropped riceland has been in the varieties of paddy cultivated. Traditional kodai varieties, such as Vellekatay, and kalam varieties such as Koyil Samba were almost completely replaced by the hybrid varieties IR8 and IR20 respectively within two years of their introduction to the village in 1968. According to the Sample survey Koyil Samba was last grown in 1975, and Thangamani, another traditional kodai variety in 1974. The survey indicated that 100% of wetland was cultivated with IR8 in kodai and IR20 in kalam. Other hybrid varieties in occasional use during kodai, because they are shorter duration varieties than IR8 include Vaighai and Karuna.

4.6 Labour Demand

a. Labour is treated here as a direct facet of the agricultural process of the village. The "village" boundary is defined by land operated by residents of the village. This section will examine demand for labour from crop cultivation for specific agricultural operations. Employment Status, which may be considered as the demographic embodiment of labour use, is outlined in Chapter 3, and Organisation of Labour, which may be considered as a facet of class and social relationships, will be dealt with in Chapter 5.

b. Because of the differences between male and female labour practices, which result directly from agricultural process, as well as being reinforced by social custom, demand for male and female labour are treated here as separate indices. Figures are also given in this chapter for total and proportionate demand for hired and family labour[1], although no conceptual division is made between these two types of demand in this chapter. (The data are presented here to avoid repetition in subsequent chapters).

c. Along with the scheme for previous sections of this chapter, labour demand will be described with reference to each major landuse type before being considered as a whole. Thus methods of calculation of labour demand vary with the landuse type. However the great majority of data on the frequency, periodicity, and intensity of labour demand was collected from the questionnaire

1 See Chapter 9.

of sample households on cultivation practices. Although this relied upon memory of the respondents (supplemented by random observation by the author), rather than systematic observation (which was impossible given constraints on time), the results are considered to be sufficiently accurate to evolve comparative estimations of labour demand for different crops and landuse types. Moreover, as estimates were required for labour demand for agricultural operations for specific areas of cultivated land, the farmer (the decision maker, and paymaster) for that land is perhaps the most appropriate source of information given limited survey time.

d. While data from the sample survey on the periodicity of cropping patterns in the year of the survey made possible an estimation on the periodicity of 1978/79 labour demand, neither information from the adangal on past cropping patterns, nor the idealised cropping patterns evolved from the sample survey (Fig 4.17), was considered to be sufficiently accurate to be used for the evolution of quantitative estimates on the periodicity of past labour demand. However, the idealised cropping patterns and the adangal were used in estimations of direction of change in periodicity, and the adangal also used to estimated overall changes in the intensity of labour demand.

e. Data on periodicity of labour demand for sample survey were gathered with respect to monthly intervals, and the Tamil calendar (which does not coincide with the Roman calendar), was used. The months, with the respective periods in the Roman calendar are given below. In the subsequent section they will be referred to by number; for example, T.M.2 (the Tamil month Vaigasi, mid-May to mid-June).

T.M.1	Cittirai	mid-April to mid-May
T.M.2	Vaigasi	mid-May to mid-June
T.M.3	Ani	mid-June to mid-July
T.M.4	Adi	mid-July to mid-August
T.M.5	Avani	mid-August to mid-September
T.M.6	Purattasi	mid-September to mid-October
T.M.7	Ayappaci	mid-October to mid-November
T.M.8	Kattigai	mid-November to mid-December
T.M.9	Margali	mid-December to mid-January
T.M.10	Tai	mid-January to mid-February
T.M.11	Marci	mid-February to mid-March
T.M.12	Panguni	mid-March to mid-April

4.6.1 Dryland labour demand patterns

Dryland, of the three landure types, shows the simplest patterns of labour demand, having fewer agricultural operations for only one crop per year.

Land is ploughed over a three to four month period from about T.M.1, first usually after the onset of heavy rainfall during the less important south-westerly monsoon, and seeded at the time of the last ploughing (land is usually ploughed between two and four times), at the onset of the first heavy rain of the north-easterly monsoon about the beginning of T.M.5. Ploughing is performed by either tractor- or bullock-drawn plough or a combination of both. Manure or pond mud may be applied to the soil, being spread over before ploughing in. Chemical fertilizer is not normally used in dryland farming. Weeding, like manure application, is not seen as an essential operation, but is usually done especially where cholam is grown as part of the crop combination. Weeding is carried out usually between one and two months after seeding. Harvesting of the various crops is carried out at different times, but is usually concentrated into a period of about one month in T.M.9. Cholam, samai and varagu, usually the most important crops in any crop combination, are harvested first, followed by tovare, and then by parcipayir, tattanpayir, and kallupayir, the latter two usually being gathered gradually. Millets require threshing before storing.

Table 4.12 shows the average yearly labour demand per acre for dryland of each village[1]. The figures are computed from the average labour demand of different crop combinations among the sample survey households, and the respective area proportions among land operated by sample survey households. Ploughing is exclusively a male operation, and transport of mud/manure predominantly male, while weeding and harvesting are dominated by female labour. While the volume of female labour demand is greater than male for dryland as a whole, this distinction is less clear in Village A than Village B. While females participate in the transport of manure/mud in Village B, and are the only sex performing mixing of manure/mud in that village, in Village A

1 Seeding is included with ploughing, and threshing with harvesting.

males participate in weeding, and in greater proportions in harvesting than in Village B. The greater total per acre labour demand of Village B (20.96 man days) reflects the greater proportionate female participation in that village. The greater participation of males in Village A, especially at harvest, must tend to lower the total labour demand (19.86 man days).

Ploughing was traditionally carried out by bullock-drawn plough alone. Tractors have been used for ploughing from about 1970. Some indication of the effect of the partial or total substitution of the bullock by the tractor may be gained from the computation of labour demand figures for different methods of ploughing in both villages. Table 4.13 shows the proportional area ploughed by different methods and the respective average labour demand among sample survey households in both villages, and for the average of both villages. While in Village A there tends to be greater total substitution of bullock-drawn ploughing by tractor-drawn ploughing, in Village B substitution tends to be partial. The input of labour for ploughing by bullock tends to be greater in Village A than Village B, and this is consistent with the greater availability of draft animals in Village A. Because it is expected that the number of bullocks in Village B have fallen since the introduction of powersets (roughly coincident with the first use of tractors), the present figures for the input of labour for land ploughed by bullock alone may be assumed an underestimate of pre-powerset labour demand for ploughing. Perhaps a more accurate estimate of labour substitution by tractors may be gained from average figures for both villages. These show that an average of 4.01 days input of labour for ploughing by bullock alone is substituted by 1.45 hours ploughing by tractor.

Fig 4.18 shows in polygon form the estimated total monthly female and male labour demand for both villages. Ploughing is assumed to be carried out in T.M.1, 2 and 5, transport and mixing of manure/mud in T.M.5, weeding in T.M.6, and harvesting in T.M.9. The estimates are computed from the multiplication of labour demand per acre for dryland cultivation by total area operated by villages resident for the proportion of land cultivated during 1978/79 by land operators of sample survey households[1]. Because of its concentration into short periods, differences in the volume of male and female labour demand between villages tend to be emphasised for specific months. Thus the bimodal distribution of female labour demand (for weeding in T.M.6 and harvesting in T.M.9) is more pronounced in Village B, and similarly the bimodal distribution of male labour demand (for ploughing and other land preparation in T.M.4 and 5, and harvesting in T.M.9) is more pronounced in Village A.

4.6.2 Gardenland labour demand patterns

Gardenland is characterised by complex and intensive systems of labour demand, resulting from the multiplicity of cropping combinations, periodicity of cultivation, and variety

1 In Village A the assumed cultivated area of dryland was 433.58 acres, and in Village B 423.58 acres. Detailed figures are given in Appendix 4.

of agricultural operations which are characteristic of this landuse type.

Like dryland, gardenland requires labour for ploughing, the transport and mixing of manure or pond mud into the soil, seeding or transplanting, weeding and harvest. However these operations are characterised by a far higher input of labour, and may be carried out more frequently. Ploughing is carried out using either bullocks or tractor or both. Ploughing by tractor offers the advantage of saving time, a factor which is irrelevant in dryland cultivation. The transport to and mixing of manure or pond mud into the soil before cultivation is considered necessary in order to maintain land fertility and productivity. Manure and mud are transported by the cartload although at the time of the survey there was limited but increasing transportation by lorry. The amount of manure or mud applied varies with the length of the cultivation period. Another traditional method of land fertilisation, the kodai, or folding of a flock of sheep overnight onto the land before cultivation, is carried out in Village B gardenland on an increasingly limited scale. The Kurumba Goundas resident in in the village make access to this method easier than in Village A. Chemical fertilizers have come into use with the introduction of high yielding varieties, and are periodically applied during cultivation.

After ploughing and mixing of manure, land is prepared for planting and irrigation, by making it up into squares surrounded by bunding ridges, as described above. Planting, or transplanting is a labour intensive operation, carried out as a separate operation from land preparation[1], except in the case of banana shoots which are planted at the same time as squaring for irrigation. Weeding is carried out periodically and intensively especially in the early stages of cultivation. Irrigation is necessary for almost all gardenland crops on a regular basis, at a frequency depending on the water demand of individual crops. Irrigation is sometimes needed more frequently in the early stages of cultivation. High yielding varieties, especially cotton and chillis demand pesticide application at regular intervals. Pesticide is sprayed onto the crops using a portable petrol driven sprayer. Crops are either harvested in one operation, as with onions, groundnuts, cholam and bananas, or harvested gradually as the fruits ripen, as with cotton and chillis. Millets require threshing before storing.

Gardenland agricultural operations may be grouped into 14 different operations, listed as follows:

(1) Ploughing by tractor.
(2) Ploughing by bullock.
(3) Transport of manure/mud.
(4) Mixing of manure/mud.
(5) Squaring.
(6) Squaring and planting (bananas only).
(7) Planting.
(8) Weeding.
(9) Weeding and resquaring (bananas only).
(10) Chemical fertilizer application.
(11) Spraying.

1 In contrast to dryland cultivation practice

(12) Irrigation by kamalai.

(13) Irrigation by powerset)

(14) Harvesting.

Appendix 5 shows the average labour demand for these operations for various crops and crop combinations for both villages, as well as the average frequency of the operations. Figures are given in the left hand column entitled "Post-powerset" for 1978/79 operations, and where there is evidence of technological and operational changes in cultivation methods (for ploughing, chemical fertilizer application spraying, and irrigation), calculated labour demand is given in the right hand column, entitled "Pre-powerset".

Ploughing in all gardenland crops shows a greater labour demand than for dryland cultivation. This is especially true for dryland crops, which tend to be ploughed by bullock alone (Table 4.14). Longer term crops tend to be ploughed in greater areas by tractor with or without bullock ploughing. Average figures for gardenland labour demand for ploughing indicate that there is a substitution of 8.56 man days bullock-drawn ploughing by 5.39 hours tractor-drawn ploughing per acre. Ploughing is an exclusively male performed operation.

Labour demand for the transport and mixing of manure or mud is successively greater for longer term crops. Transport is male dominated, and mixing performed by both sexes. Similarly squaring, performed by males only, is characterised by progressively greater inputs of labour for the longer term crops. Planting is mainly carried out by females, though for banana planting is carried out as one operation at the same time as squaring by males. There is a variety of volume of labour demand for planting ranging from 13.23 man days per acre for onions to 6.12 man days per acre for chillis.

Weeding, except in the case of bananas, is carried out by females. For bananas weeding is carried out as one operation with resquaring by both males and females. Fertilizer application is done mainly by women, and is performed more frequently, and more intensively for longer term crops. It is assumed that chemical fertilizers were not applied in pre-powerset cultivation practices. This assumption is not entirely accurate as there is evidence that chemical fertilizers were used in lesser volumes for commercial crops, especially chillis, before the introduction of powersets. However the introduction of chemical fertilizers may be considered part of a mix of new technologies associated with "green revolution" cultivation techniques, and therefore foreign to traditional cultivation techniques. The labour demand for spraying was considered to be insufficient to quantify for specific areas. It is, of course an exclusively male operation.

Figures for the frequency of irrigation for different crops (Table 4.10) determine the labour demand. Banana and chillis require the most frequent irrigation, and millets (ragi and cholam) the least of the crops detailed. Differences between pre- and post-powerset demand for labour are determined by operational differences between the <u>kamalai</u> and the powerset. The operation of the kamalai, the output of which is slower than that of powersets, needs one man to operate each set of bullocks (there may be more than one set), and one man to direct the flow of water into the prepared squares, by mammutty (shovel). Irrigation by powerset, however, requires only one man to direct the flow of water (although he must work much harder). The labour demand for irrigation by powerset was estimated at 0.25 days per acre, and by kamalai at 2.0 days per acre per occasion.

Harvesting is dominated by female labour. The greater frequency of harvesting of cotton, especially, and chillis is reflected in the high total demand for labour for these crops. Banana harvesting is carried out by male labour 'imported' into the village by the buying banana contractor. The other three-month crops show a variety of labour demand for harvesting, onion and groundnut requiring greater input of labour than cholam.

Thus gardenland cultivation practices are generally characterised by high labour demand for land preparation and irrigation by males, and weeding, harvesting, and to a lesser extent planting by females. All crops except banana are characterised by the same operations, and have generally the same sequence and intensity of operation. Banana is unusual in that it is a long term crop, squaring and planting is carried out as one operation by men, there is resquaring and weeding as one operation performed by both men and women, and there is no labour demand for harvesting from within the village.

The highest total labour demand for the crops shown in Appendix 5 is for cotton, chillis, and banana plus a mixed crop. However, monthly labour demand totals, Table 4.15, show a low figure for banana and banana plus a mixed crop[1]. Monthly

1 As these figures are calculated for a 12 month crop, rather than a 14 or 16 month crop for banana, this figure may often be an underestimate.

labour demand for 6 month crops are similar to demand for the shorter term crops, of which white cholam, a millet, has the smallest monthly labour demand. The higher figures for pre-powerset cultivation practices generally reflect the lowering of male labour demand for ploughing and irrigation. (The rele vance of pre-powerset figures for banana and cotton cultivation is limited by the small extent of cultivation before the introduction of powersets). It is also reasonable to assume that labour demand for weeding and harvesting has increased with the introduction of high yielding varieties and chemical fertilizers, though it is not possible to estimate the quantity of change. These changes, as well as the introduction of chemical fertilizer application (performed by women), mean that changes in methods of cultivation and total demand have consistently and systematically tended towards a lower male to female ratio of total labour demand, as shown in Table 4.15. The only crops with relatively high male to female ratios of total labour demand for post-powerset cultivation practices are cholam, having a lower labour demand for weeding, harvesting and planting, and banana with its unusual cultivation practices.

The estimated monthly labour demand for gardenland as a whole may be calculated from the estimated monthly labour demand per acre for the crops detailed in Appendix 5 for crops grown by gardenland farmers <u>within</u> Sample Households[1]. Because, although different crops may be characteristically cultivated at certain times of the year, the flexibility given to cultivation practices in gardenland by the availability of irrigation, especially after the introduction of powersets, means that an

1 See Table 4.

estimation of monthly labour demand through idealised cropping patterns is impossible. One month is assumed to be the period over which land preparation operations, (1) to (5) (of the 14 gardenland operations), take place. Planting is assumed to take place in the second month. For three month crops, land fertilization and weeding is assumed to take place in equal proportions over two months, for six month crops over three months. For bananas, land fertilization is assumed to take place in equal proportions over six months, and weeding and resquaring over eight months. Harvesting is assumed to take place in one month, except in the cases of chillis and cotton where it is assumed to take place over two months.

The gardenland agricultural operations may be grouped, as in Figs 4.19 and 4.20, into four categories: land preparation and planting (operations (1) to (7)), in-cultivation operations ((8) to (10)), irrigation ((13)), and harvesting ((14)). The estimated monthly labour demand for these four categories for both villages, for males and females, computed from the proportionate area represented by identified land of sample survey households to the total gardenland operated in both villages, is shown in polygon form in Figs 4.19 and 4.20[1] (males and females respectively). Appendix 6 gives the estimated monthly gardenland labour demand for grouped operations.

The total monthly demand for male labour,(Fig 4.19), is influenced primarily by fluctuations in demand for land preparation, in-cultivation operations, and irrigation. While demand for irrigation is relatively constant for all months, and demand

1 Note differences in scale between male and female labour demand polygons.

for in-cultivation practices is mainly spread over a long period from T.M.3 to T.M.10, demand for ploughing is concentrated into particular months. T.M.1, T.M.3-6, and T.M.8-11, representing the months preceeding traditional cultivation periods. This concentration, espceially in T.M.1, is greater in Village B. The total male labour demand for gardenland cultivation shows that while, unlike dryland, there is demand for labour throughout the year, there are peaks of demand depending on the timing and extent of land preparation.

Female labour demand, (Fig 4.20), is influenced mainly by fluctuating demand for in-cultivation operations, and harvesting. Both villages have a peak period of labour demand for in-cultivation operations from T.M.3 to T.M.10, and peaks of demand for harvesting about T.M.4, T.M.6-7, and T.M.10-11. However these fluctuations are less pronounced in Village A, and while both villages have a tri-modal pattern of total demand for female labour, which is determined by the harvesting pattern, the trough of demand for total labour in T.M.1-2 is more significant in Village B.

Thus labour demand for Village B gardenland operations for both males and females tends to fluctuate because of the timing of cultivation.

4.6.3 Wetland labour demand patterns

Like gardenland, wetland labour demand patterns are characterised by a multiplicity of intensive operations, but these apply to the cultivation of one crop, rice, the periodicity of which is determined by the controlled avaiability of canal water. Thus operations fall into set patterns which change little from year to year.

Water is made available from the middle of T.M.2 (about June 1st), and seedlings are prepared in either dry or wet seed beds from this time. The farmer may transplant his own seedlings from the previous harvest, or buy from other farmers in the village, or buy seedlings at the time of transplantation from government sources[1]. The ridges of the paddy fields must be re-straightened before the land is ploughed, either by tractor- or bullock-drawn plough. The field is ploughed on about three occasions, and as many as four teams of bullocks may be used for each ploughing. Green manure, compost manure or oil cakes may be applied to the soil and mixed during the process of ploughing. The land is finally levelled after being saturated with water using a plank of wood drawn behind a bullock team before transplantation.

Seedlings are plucked on the day before transplantation, and chemical fertilizer, applied immediately after transplantation. Urea is applied again after about 80 days. Weeding takes place twice about 20 and 40 days after transplantation. No spraying is needed for the first (kodai) crop because of rainfall during its cultivation from the main north-easterly monsoon.

Harvesting takes place about 110 days (for IR8) after transplantation, in T.M.8. There is a period of about one week between the time that the rice ripens and the time it starts

1 The block development office supplies seedlings from government owned agricultural research stations in the region.

to fall off the stalk, when harvest must take place. The rice is scythed, bundled, and transported to the threshing floor by the harvesters. Rice is threshed by a combination of traditional techniques, taleyadi, (or threshing by hand), and suttradi, (or threshing by trampling of the rice stalks by a team of bullocks), or by tractor, by simply pushing the bundles of rice under the wheels of a circling tractor.

The seed bed for the second (kalam) crop is prepared (after the harvest of an early sown short term crop) about 15 days before the main harvest, allowing transplantation to take place about 15 days after the kodai harvest, and in this interval the land is prepared by ploughing, cutting and straightening the field ridges, and levelling in the same way as for the kodai crop. No manure is added for the second crop during this process. Otherwise the agricultural operations are largely the same, except for the application of pesticide by sprayer[1] twice during cultivation. The harvest takes place in T.M.12, leaving about 75 days before the next agricultural year, enough time for a green manure crop, or a pulse[2]. The land must be ploughed for this, though not as intensively as for the rice crop.

During cultivation, water must be diverted into the bunded fields to maintain he correct levels of water for different times during cultivation. The water continually drains from the higher fields on the southern and western extremities of the strip of paddy land through to the river.

1 Using the same machine as for gardenland.

2 Usually redgram, or blackgram, or horsegram.

Table 4.16 shows the average labour demand per acre, and frequency of operation, for various agricultural operations during the cultivation of one crop of paddy. The figures are compiled from identified land of sample survey households for the kodai crop of 1978/79. Figures for ploughing include demand for cutting ridges. The transport and mixing of manure takes place only for the first crop and thus figures for the second crop omit this. Figures for transplantation include plucking of the seedling from the seed bed, at a ratio of about 1 to 5 (plucking to transplanting). Pesticide figures apply to the second crop only, figures being given for the frequency of application only. Figures for harvest include transport of the bundles of rice to the threshing floor and threshing. No figures are given for the demand for labour for water control, for seed beds, or for the third green manure/pulse harvest.

As with other landuse types, ploughing and transport of manure is performed by men, mixing of manure by both men and women, and weeding by women. Levelling of land is performed by men, and transplanting predominantly be women. Harvesting, in contrast to the crops of other landuse types is performed by a substantial proportion of men as well as women.

Table 4.17 gives the proportions of land cultivated by different methods of ploughing and the average labour demand for each method. By far the largest proportion of land is cultivated by ploughing by bullock alone, and no land is cultivated by tractor alone. The average labour demand for ploughing is greater than that for dryland or gardenland. Although a relatively high figure for demand for labour is given for both transplanting and harvesting, the most labour intensive operation is weeding. Weeding may be carried out over a two day period for areas of about one acre on each occasion, while harvesting and transplanting must be completed within a short period, because of the tight schedule of cultivation for wetland throughout the whole village.

The estimated totalled monthly labour demand for riceland for Village A as a whole, calculated from the multiplication of demand per acre by the total area operated by Village A residents is shown in polygon form in Fig 4.21[1]. In contrast to the pattern of labour demand for gardenland, demand for wetland labour is characterised by pronounced peaks of demand for labour interspersed with periods of absence of any demand for both male and female labour. Land preparation, predominantly male performed, is concentrated into T.M.3, T.M.8 and, to a lesser extent, T.M.1, while transplanting and weeding, operations which are carried out in successive months, mean that there are peaks of demand for female labour in T.M.4-5, and T.M.9-10. Peaks of demand for harvesting for males and females are seen in T.M.8 (coinciding with a peak of land preparation for males) and T.M.12. Appendix 7 gives the estimated monthly demand for wetland operations.

While cultivation practices have changed little, the demand for labour for harvesting, weeding and chemical fertilizer application must have increased with the introduction of high yielding varieties, while there is little change in

1 This calculation assumes two crops of rice and one of green manure, each operation timed according to the details given above. Labour demand for ploughing is assumed to be half as much for green manure cropping as for rice cropping. Demand for Village B wetland follows the same pattern for its considerably smaller operated area.

land preparation practices, bullocks being used for all ploughing (mostly not in conjunction with tractors) and levelling. Thus the relative demand for female labour must have increased to a greater extent than that for male labour, but the systematic increase in female labour demand and decrease in male labour demand characteristic of gardenland cultivation practices after the introduction of powersets and high yielding varieties is less pronounced in wetland cultivation.

4.6.4 Total Labour Demand

Fig 4.22 shows the aggregated projected totals for male and female demand for labour for both villages for all landuse types[1]. For female labour demand there are marked peaks of demand in T.M.4-6 and 9-10 for Village A and for T.M.6 and 9 in Village B, while for male labour demand there are peaks for T.M.3 and T.M.8 for Village A, and no marked peaks for Village B. Total demand is greater for Village A, and female demand greater than male demand for both villages.

Although a quantitative estimation of the changing total labour demand during the period from 1915 to 1978 was not possible given the limited accuracy of past labour demand estimates, relative changes in the total labour demand for agricultural production may be deduced from the changing area of and cultivation practices of different landuse types.

Dryland cultivation practices have changed little except in the substitution of bullock-drawn ploughing by tractor ploughing from about 1970. Areas available for dryland cultivation

1 Appendix 8 gives the estimated monthly and total labour demand for each landuse type.

have also changed little since 1915 and largely as a result of fluctuating gardenland areas.

An estimation of the relative change in total demand for gardenland labour may be made from the multiplication of assumed pre- and post-powerset labour demand figures by average crop cultivation total as shown in the village adangal[1] for available periods before and after the introduction of powersets in either village. For pre-powerset cultivation for Village A averaged acre-month figures were taken for 1960, 1961, and 1962, and for Village B for 1966 and 1968. For post-powerset cultivation for both villages figures were taken for 1976, 1977, and 1978. Crops were grouped into four categories: 3-month crops (a category defined in Section 4.6.2), chillis, cotton, and banana. Table 4.18 shows the average pre- and post-powerset cultivation of these categories of crops by acre-months, and Table 4.19 the projected total male and female labour demand for labour for these categories.

Both villages show an increase in the acre-month totals for cotton and banana, and a decrease in that of 3-month crops. While in Village A there is an increase for chillis, for Village B there is a decrease. The changes in total demand for labour reflect the increase in acre-month totals for both villages, as well as the general decrease in the demand per unit are for male labour. However, the relative changes in the different categories of crops indicate that while total demand

1 Although the adangal is subject to omissions and fluctuations in accuracy from year to year, the comparison of cultivation practices using the averaged extent of cropping for different periods using the same source makes this analysis more valid.

for labour has increased by only 4% in Village A compared to 45% in Village B, and demand for female labour has increased by 314% in Village A compared with 181% in Village B. Thus the most important factors in the higher relative decline of male labour demand and the lower relative increase in female labour demand in Village B, are the higher relative decrease in 3-month crops and the higher relative increase in banana cultivation (for which the monthly demand for female labour is comparatively low).

Changes in wetland labour demand in Village A have been less pronounced, and although there have been fluctuations in the extent of ownership of wetland by residents of the village (Fig 5.11), the relative inflexibility of the area under wetland within the immediate area of the village site would seem to indicate that total demand for labour can have increased only in proportion to increases in production (for weeding, harvesting, and chemical fertilizer application), though perhaps there has been a marginal decrease in the demand for male labour for ploughing with the introduction of tractors.

4.6.5 Determinants of total and seasonal demand for labour

A number of factors may be identifed as the main determinants of changing total and seasonal demand for labour.

1 Labour demand patterns reflect the different cultivation of landuse types. While dryland cultivation practices are determined by the rainfall regime, and those of wetland determined

by the schedule of canal water release, those of gardenland are more flexible because of the use of stored rainwater.

2. Forced peaks of demand for labour affect the division of male and female labour (although this is influenced as well by practical considerations of efficiency, and reinforced by social custom). Thus while operations which demand a relatively great input of labour, but may be spread over a relatively long period, such as weeding (especially in riceland), and the harvesting of cotton and chillis, are dominantly performed by women, those which are restricted to a short time period, such as the paddy harvest, are performed by both men and women.

3. The timing of demand for labour for gardenland is effected by the necessary demand for labour for landuse types of more restricted cultivation practices. Thus the contrast between the peak in demand for male labour for land preparation for Village A gardenland in T.M.1 and the more evenly spread demand for Village B may be explained in the context of the high demand for male labour for the preparation of wetland in T.M.3 in Village A.

4. The use of agricultural technology, through its influence on the extent of landuse types, production capabilities, and the extent to which it substitutes previous production techniques, has a fundamental influence on labour demand patterns which have been outlined in this chapter. Three general observations on the effect of agricultural technology on labour demand may be

made. First, the introduction of new technologies has had a differential affect on labour demand patterns according to landuse type. The introduction of tractors for ploughing has effected dryland and gardenland more than wetland, new hybrid varieties are used exclusively in gardenland and wetland but have facilitated a total change in gardenland practices alone, and chemical fertilizers have tended to be adopted in gardenland faster than wetland and not at all in dryland, and have almost completely substituted by the kodai in Village B. Second, technology has also had a differential affect on the labour demand patterns of the same landuse types in the two villages, most notably gardenland, because of the differing hydroecological bases of either village. Third, the introduction of new technology generally results in the systematic increase in female labour demand and decrease in male labour demand, and at the same time increases in peaks of demand for labour and decreases of constant labour demand.

4.7 Summary

The basic argument and a priori assumption of this chapter has been that resources, and the utilisation of resources through technology, profoundly influence the character of the agricultural production process of the village. It has been demonstrated that three discrete landuse types have existed in the villages, each giving rise to distinctive cropping patterns (and therefore, arguably, patterns of consumption), and of labour demand.

It is important to emphasise the interdependence of resource availability and technology (especially where technology is relatively unchanging). Where technological availability has changed, for example with the introduction of powersets, new relationships between resource availability and technology have accelerated the adoption of technology. For Village B the change to powersets was accelerated as a result of the falling water table which it produced. This made kamalai operation uneconomical, reduced water in the village tanks, thus making bullock washing more difficult, and reduced the overall demand for bullock labour, thus making their retention for all-round work less profitable. The resulting effects on cropping patterns and labour demand were accelerated as well. Dhavan (1975) in particular has drawn attention to the potential external diseconomies of increased groundwater withdrawal resulting from the use of powersets.

That this situation was largely the reverse in Village A, was again largely the result of the relationship between technology (in this case the combined effect of two technologies:

canal and powerset irrigation) and resources.

The nature of the interdependent relationship between resources and technology has, moreover, accentuated the differences between landuse types because it tends to enhance the spatial variation in resource availability within the village.

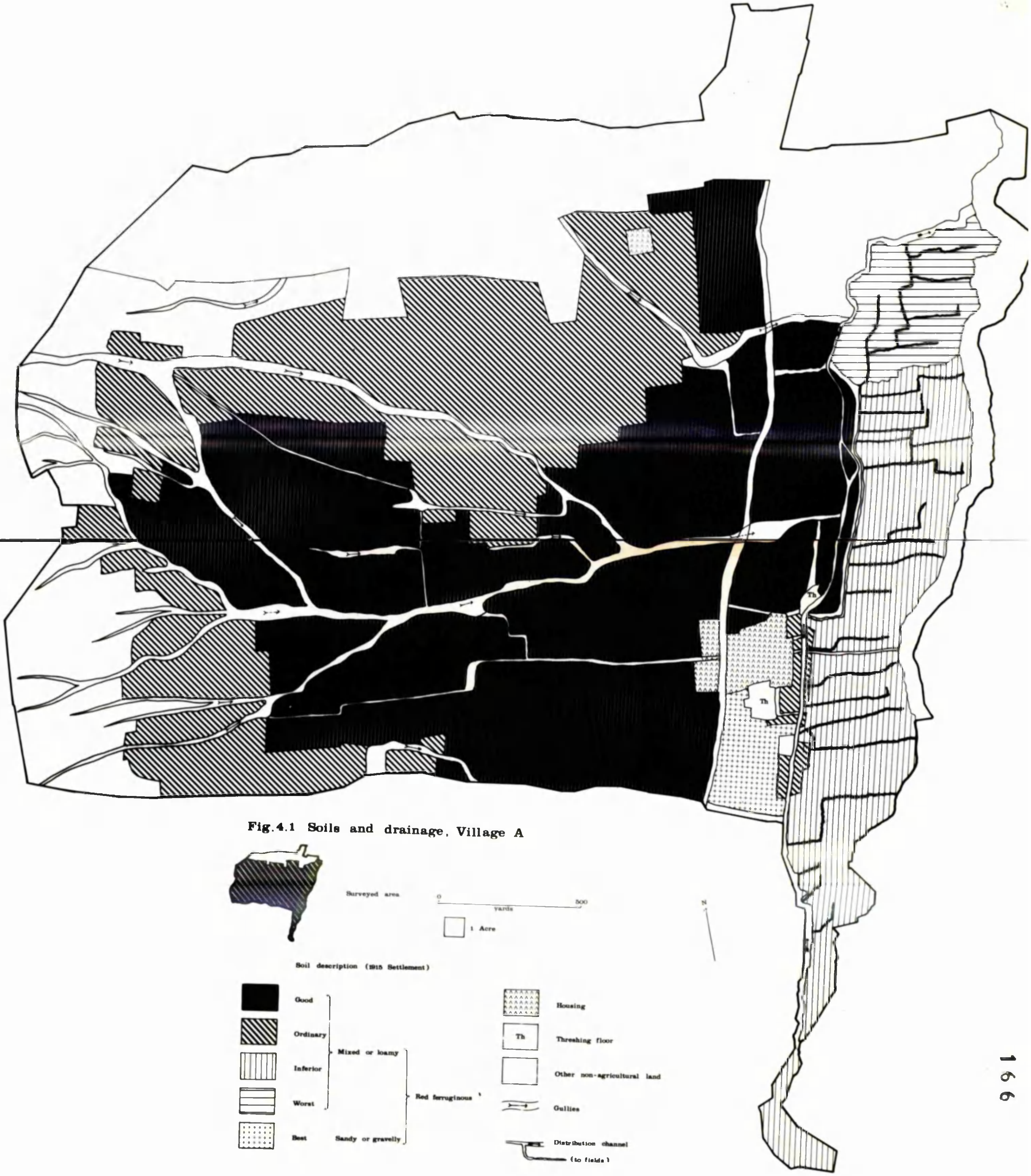


Fig.4.1 Soils and drainage, Village A

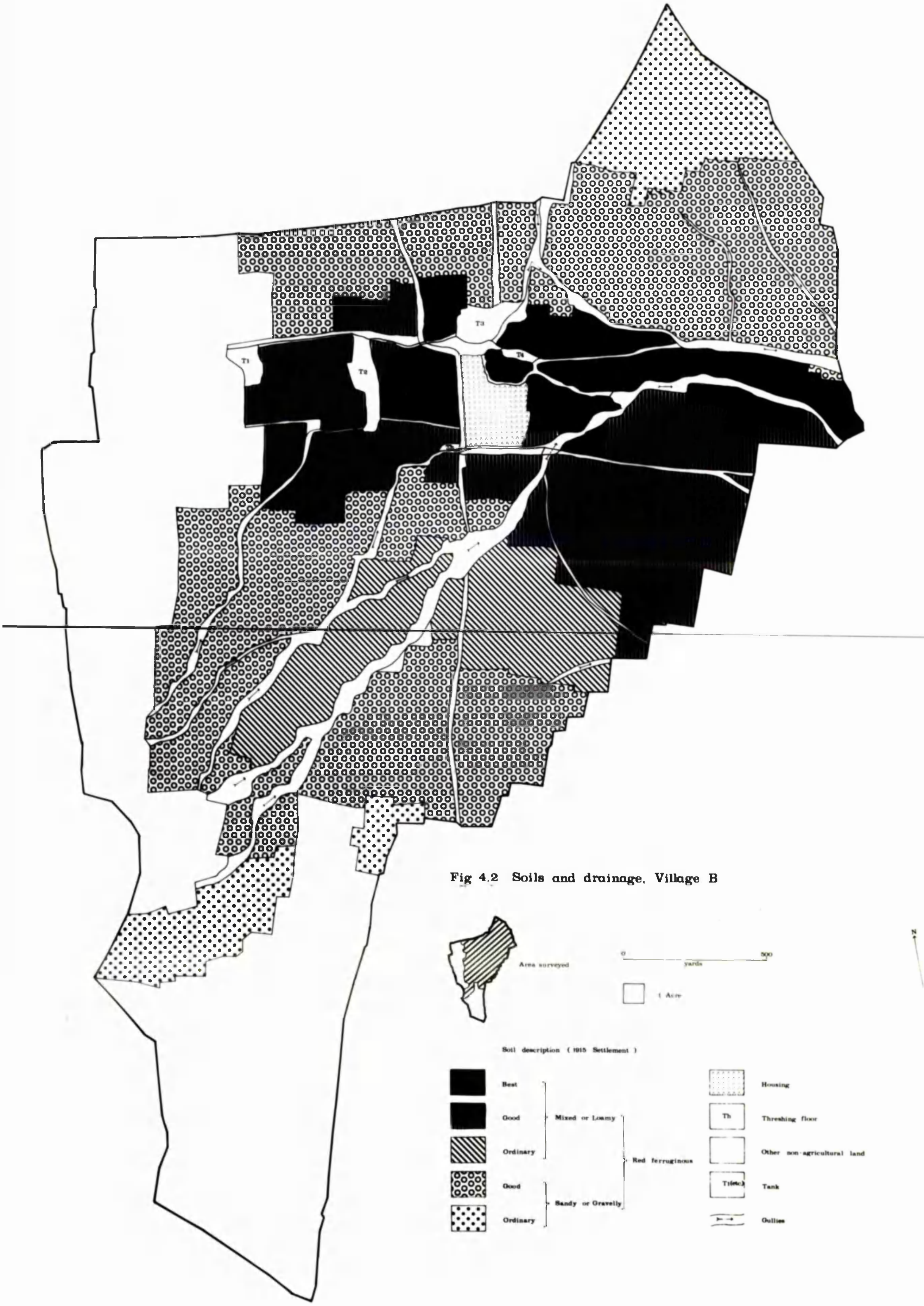


Fig 4.2 Soils and drainage, Village B

FIG 4.3 Aerial Views of Village Topography

(contours at 50 feet)

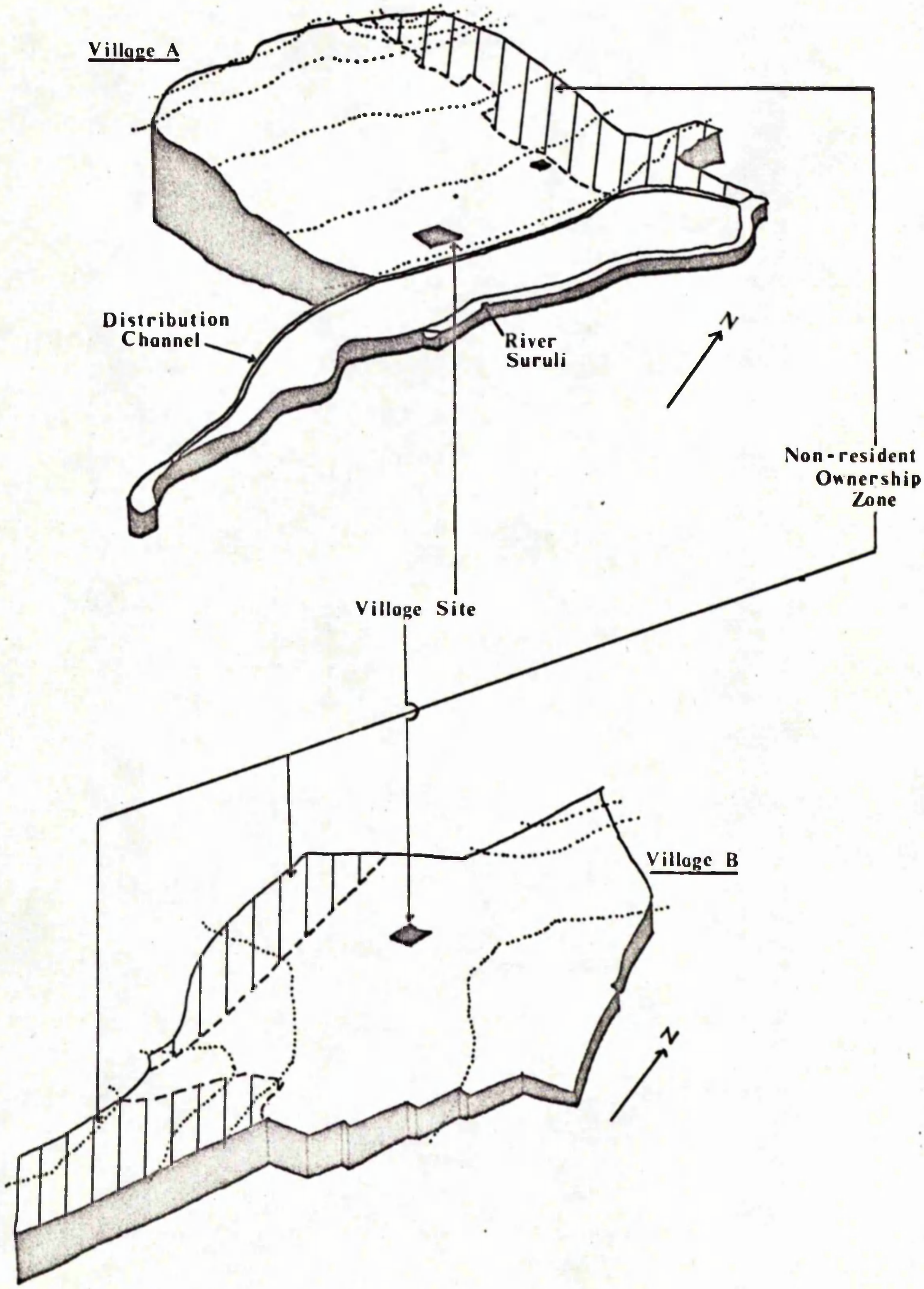


FIG 4.4 Mean (weekly) rainfall, Dec. 1973 - Dec. 1978, Sindalaicheri Village

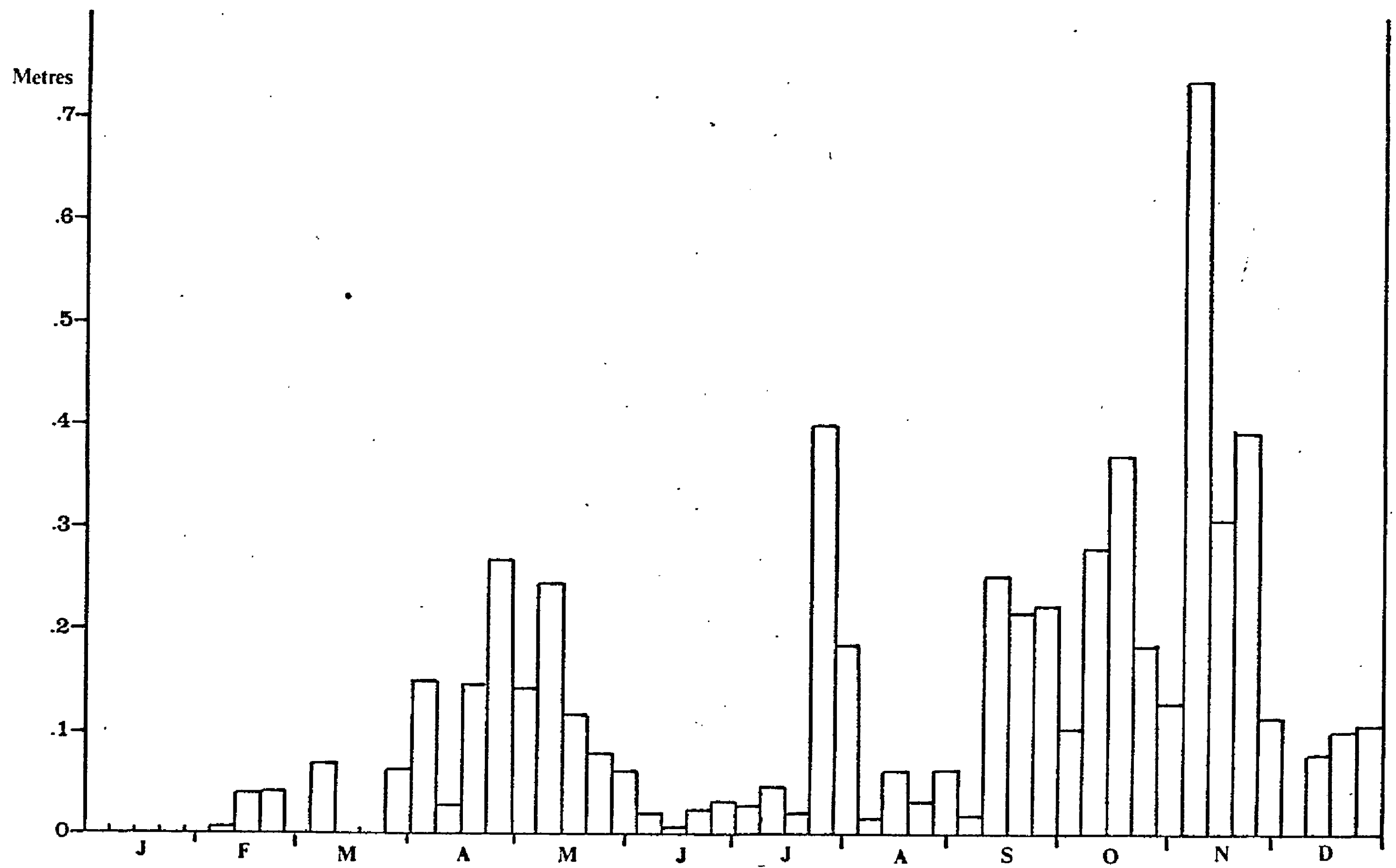
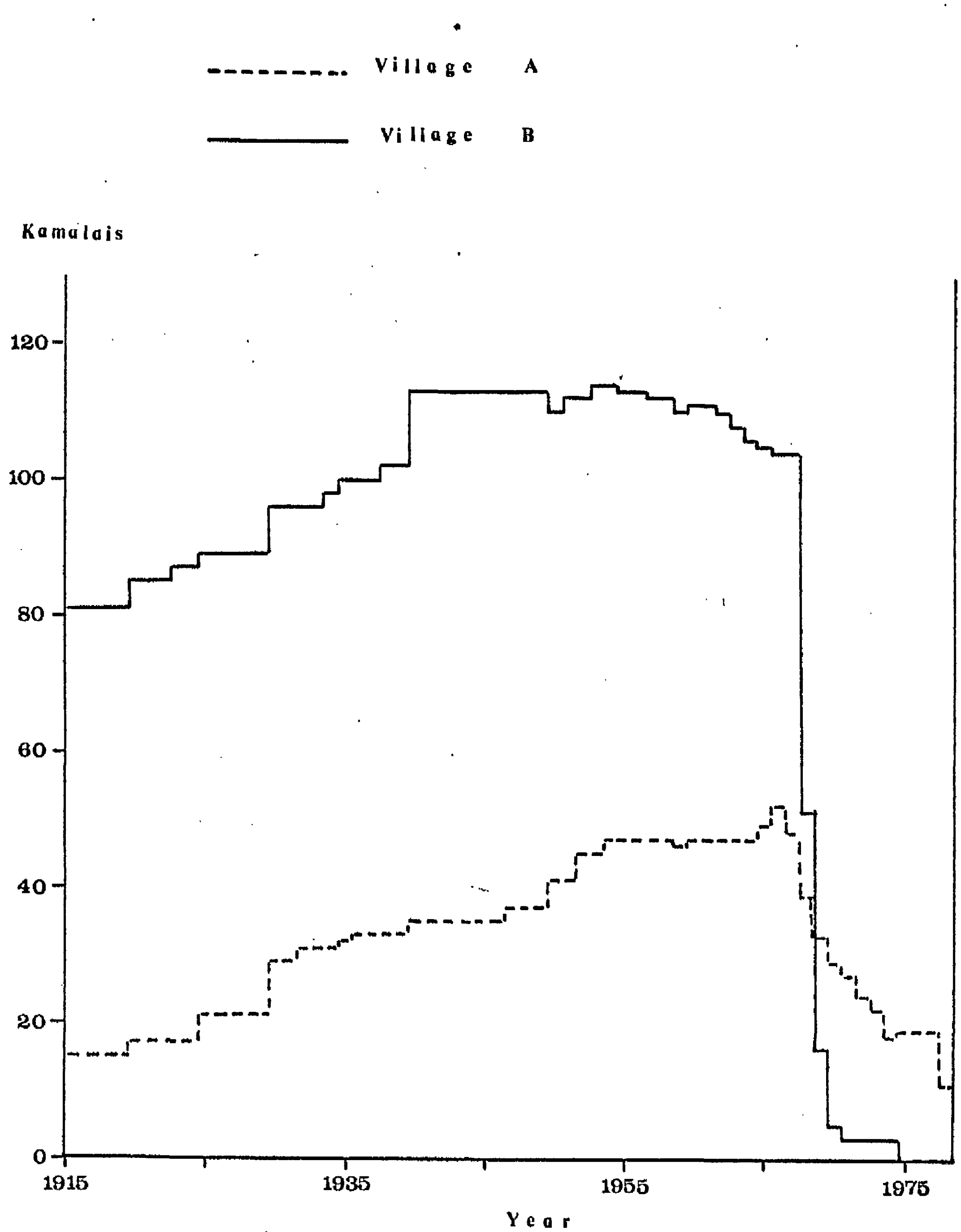


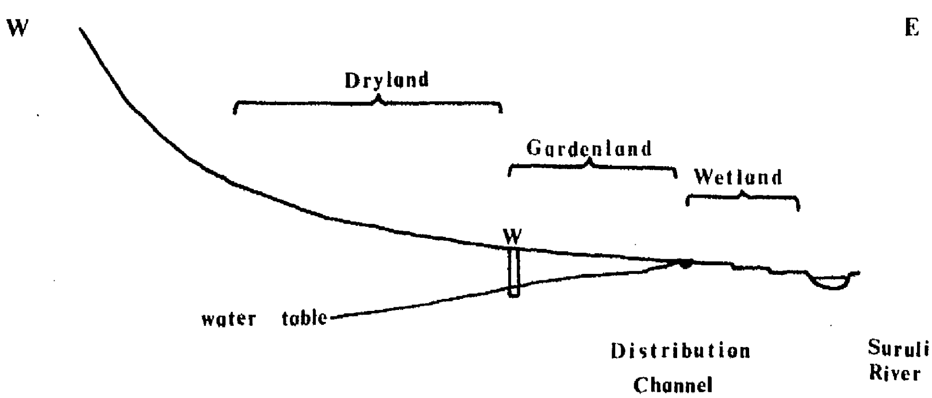
Fig.4·5 Operational Kamalais, 1915 – 1978



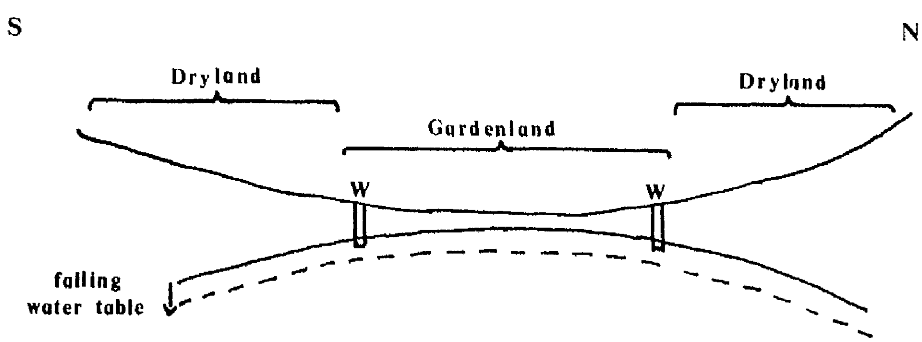
Village Cross Sections

FIG 4.6

Village A (West to East)



Village B (South to North)



W Well

4.7 Piping system drawing water from a well located next to the distribution channel of Village A and filling this well for the irrigation of a large garden to the west of the village; bananas and sugarcane in the background.

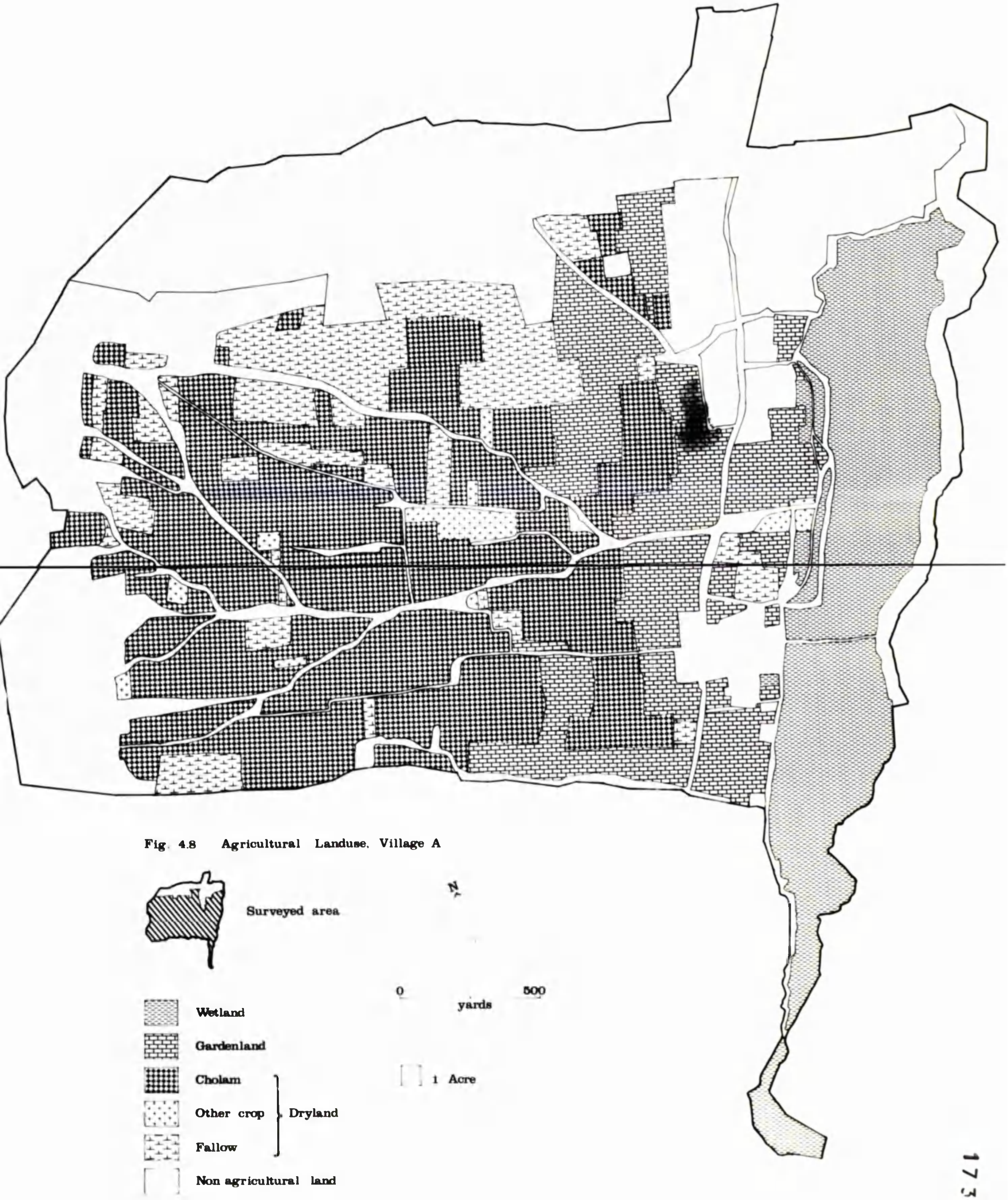


Fig. 4.8 Agricultural Landuse, Village A

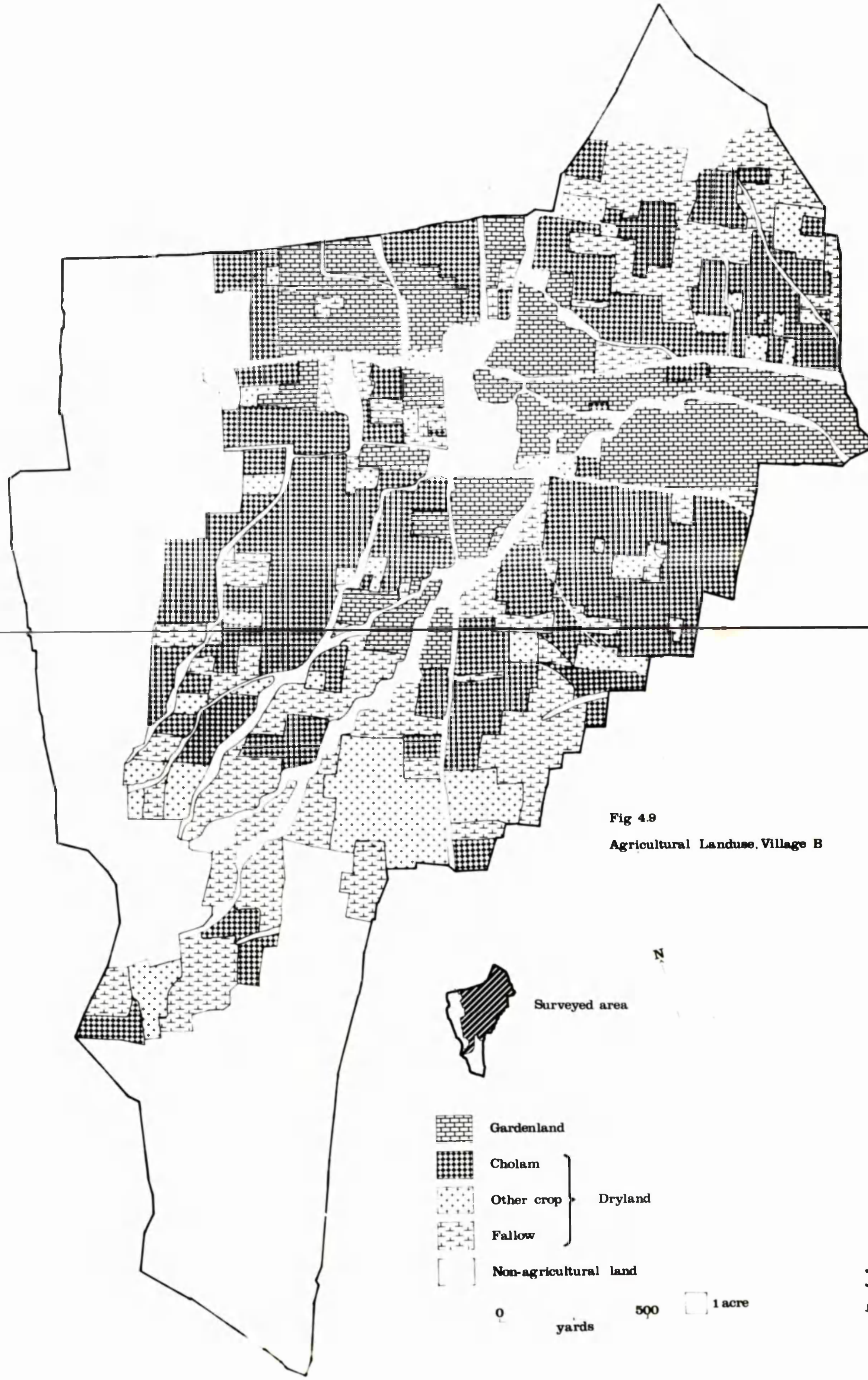
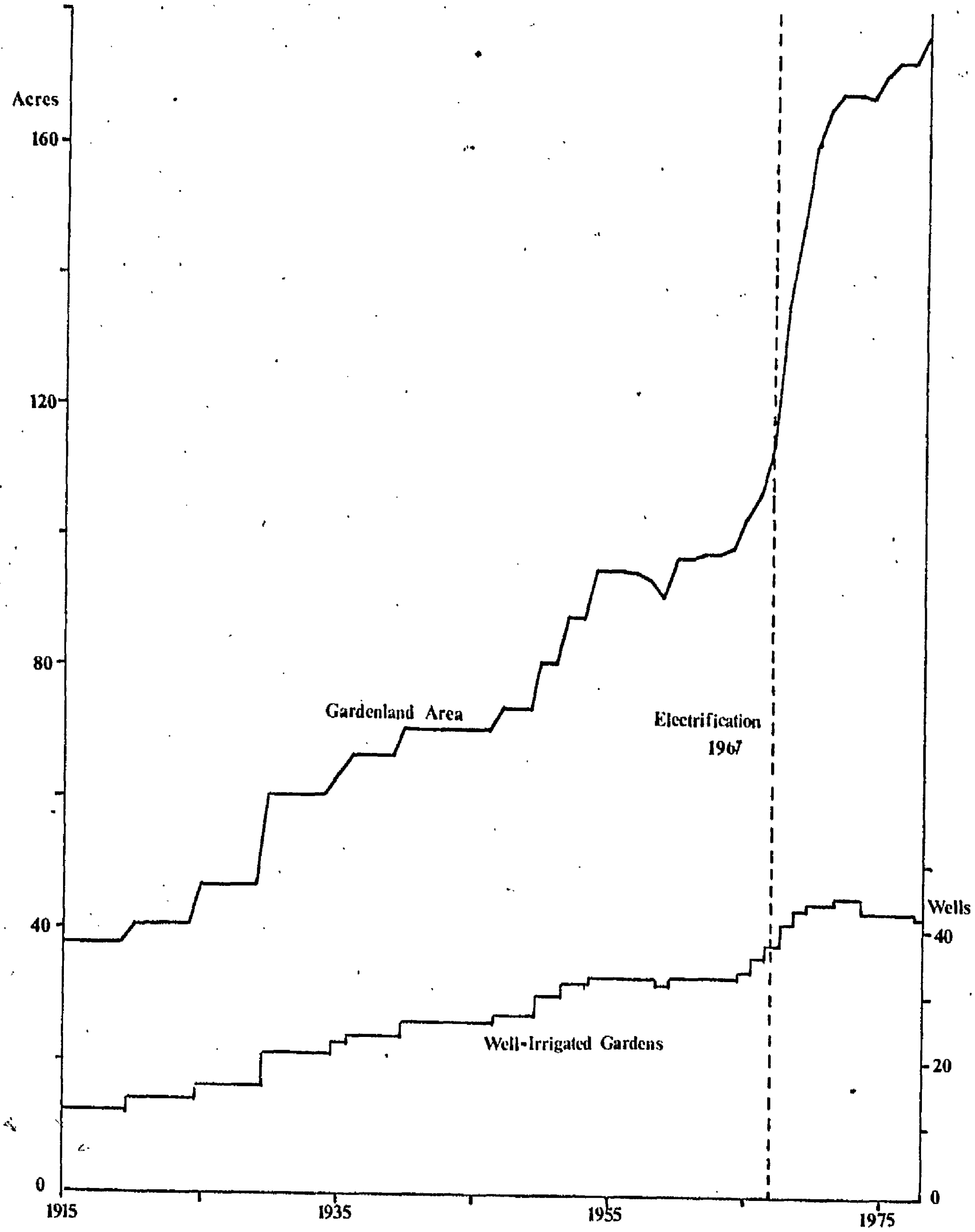


Fig 4.9

Agricultural Landuse, Village B

Fig. 4.10a Gardenland Cultivation, Village A 1915 – 1978



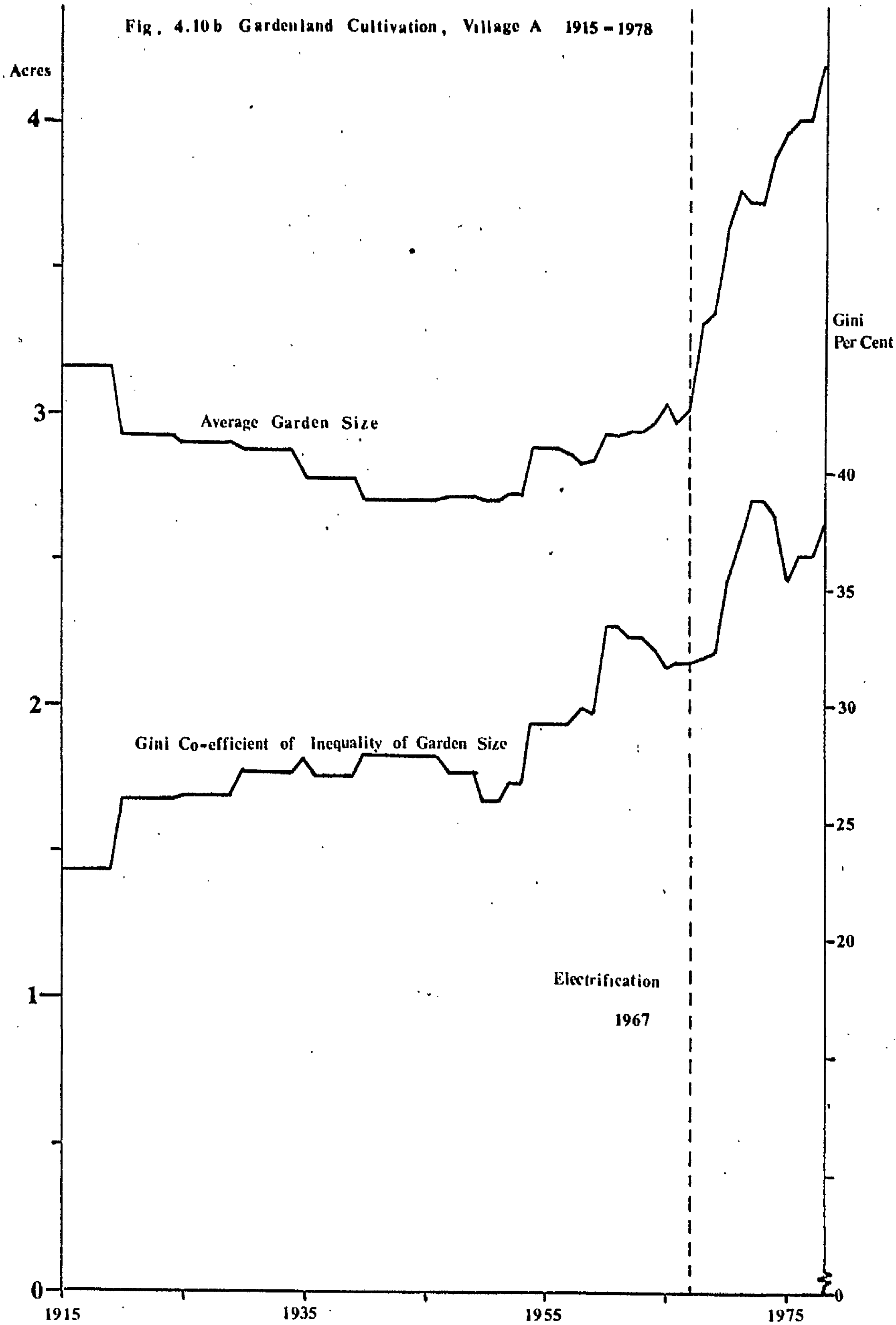


Fig. 4.10b Gardenland Cultivation, Village A 1915 – 1978
Acres
4
3
2
1
0
Average Garden Size
Gini Co-efficient of Inequality of Garden Size
Gini
Per Cent
40
35
30
25
20
0
Electrification
1967
1915
1935
1955
1975

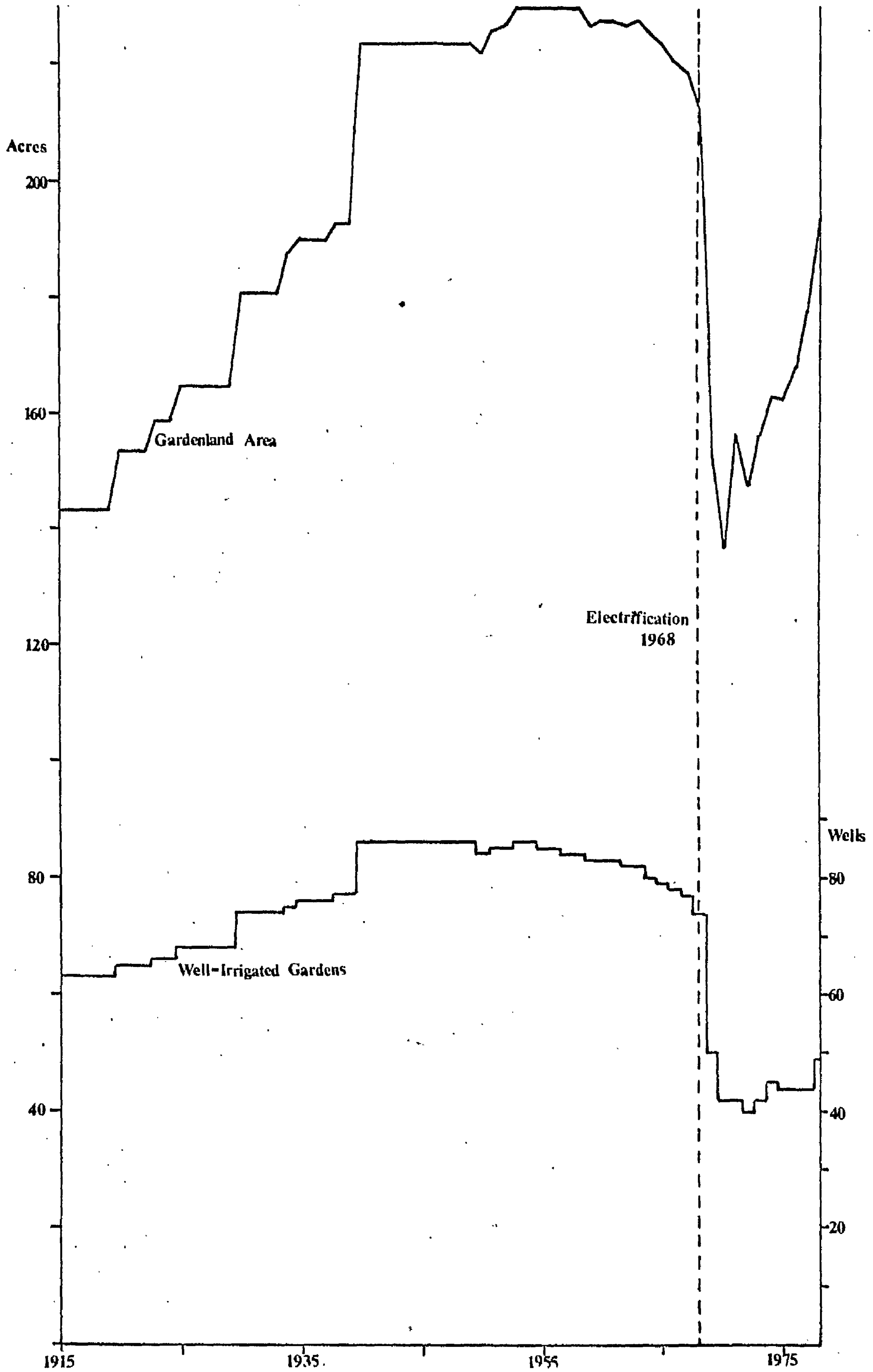
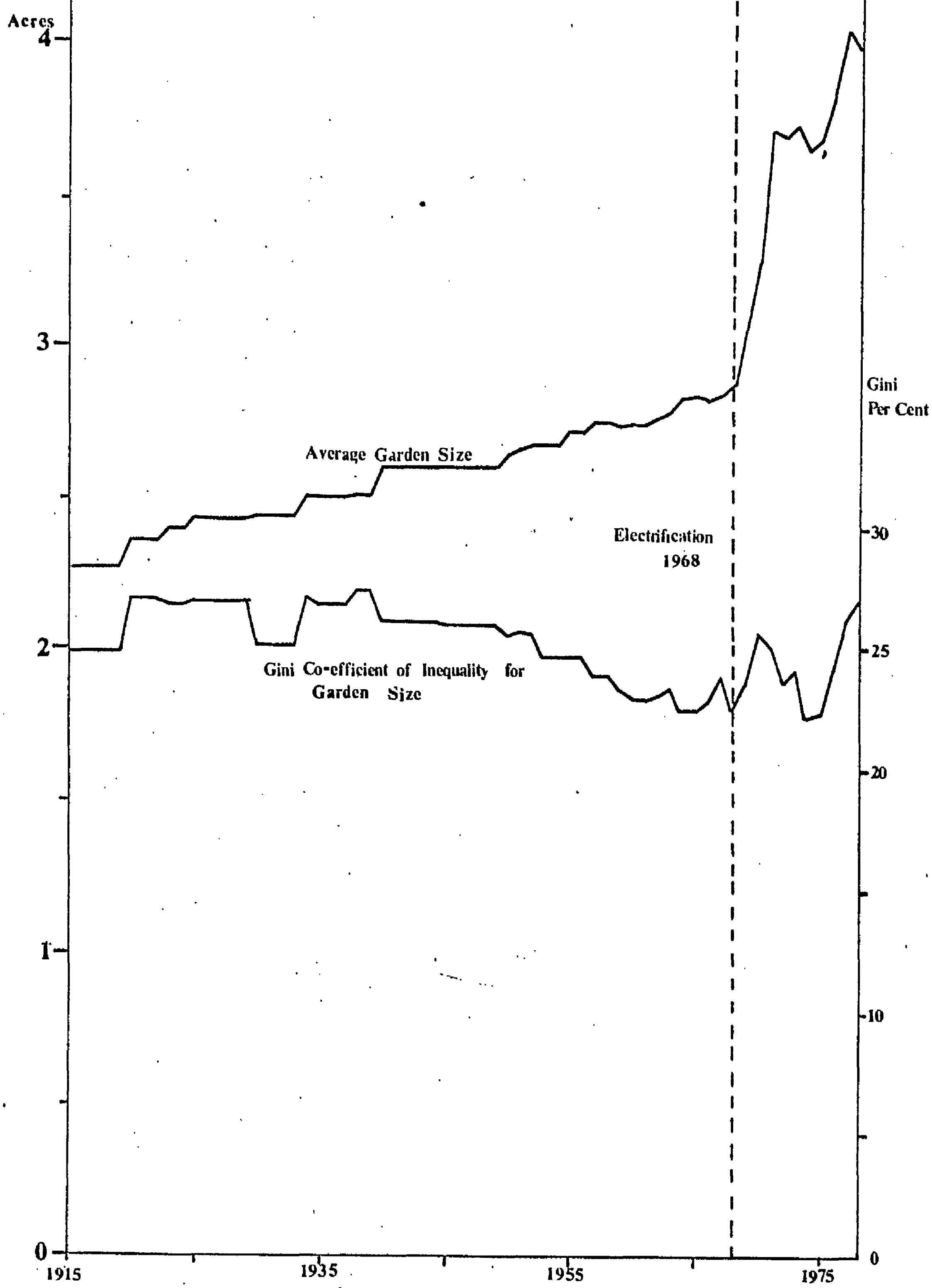


Fig. 4.11a Gardenland Cultivation, Village B 1915 - 1978

Fig. 4.11 b Gardenland Cultivation, Village B 1915–1978



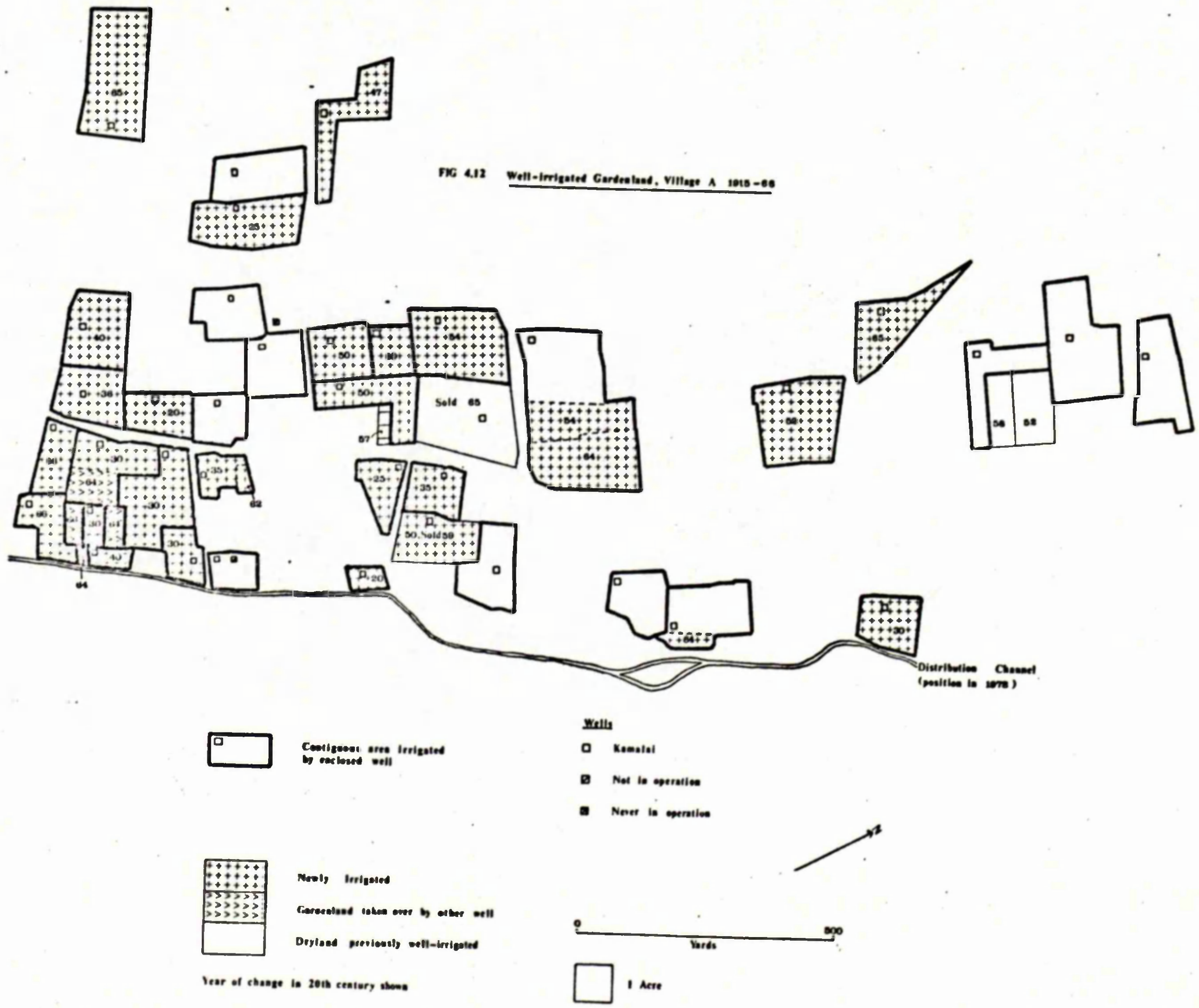


FIG 4.12 Well-irrigated Gardenland, Village A 1915 – 68

FIG. 4.13

Well irrigated Gardenland, Village A 1967–78

(excludes 8 gardens, total area 10.8 acres, purchased in ajacent village)

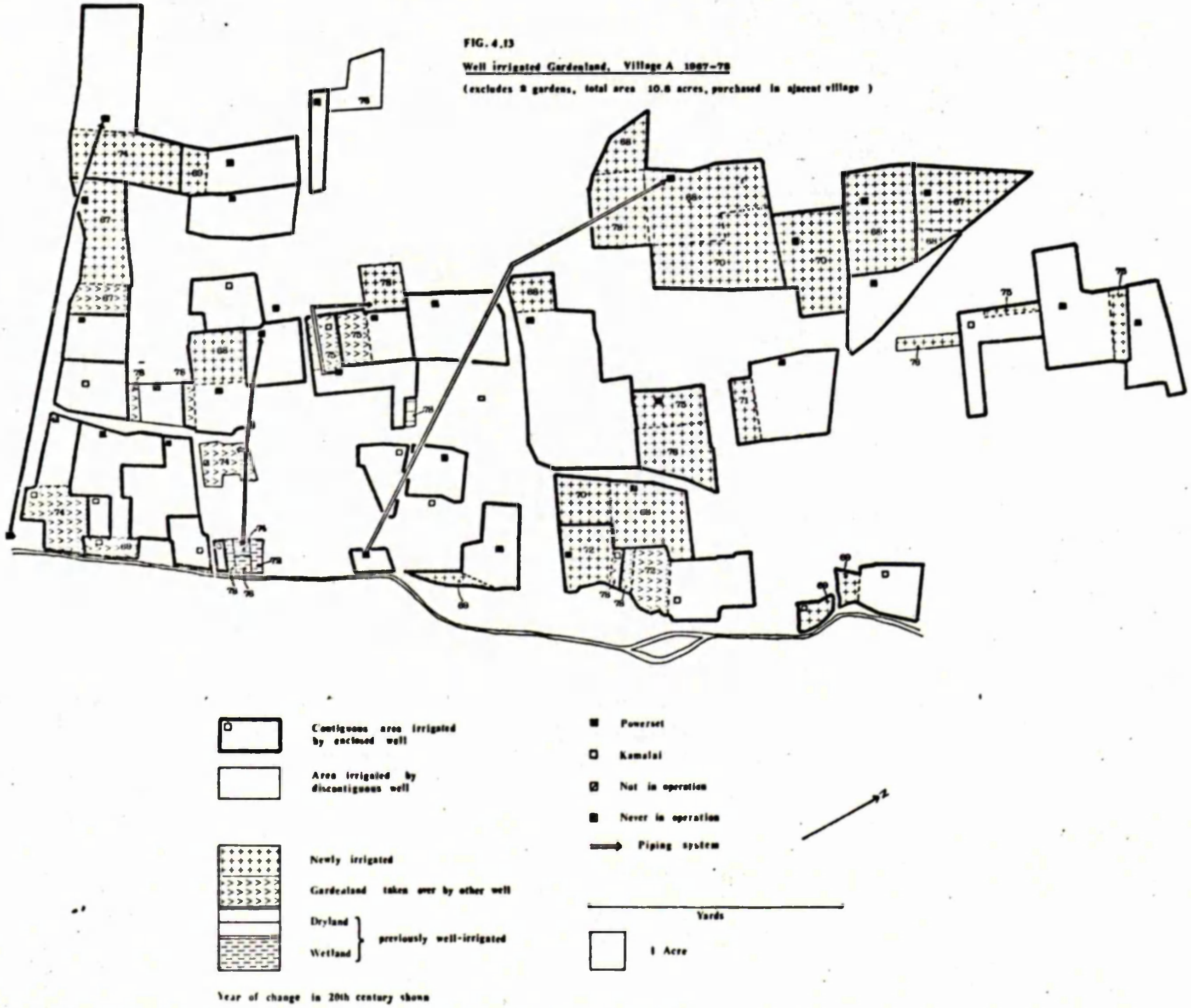


FIG 4.14

Well-irrigated Gardenland, Village B 1915-52

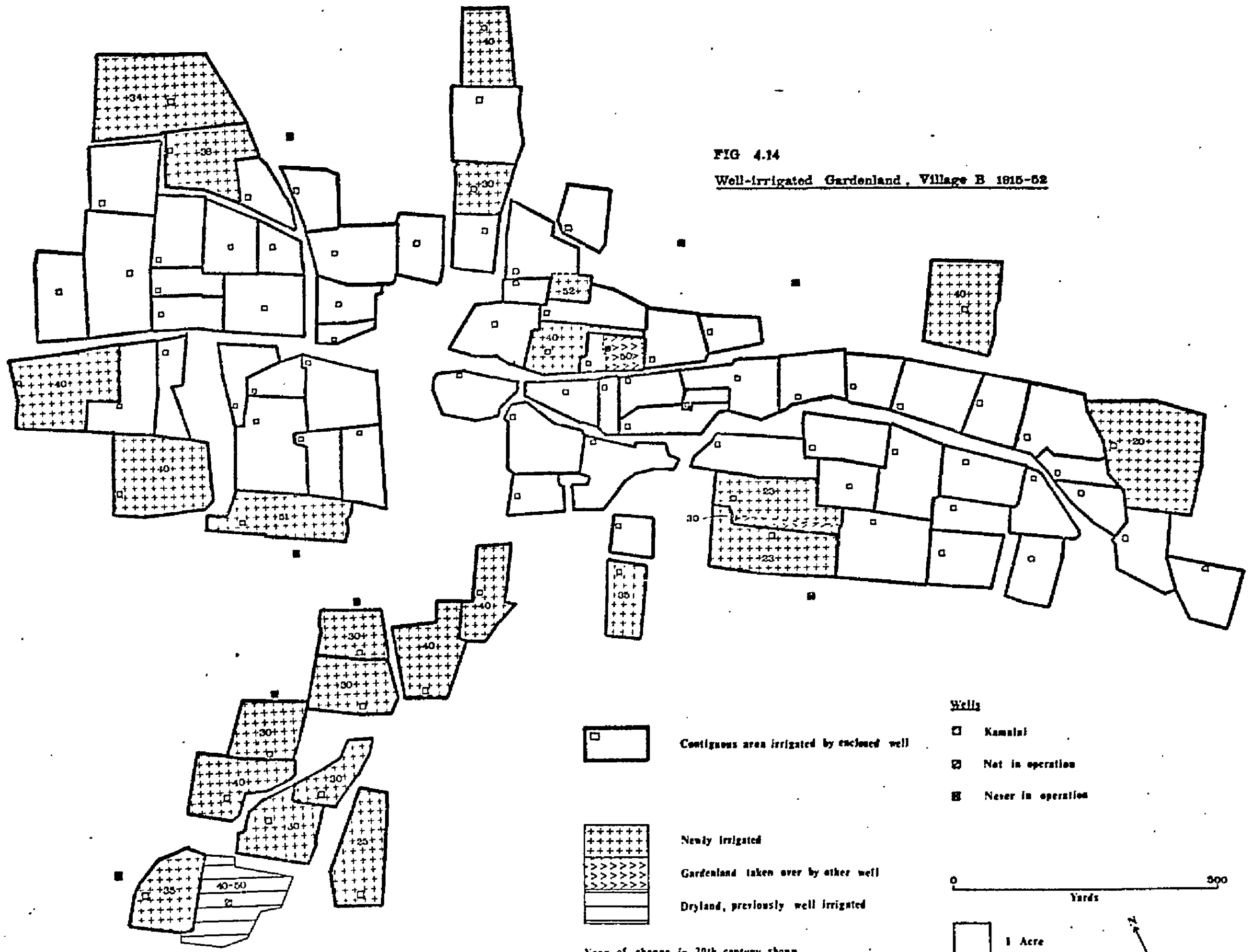
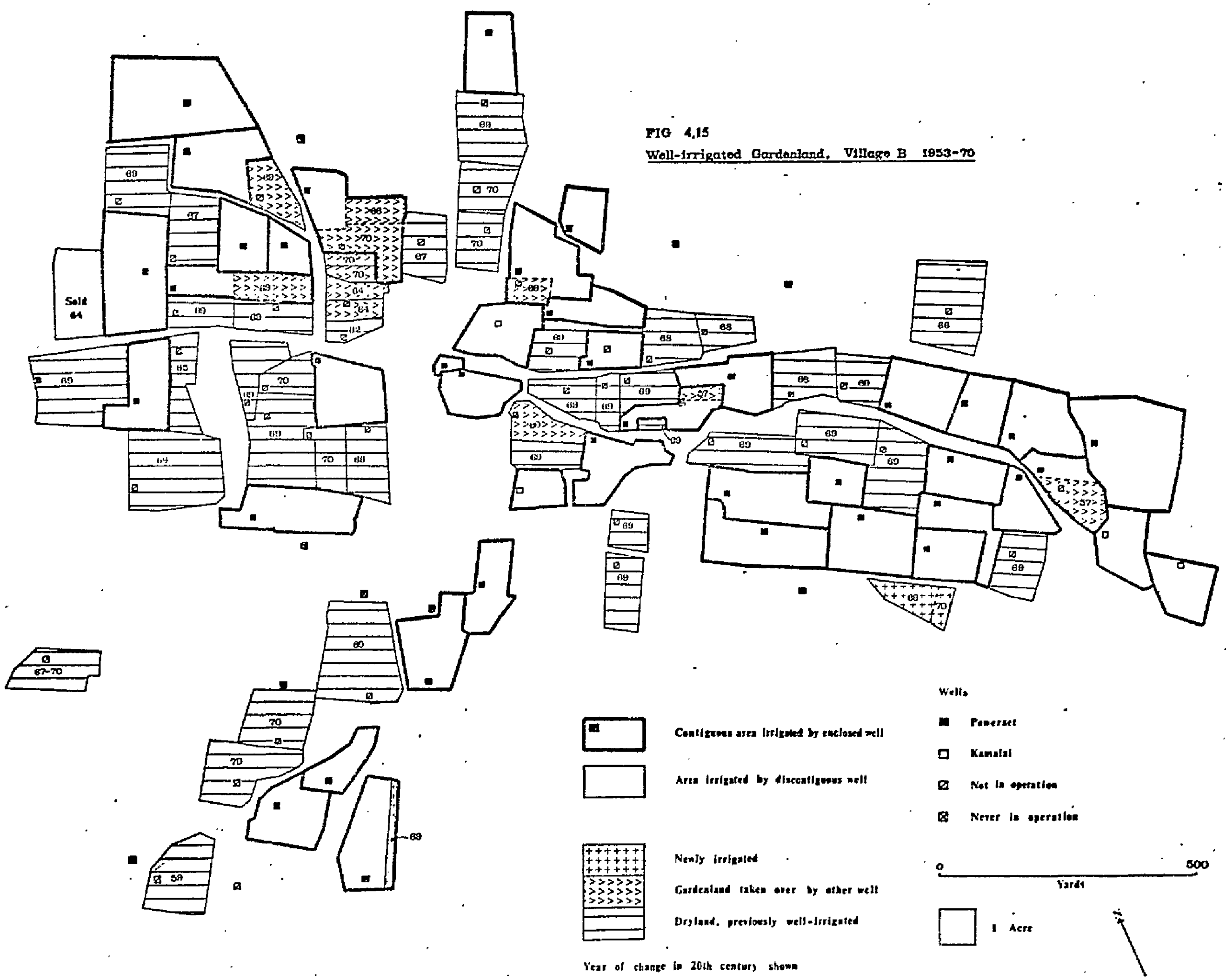


FIG 4.15

Well-irrigated Gardenland, Village B 1953-70



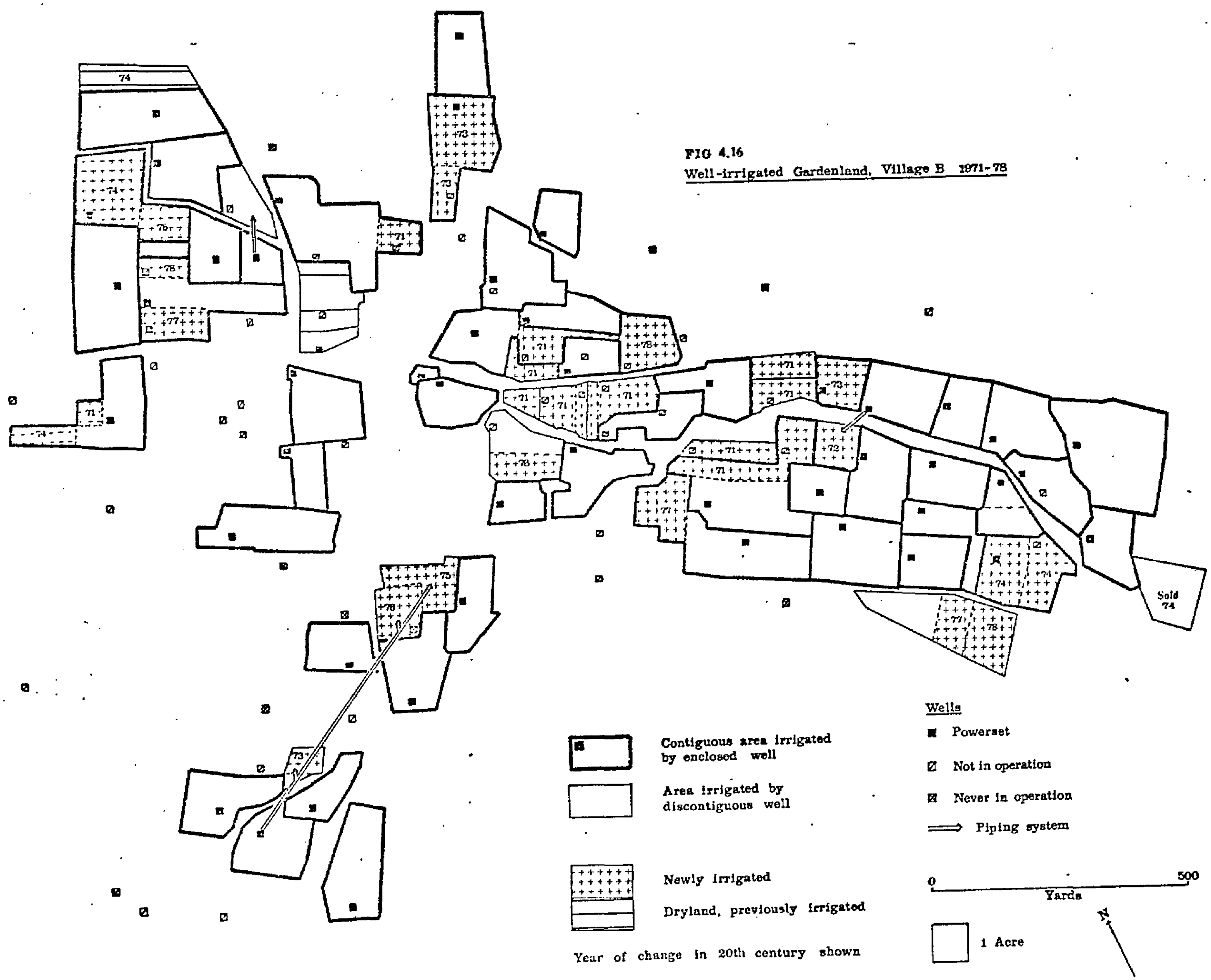


FIG 4.16
Well-irrigated Gardenland, Village B 1971-78

FIG 4.17 Typology of Pre-powerset Cropping Patterns

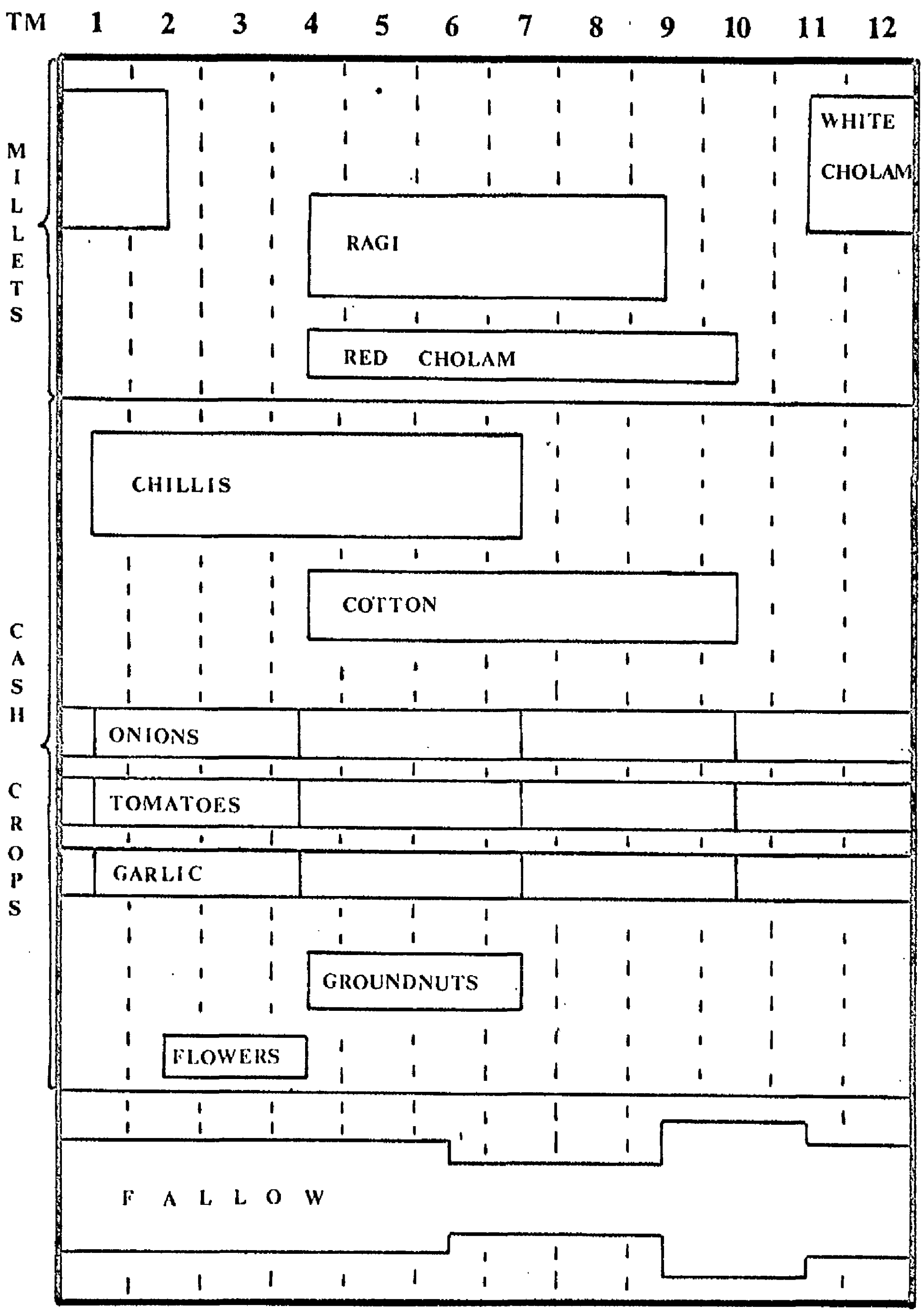


FIG.4·18 Estimated Monthly Dryland Labour Demand

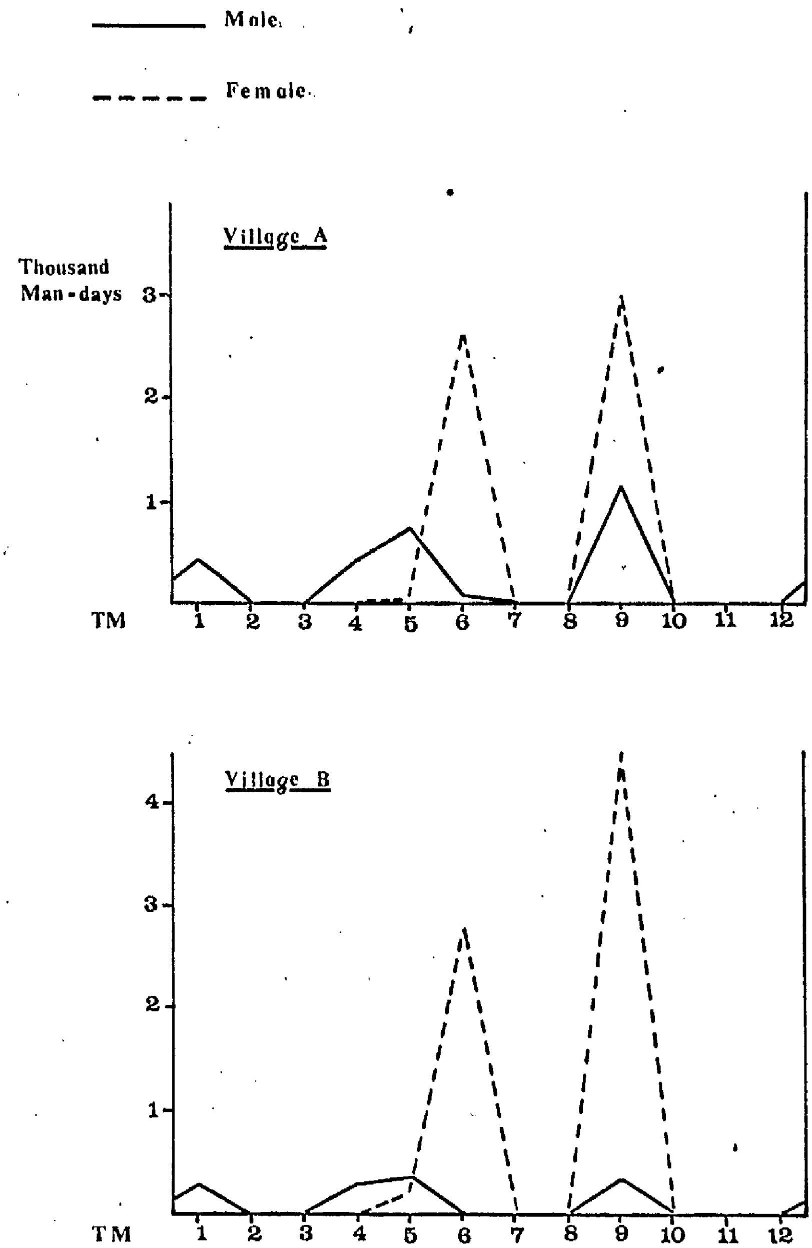


FIG 4.19 Estimated Monthly Labour Demand (Male) Gardenland

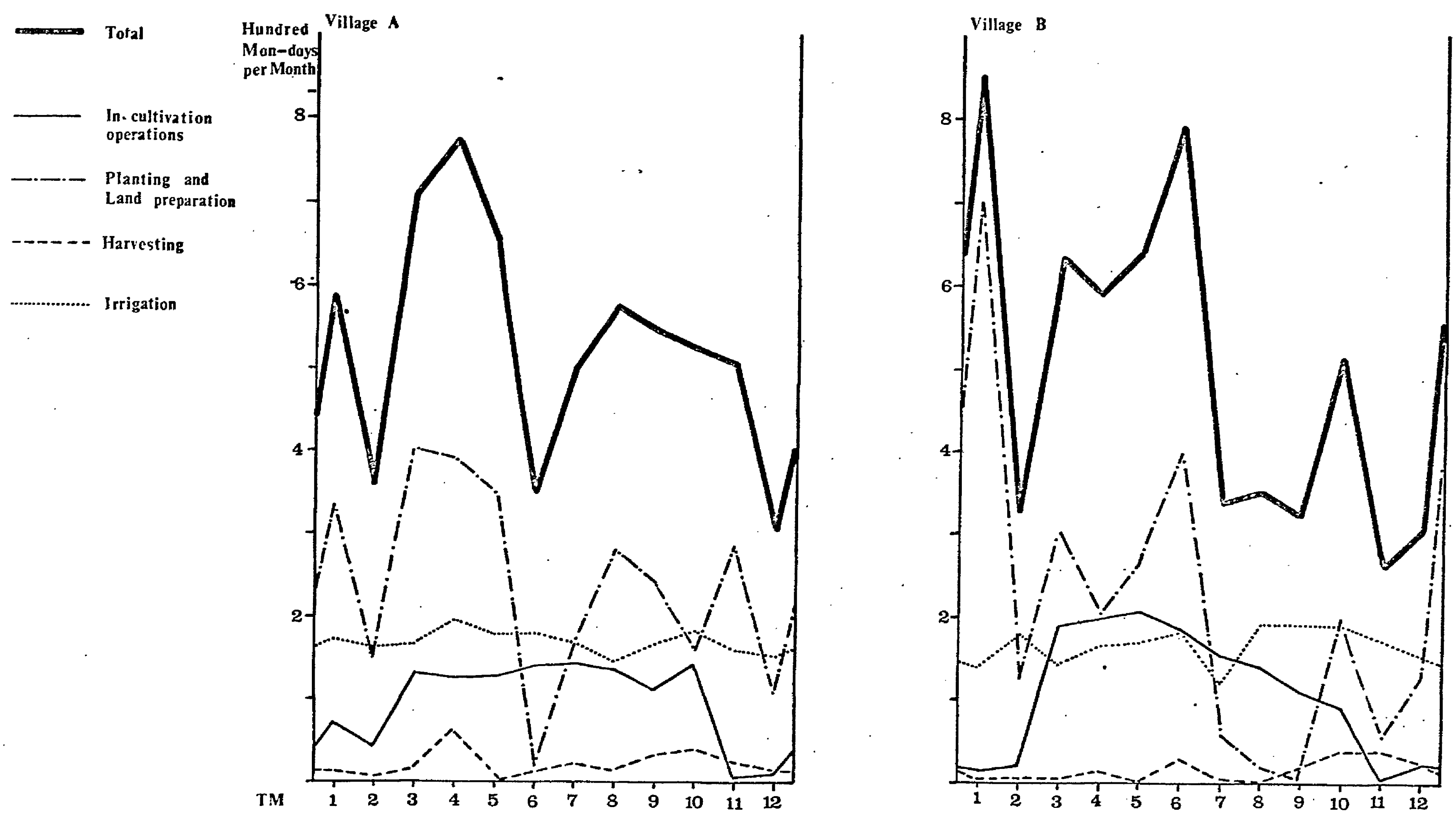


FIG 4.20 Estimated Monthly Female Labour Demand, Gardenland

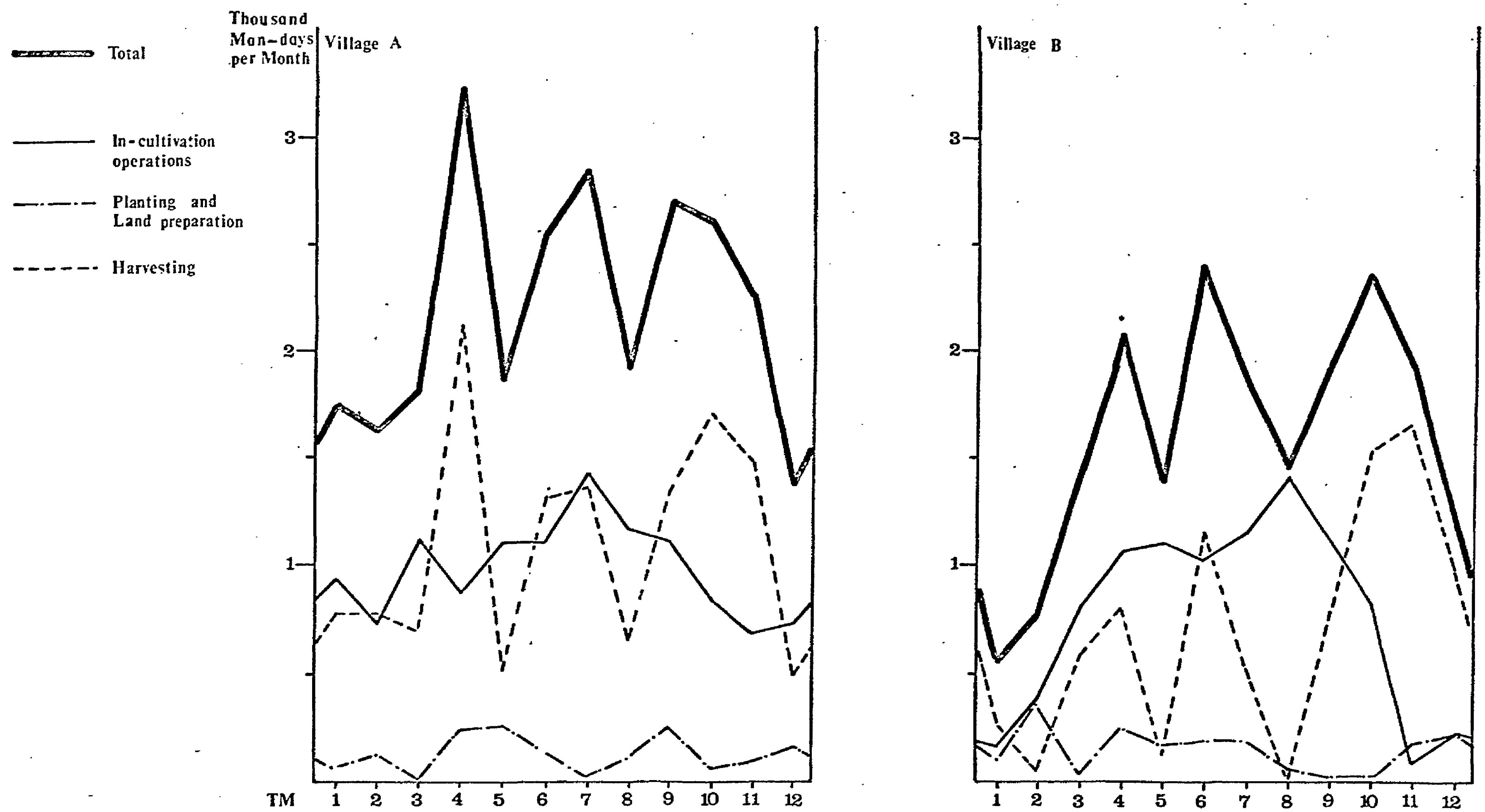


FIG.4.21 Estimated Monthly Labour Demand for Wetland Operations, Village A

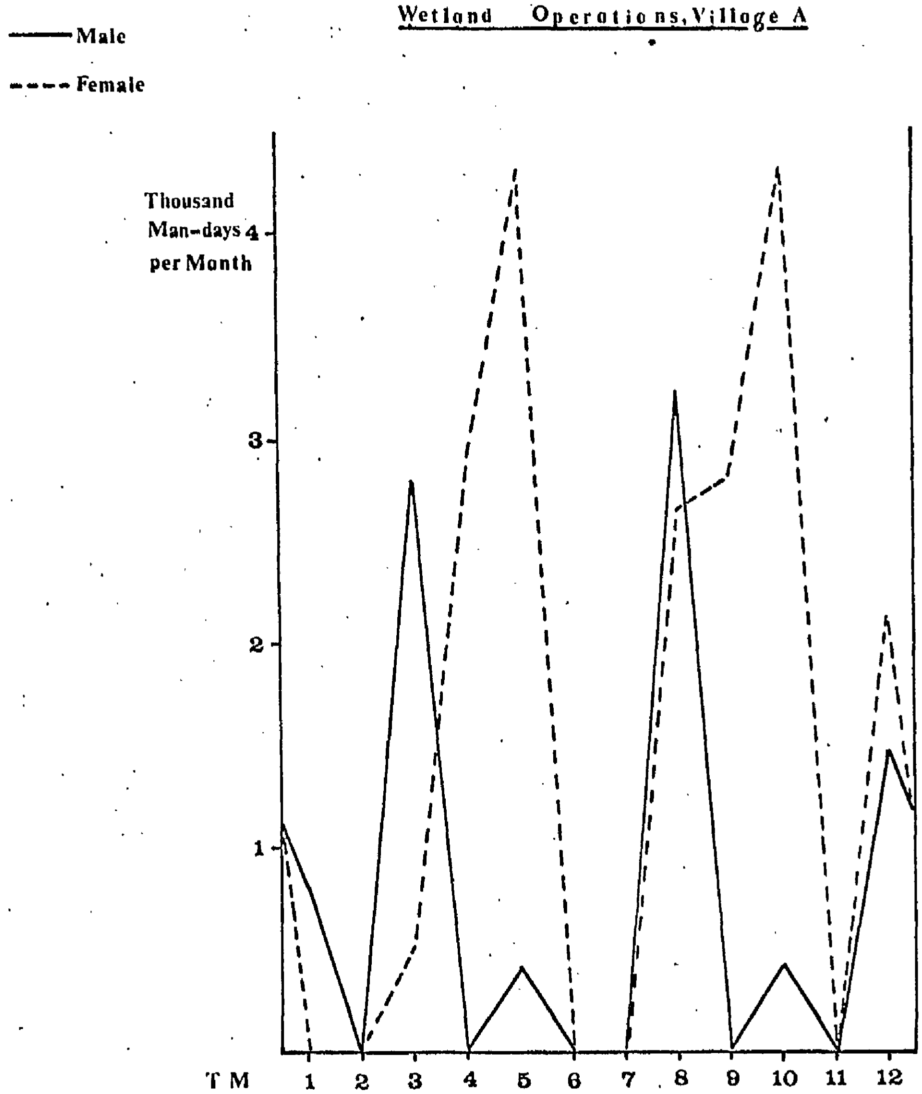


FIG 4.22 Estimated Total Monthly Labour Demand, 1978

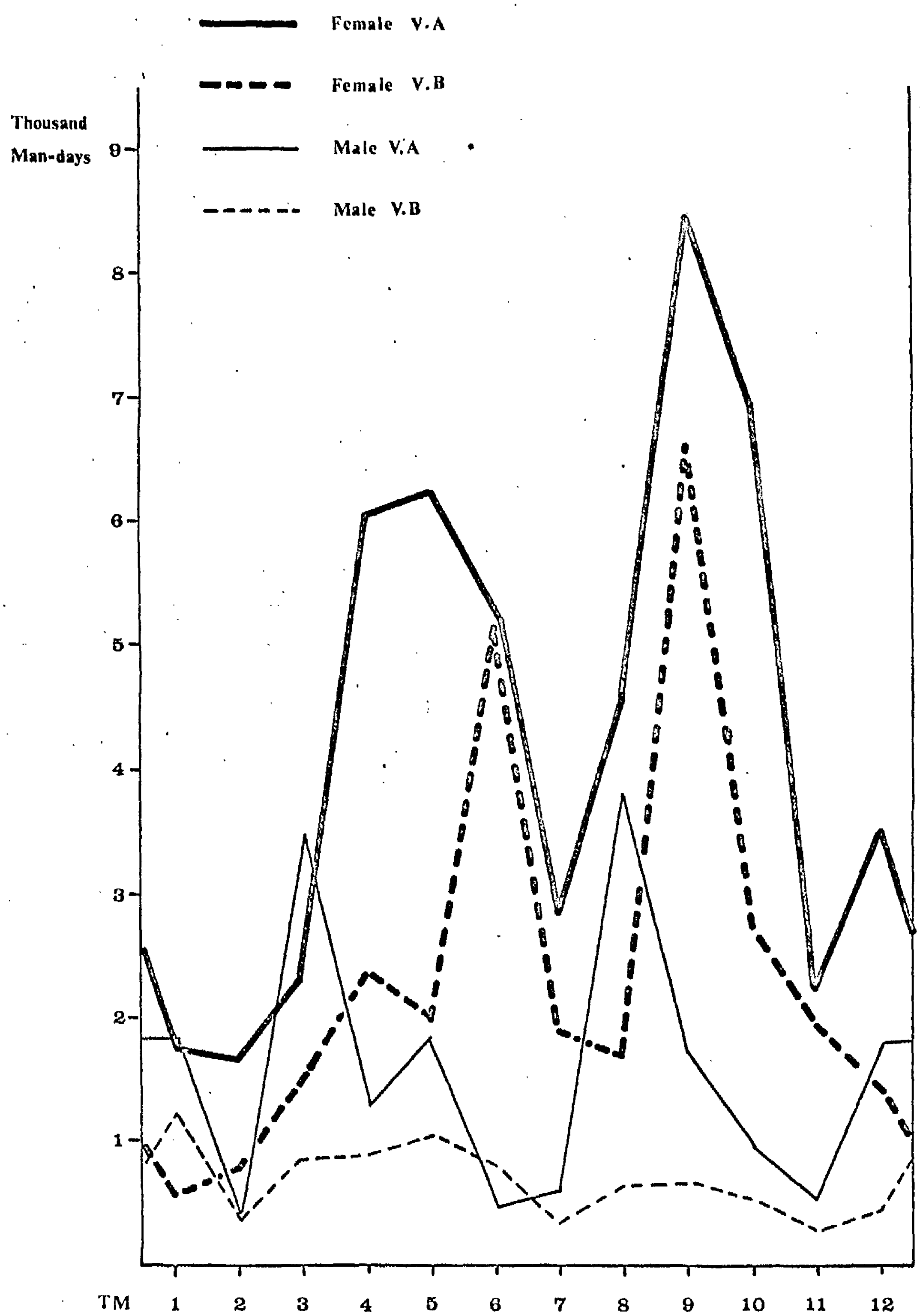


Table 4.1 Livestock Populations

	Village A		Village B	
	Sample Survey	Estimated Total	Sample Survey	Estimated Total
Bullocks	46	276	18	100
Milch Cattle	58	348	9	50
Buffaloes	10	60	11	61
Goats	88	528	235	1307

Table 4.2 Changing Area under Landuse Types in Village Ownership Zone, 1885-1978 (acres)

	Year	A	A1	A2	A3	B	C
Village A	1885	714.9	572.7	- [1]	142.2	366.1	133.6
	1915	944.4	732.1	37.8	174.6	118.1	155.3
	1945	979.1	730.0	70.2	178.8	81.5	157.6
	1965	1005.2	720.8	102.9	181.5	58.0	152.3
	1978	1037.5	675.3	169.9	192.3	43.9	136.7
Village B	1885	506.6	?	?	-	236.4	83.3
	1915	576.2	443.9	132.3	-	163.7	86.8 [2]
	1945	698.2	503.1	195.1	-	41.7	86.8
	1965	708.9	513.5	195.5	-	31.0	86.8
	1978	708.9	539.9	169.0	-	33.9	86.8

A Cultivated agricultural land
A1 Cultivated dryland
A2 Gardenland
A3 Wetland
B Agricultural land uncultivated
C Non-agricultural land

1 The 1885 Register shows two wells in the village, but their location, and extent of irrigation are unknown.

2 Increase is due to the Re-survey of Government lands.

Table 4.3 Depths (feet) of Operating Wells: 1885[1] and 1960-78

Year	Village A			Village B		
	K	P	D	K	P	D
1885	2	0	?	68	0	23.5
1960	32	0	23.2	79	0	34.6
1961	32	0	23.2	79	0	34.6
1962	32	0	23.2	78	0	34.6
1963	32	0	23.6	77	1	34.7
1964	32	0	23.9	75	1	35.3
1965	33	0	23.7	74	1	35.8
1966	35	0	23.6	73	1	36.2
1967	34	3	25.1	71	1	36.3
1968	30	10	26.0	35	34	38.0
1969	25	16	26.8	10	37	40.9
1970	23	19	27.4	4	38	45.1
1971	21	20	28.1	2	40	47.0
1972	20	24	28.2	2	38	50.4
1973	18	26	28.4	2	40	51.1
1974	15	28	29.1	2	42	52.4
1975	15	28	30.4	0	43	54.4
1976	14	29	31.3	0	43	56.5
1977	12	31	31.8	0	43	58.0
1978	9	32	32.5	0	48	58.7

K Number of Operating Kamalais, P Number of Operating Powersets

D Mean depth of Operating Wells.

[1] Information for Village B is taken from the 1885 Settlement Register, though the exact date of the karnam's survey of wells is unknown.

Table 4.4 Innovation and Use of Powersets, 1963-78

Year	Village A		Village B	
	Number Introduced	Number In Use	Number Introduced	Number In Use
1963			1	1
1964				1
1965				1
1966				1
1967	4	4		1
1968	8	12	33	34
1969	5	17	4	38
1970	3	20	3	39
1971	1	21	2	41
1972	4	25		39
1973	2	27	2	41
1974	2	29	3	44
1975		29	2	45
1976	2	31		45
1977	2	33		45
1978	1	34	1	50

Table 4.5 Occasions of and Depths of Well Excavation 1962-78

Year	Village B		Village A			
	All Wells		All Wells		New Wells	
	A	B	A	B	A	B
1962	3	16	-	-	-	-
1963	1	4	2	13	-	-
1964	8	45	3	11	-	-
1965	4	21	1	22	1	22
1966	5	29	3	46	2	41
1967	4	33	7	73	1	50
1968	13	85	6	130	4	124
1969	16	107	9	90	2	42
1970	20	140	8	74	2	50
1971	11	81	9	38	-	-
1972	17	119	5	53	2	42
1973	10	67	3	11	-	-
1974	16	112	5	21	-	-
1975	12	132	5	74	1	40
1976	11	99	5	22	-	-
1977	9	65	3	36	-	-
1978	8	77	2	18	-	-

A = Number of wells excavated

B = Total depth excavated (feet)

Table 4.6 Bore-holes added to Wells, 1939-1978[1]

Year	Village B A	Village B B	Village B C	Village B D	Village A A	Village A B	Village A C	Village A D
1939	-	-	-	-	1	1	60	60
1958	1	1	45	45	1	1	60	60
1959	-	-	-	-	1	2	34	17
1960	-	-	-	-	2	2	37	18.5
1963	1	7	490	70	-	-	-	-
1964	-	-	-	-	2	2	89	44.5
1965	-	-	-	-	-	-	-	-
1966	1	1	25	25	-	-	-	-
1967	1	1	24	24	-	-	-	-
1968	1	3	170	56.7	-	-	-	-
1969	3	4	242	60.5	-	-	-	-
1970	13	20	1257	62.8	3	8	359	44.9
1971	5	6	275	45.8	3	5	113	22.6
1972	5	8	480	60	1	4	240	60
1973	5	8	610	76.2	3	4	152	38
1974	4	6	440	73.3	2	2	59	29.5
1975	9	11	770	77	4	7	304	43.4
1976	10	14	789	60.7	4	6	259	43.2
1977	5	10	664	66.4	1	1	70	70
1978	6	10	1047	104.7	1	2	93	46.5

A Number of wells with bores added

B Number of bores added

C Total amount bored (')

D Average depth bored (feet)

[1] Data given only for years of addition in this period

Table 4.7 Crop cultivation at Settlement, 1885 and 1915

	1885				1915	
	Village A		Village B			
	Wet	Dry	Wet	Dry	Village A	Village B
Paddy	17	-	-	4	355	-
Cholam	38	178	2	95	593	143
Ragi	23	4	-	2	21	105
Cumbu	27	8	-	4	11	-
Samai	-	344	-	360	117	350
Varagu	-	-	-	7	63	9
Horsegram	-	79	-	69	86	251
Cotton	6	9	-	1	143	2
Tobacco	-	-	-	-	17	27
Gingelly oil-seed	14	11	-	-	-	-
Other cash crops	5	1	-	3	6	57*
Other crops	-	1	-	-	-	9
Total					1412	953
Second Crop					194	-
Net Area cultivated					1218	953

* 54 acres "Vegetables"

Table 4.8 Dryland Crops and Crop Combinations, 1978

Crops	Code
Red Cholam	1
Samai	2
Karnam	3
Varagu	4
Tovare	5
Parcipayir	6
Tattanpayir	7
Kallupayir	8

Combination	Area in acres cropped on identified land cultivated by Sample Survey Households	
	Village A	Village B
1. 1,5,6,7,8 or 1,5	71.80	61.32
2. 2,5,6,7,8, or 2,5	0.98	9.11
3. 3	4.05	11.24
4. 1,3,5,6,7,8	3.27	-
5. 4 or 4,5,6,7,8	0.52	2.87
Total Cropped Land	80.62	84.54
Total Identified Land Operated	109.91	105.80

Table 4.9 Duration and Intensity of Gardenland Crops, 1960-78

	Percentage of Crops Irrigated in Acre-Months			Irrigated Acre-Months[1]	Intensity of Irrigated Crops (%)[2]	Intensity of Irrigated and Rainfed Crops (%)[3]
	3-Month	6-Month	12-Month			
Village A						
1960	37.3	62.3	0.4	259.1	22.30	40.8
61	61.3	38.3	0.4	347.1	29.88	37.3
62	69.6	36.4	0.4	369.4	31.68	99.2
67	68.7	31.3	-	552.6	40.26	41.5
68	85.2	9.4	5.2	781.4	47.96	54.0
69	53.8	30.2	16.1	490.3	27.64	38.6
70	46.7	43.9	9.4	1014.9	52.75	64.0
71	17.3	82.2	0.4	780.7	39.27	45.9
72	47.9	47.4	4.6	763.8	37.91	42.9
73	20.8	65.5	13.7	905.6	45.11	49.5
74	27.3	69.2	35.0	1321.6	65.58	69.7
75	37.0	60.9	2.0	798.0	38.98	45.3
76	5.2	89.2	5.5	1215.0	58.78	63.1
77	17.4	69.2	13.2	787.8	38.11	41.6
78	18.8	47.7	31.5	947.9	44.78	46.4
Village B						
1966	50.2	39.6	10.2	696.9	26.36	45.4
68	68.6	20.9	10.5	641.2	25.17	44.1
69	46.7	11.8	41.5	649.3	35.49	41.4
71	17.2	71.5	11.2	756.2	40.36	52.0
72	27.8	33.0	43.2	1143.4	64.66	67.8
73	9.9	26.3	63.8	1407.0	74.94	78.8
74	17.8	50.6	29.6	1117.0	57.27	62.7
75	26.0	53.6	20.3	841.6	43.26	56.1
76	3.9	80.1	16.1	1343.7	66.68	75.6
77	11.7	37.0	51.3	1018.1	47.75	55.4
78	8.8	21.5	64.2	1487.9	63.80	65.9

1 Shown as a factor of acreage and duration of cultivation.
2 Proportion of land cultivated per year by irrigation.
3 Proportion of land cultivated per year by irrigation and with raifed crops (5-month crops).

Table 4.10 Frequency of Demand for Irrigation for Gardenland Crops[1]

Crop/crop combination	Duration in months	Total frequency of demand for irrigation	Average monthly frequency of demand for irrigation
Banana and mixed crop	12	87.8	7.31
Chillis	6	39.9	6.64
Cotton	6	25.2	4.20
Groundnuts	3	14.3	4.77
Onions	3	15.0	5.00
White Cholam	3	11.0	3.67

[1] Derived from data from sample survey households for both villages.

Table 4.11a Proportional Monthly Crop Areas for Gardenland[1] 1978/79 (shown as a percentage of identified land for that month)

Village A

Crop[2]	Tamil Month 3	4	5	6	7	8	9	10	11	12	1	2
Banana	19	21	21	21	21	20	26	27	27	27	28	28
Cotton	10	16	30	34	40	36	42	33	31	25	25	22
Chillis	10	9	4	-	-	-	3	5	5	5	18	19
Sugarcane	8	7	7	7	7	5	-	-	-	-	-	-
Tomatoes	3	3	3	3	3	-	-	-	-	-	-	-
Cabbage	-	6	6	6	6	6	-	-	-	-	-	-
Groundnut	-	-	-	-	-	-	6	6	6	-	-	-
White Cholam	3	3	3	3	-	-	-	-	-	6	6	6
Dry Millets	11	11	9	9	4	4	-	-	-	-	-	-
Others	1	1	1	1	1	1	1	1	1	-	6	1
Fallow	21	20	15	15	18	24	22	28	30	34	22	19

1 For identified land farmed by Sample Households.

2 Banana, cotton, and chillis may be cultivated with other crops.

Table 4.11b Proportional Monthly Crop Areas for Gardenland[1] 1978/79 (shown as a percentage of identified land for that month)

Village B

Crop[2]	Tamil Month 3	4	5	6	7	8	9	10	11	12	1	2
Banana	39	35	35	36	35	35	35	33	35	35	38	30
Cotton	6	7	15	27	31	30	30	32	19	12	3	3
Chillis	2	1	1	1	1	-	-	-	-	1	17	19
Tomatoes	4	4	4	3	1	-	-	-	-	2	9	9
Cabbage	-	-	-	-	-	1	1	-	-	-	-	-
Groundnut	-	-	-	-	-	1	1	4	4	4	2	1
White Cholam	1	1	1	1	-	-	-	-	1	2	2	2
Onion	1	1	1	2	1	-	-	-	1	1	2	2
Ragi	4	4	-	-	-	-	1	1	1	-	-	-
Red Cholam	4	4	5	5	-	-	-	-	-	-	-	-
Fallow	40	41	38	30	30	33	32	29	41	43	26	35

1 For identified land farmed by Sample Households.

2 Banana, cotton and chillis may be cultivated with other crops.

Table 4.12a Dryland Yearly Labour Demand[1]

Village A

Agricultural Operation	Male		Female		Total Male	Total Female	Total
	Hired	Family	Hired	Family			
Ploughing by tractor	0.19H	0.21H			0.39H		0.39H
Ploughing by bullock	2.30	0.76			3.06		3.06
Transport of manure/mud	0.35	0.12			0.47		0.47
Mixing of manure/mud	0.21	0.09	0.06	0.01	0.29	0.08	0.37
Weeding		0.13	5.75	0.38	0.13	6.13	6.26
Harvest of Cholam	0.96	0.08	2.41	0.09	1.04	2.50	3.54
Tovare	0.32	0.10	0.74	0.15	0.42	0.89	1.31
Parcipayir	0.23	0.09	1.13	0.14	0.32	1.26	1.58
Tattanpayir	0.32	0.12	0.67	0.11	0.44	0.78	1.22
Kallupayir	0.33	0.10	0.68	0.09	0.42	0.77	1.19
Samai		0.05	0.05	0.03	0.05	0.08	0.13
Karnam	0.02		0.61	0.00	0.02	0.61	0.63
Varagu			0.02	0.01		0.04	0.04
Total Harvest	2.17	0.54	6.31	0.62	2.71	6.94	9.65
Total	5.06	0.91	12.12	1.01	6.71	13.15	19.86

[1] Figures shown represent total demand per acre in man-days, except 'Ploughing by Tractor' where shown in hours.

Table 4.12b Dryland Yearly Labour Demand[1]

Village B

Agricultural Operation	Male		Female		Total Male	Total Female	Total
	Hired	Family	Hired	Family			
Ploughing by tractor	0.94H				0.94H		0.94H
Ploughing by bullock	1.61	0.38			1.99		1.99
Transport of manure/mud	0.10	0.06		0.12	0.16	0.12	0.28
Mixing of manure/mud			0.01	0.30		0.40	0.40
Weeding			5.65	0.96		6.61	6.61
Harvest of Cholam	0.22	0.13	2.31	0.46	0.35	2.78	3.13
Tovare	0.09	0.14	0.76	0.61	0.22	1.37	1.59
Parcipayir	0.06	0.14	0.76	0.65	0.20	1.41	1.25
Tattanpayir			0.74	0.90		1.64	1.64
Kallupayir			0.74	0.90		1.64	1.64
Samai	0.02	0.02	0.52	0.12	0.05	0.65	0.70
Karnam			0.96	0.11		1.07	1.07
Varagu			0.16	0.08		0.24	0.24
Total Harvest	0.39	0.43	6.95	3.79	0.82	10.74	11.56
Total	2.22	0.87	12.61	5.17	3.09	17.87	20.96

1 Figures shown represent total demand per acre in man-days, except 'Ploughing by tractor' where shown in hours.

Table 4.13 Labour Demand[1] for Dryland Ploughing

Method	Village A		Village B		Average	
	% Land Surveyed	Labour Demand	% Land Surveyed	Labour Demand	% Land Surveyed	Labour Demand
By bullock alone (No substitution)	58.7	4.55	41.4	2.93	51.5	4.01
By bullock and tractor (Partial substitution)	8.2		49.9		25.5	
Tractor		1.23H		1.07H		1.10H
Bullock		3.43		1.66		2.00
By tractor alone (Total substitution)	33.0	0.90H	8.6	4.44H	22.9	1.45H

1 Shown in hours (H) per acre for ploughing by tractor, and man days per acre for ploughing by bullock.

Table 4.14 Labour Demand[1] for Gardenland Ploughing

Method	3 month crops		6 month crops		12 month crops		Average	
	% Land Surveyed	Labour Demand	% Land Surveyed	Labour Demand	% Land Surveyed	Labour Demand	% Land Surveyed	Labour Demand
By bullock alone (No substitution)	64.2	8.64	55.1	8.82	19.5	7.74	40.2	8.56
By bullock and tractor (Partial substitution)	23.2		37.5		76.0		52.7	
Tractor		5.99H		2.50H		2.19H		2.35H
Bullock		8.33		5.87		5.21		5.34
By tractor alone (Total substitution)	12.7	9.05H	7.3	3.75H	4.5	4.00H	7.1	5.39H

1 Shown in hours (H) per acre for ploughing by tractor, and man days per acre for ploughing by bullock.

Table 4.15 Total and Monthly Labour Demand[1] and Ratio of Male to Female Labour for Principal Gardenland Crops, Pre- and Post-powerset

	Total Demand							Monthly Demand			
	M		F								M/F
	H	Fa	H	Fa	M	F	Total	M	F	Total	Ratio
Pre-powerset											
Onion	5.51	32.81	81.99	0.57	38.32	82.56	120.88	12.77	27.52	40.29	0.464
White Cholam	10.35	29.80	33.67	0.30	40.15	33.97	74.12	13.38	11.32	24.71	1.182
Groundnut	6.14	34.89	66.69	0.00	41.03	66.69	107.72	13.68	22.23	35.91	0.615
Chillis	9.04	98.35	149.20	3.28	107.39	152.48	259.87	17.90	25.41	43.41	0.704
Cotton	10.37	62.16	135.97	15.27	72.53	151.24	223.77	12.09	25.21	37.30	0.480
Banana	33.37	383.02	66.05	0.99	416.39	67.04	483.43	34.70	5.59	40.29	6.211
Banana Mixed	33.38	383.02	137.44	0.76	416.39	138.20	554.59	34.70	11.52	46.22	3.013
3-Month Crop	8.33	41.30	57.55	0.71	49.63	58.26	107.89	16.54	19.42	35.96	0.852
Post-powerset											
Onion	8.44	5.45	82.78	0.57	13.89	83.35	97.24	4.63	27.28	32.41	0.167
White Cholam	10.35	7.00	33.67	0.34	17.35	34.01	51.36	5.78	11.34	17.12	0.510
Groundnut	3.44	11.27	66.69	0.00	14.71	66.69	81.40	4.90	22.23	27.13	0.221
Chillis	9.92	17.23	153.39	3.44	27.15	156.83	183.98	4.52	26.14	30.66	0.173
Cotton	11.39	15.11	145.24	16.42	26.50	161.66	188.16	4.42	26.94	31.36	0.164
Banana	35.55	28.68	75.41	1.24	64.23	76.65	140.88	5.35	6.39	11.74	0.838
Banana Mixed	35.84	28.68	148.76	1.01	64.52	149.77	214.29	5.38	12.48	17.86	0.431
3-Month Crop	9.32	8.92	58.26	0.71	18.24	58.97	77.21	6.08	19.66	25.74	0.309

H - Hired (Daily wage and contract) Labour
Fa - Family (Household and Attached) Labour
M - Male
F - Female

1 in man-days/acre

Table 4.16 Wetland Labour Demand (Single Crop)

	M		F					
	H	F	H	F	M	F	Total	f
Ploughing by Bullock	1.7h				1.7h		1.7h	1
Ploughing by Tractor	6.88	2.93			9.81		9.81	
Transport of Manure[1]	2.46	1.87			4.34		4.34	1
Mixing of Manure[1]	1.71	0.64	3.00	0.21	2.36	3.21	5.57	1
Levelling	0.54	0.46			1.00		1.00	1
Transplanting	0.12	0.06	17.71		0.18	17.71	17.90	1
Weeding			25.84	1.20		27.03	27.03	1.97
Fertilizer Application	0.28	2.28			2.56		2.56	2.66
Pesticide Apllication	?				?		?	1.66
Harvesting	9.26		13.46		9.26	13.46	22.71	1
Total	21.46	8.24	60.01	1.41	29.70	61.42	91.12	

[1] First crop only

Table 4.17 Wetland Ploughing Labour Demand

		Demand per acre	% Land Surveyed
By Bullock alone (No substitution)		9.87 days	95.8%
By Bullock and Tractor (Partial substitution)	Tractor	4.22 hours	4.2%
	Bullock	8.45 days	
By Tractor alone (Total substitution)		-	0%

Table 4.18 Average Pre-powerset and Post-powerset Cultivation of Crops (by acre-months)

(Pre-powerset figures for Village A for 1960, 1961 and 1962
Pre-powerset figures for Village B for 1966 and 1968
Post-powerset figures for both villages for 1976, 1977 and 1978)

Village A

	3-Month Crops	Chillis	Cotton	Banana	Total
Pre-powerset	183.64	80.35	59.92	1.30	453.91
Post-powerset	126.24	228.48	471.47	157.7	983.96

Village B

	3-Month Crops	Chillis	Cotton	Banana	Total
Pre-powerset	394.70	193.88	11.18	69.33	669.09
Post-powerset	114.02	99.05	495.19	574.23	1282.49

Table 4.19 Total Average Pre-powerset and Post-powerset Gardenland Labour Demand

	3-Month Crop			Chillis			Cotton			Banana Mixed			Total		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total
Village A															
Pre-powerset	3037	3566	6603	1438	2042	3480	724	1511	2235	45	15	60	5244	7134	12378
Post-powerset	767	2482	3249	1033	5972	7005	2083	12701	14784	848	1968	2816	4731	23123	27854
Village B															
Pre-powerset	6528	7665	14193	3470	4926	8396	135	282	417	2406	799	3205	12539	13672	26211
Post-powerset	693	2242	2935	447	2589	3036	2188	13340	15528	3089	7166	10255	6417	25337	31754

Chapter 5

Class/Social Relationships in the Village with particular reference to Agriculture

5.1 Introduction

This chapter will attempt to describe the changing nature of two major indices of class and social relationships within the agricultural system of the village. First, the distribution of land ownership and operation and secondly methods of organisation of labour.

No attempt is made at this stage to explain or describe relationships between different ownership classes and either the agricultural production process or the dynamics of village demography. However it is necessary at this stage to distinguish between the three landuse types outlined in Chapter 4 to avoid confusion of subsequent analysis.

Within this framework it was possible to build a composite estimate[1] of land ownership and operational patterns. The main sources of data were the land revenue records held in the village, the interpretation of these records by informed sources within the village, the preliminary count which asked for an estimate of the extent of land ownership and operation for each household, and the subsequent checking of information during personal interviews, land survey, and the sample survey on agricultural operations. The divergence of sources for this estimate was necessary because on one hand while government records provide the necessary farmework for the accurate areal measurement of the extent of land holdings, they often confuse individual family units either by the

1 Each source was inevitably contradictory in most cases.

multiplication of names of members of a family with relation to a particular unit of land area, or by the multiplicity of ownership of a particular unit of land between members of different families. On the other hand, while individuals may have complete knowledge of the actual physical extent of land ownership and operation, they may not have a knowledge of its specific areal quantity, or indeed may feel that they have reasons for concealing their knowledge. Moreover government records, while they have better "memories" than individuals, tend to be continually out of date.

Thus the systematic biases of different sources of information on this subject limited the period of time over which it was possible to trace change in the relevant indices. For example, while revenue information was available on pattas held at the first revenue settlement of 1885 for both villages, the period concerned was beyond living memory for any resident of either village in 1978, and it was therefore impossible to gain any information on the extent of systematic bias within these records. (These records were however used to gain an estimate of ownership of land by caste, and the extent of land operation). While revenue records of changing land ownership were available in the chitta from 1947 in Village A and from 1926 in Village B, it was possible to interpret ownership of all landuse types only for sample family trees. Gardenland, which offered the distinct advantage of being physically identifiable with an individual source of irrigation, the well, and having until the advent of pipelines and powersets, easily recognisable boundaries which changed little, was the only landuse type the ownership of which could be investigated in total through time.

Also, while information was collected on the nature of changing land ownership and operation within family trees, it was considered necessary to diminish the almost inevitable possibility of the systematic bias of orally transmitted information toward the confusion of ownership of land between different generations of the same family[1]. This is attempted by means of the creation of an entirely artificial concept of the distinction between the dominant and nondominant household, a concept which is used in Chapter 3 to estimate the relevance of migration data gathered through present family trees. It allowed the assumption of an almost universally immediate handing over of land from one generation to the next to be incorporated within the analysis of changing landownership patterns. Because it was also possible to use this concept to modify the present land ownership and operational pattern, comparisons of past and present land ownership and operational patterns were made more correct.

1 Existing members of sample family trees would tend to ignore the possibility of suceeding generations within the same family either existing as separate family units, or operating land as separate family units, although this inevitably happens as part of the cycle of family evolution.

5.2 Patterns of Ownership and Operation of Land

Although the most common form of land operation and ownership is self operation and ownership of an area of land by a single household, as defined in Chapter 3, there are important variations which tend to reflect the changing stages of family evolution. The forms found within the two villages are shown in diagrammatic form in Fig 5.1.

A shows the stage in family evolution when second generation households have formed, but transfer of land from the first to the second generation has not taken place. The sons of the landowner work on their fathers' land and receive revenue from it although not owning it. Control of farming activities remains with the first generation. Here four separate households are directly involved with a single Farm Management Unit. As the family evolves, land may be transferred gradually to the succeeding generation either in separate parcels, or as a single unit (as in B). While the first generation has relinquished control of the land, and no longer provides any labour input, the second generation, if they do not house the first generation in one of their own households, may feel an obligation to support the first through the revenue from the farm, a payment which is usually made in kind. While one household may own land in common with others, it may also buy up and manage land on its own (as in C). Eventually households of the same generation separate land to form their own management units (as in D). If there is a considerable difference between the ages of heads of household of the same generation, land may well be passed on to the succeeding generation in unequal proportions, land being held by the first son until the second or third has reached a sufficient age (a quantity which may vary between caste) to take over the land (as in E). Even though a younger son may have formed a separate household, he may still have to provide labour for the farm management unit, and receive less than average revenue from land which will eventually be his. F shows the separate ownership of farm management units by members of the same household, a situation which may occur with members of the same or succeeding generations.

Because of the divisibility of households and land management units, it is necessary to identify the standard denominator of landownership and operation. Because of the cycle of change in family land transfers ultimately leads to the control of land by a single household, and because the control of any involvement with the land management unit ultimately rests with the head of household, the standard denominator for analysis of ownership and operational patterns in this thesis is the household.

The standard denominator of ownership and operation over time is taken as the dominant household. It is not possible to evolve a universal definition of the dominant household, because it is based primarily on the control of land. Land is not owned by a significant proportion of dominant households, and therefore separate definitions have to be evolved for such cases. The definition of dominant households is outlined in three conditions, given below, which cover all cases.

1. Households in the generation which own and control hereditary land are considered dominant.
2. If there is a division of hereditary land between generations,

households in the generation which hold the more valuable class of hereditary land, either gardenland or wetland, are considered dominant. If households in both generations, older and younger, hold gardenland or wetland, the households of both are considered to be dominant.

3. If there is no hereditary land held by household of older or younger generations, the time of change from non-dominant to dominant for any generation is reached when the average age of brothers is 25.

5.3 Landownership and Transfer

Although, according to the Indian Constitution, the state is the ultimate owner of land, land is owned in practice by individuals, who hold the deed or patta to the land. Land is registered and revenue payable, but the individual has complete freedom to use it as he chooses. Land may be cultivated by the owner, leased out, mortgaged with possession[1] (the land being used as security for a loan), or mortgaged without possession (with the option of repossessing the land after an agreed period of time, usually two or three years). Changing conditions of tenancy will be discussed in Section 5.4.

By far the most common form of land transfer is through the system of inheritance. The general rule of inheritance is that holdings are partitioned equally among sons. Because the varying productivity of different fields is recognised, division is not made purely on the basis of area operated by the older generation, and if land is owned in more than one location individual fields may be divided. Generally, the more productive land is, the more likely it is to be divided equally among succeeding generations. Indeed, more productive land is often partitioned on the basis of varying levels of productivity within the same field. Thus a major factor in producing the very small parcels of land characteristic of gardenland and wetland is the inheritance system.

The advantages of consolidation may be recognised, but the need for each son to possess land which is as profitable

1 Termed "otti", this form of mortgaging is recognised in Chingleput District by Mencher (1974b).

as possible is considered more important. (Land, however may be exchanged between households for mutual benefit. Such a case took place in 1977 in Village A, when a farmer wished to extend the area irrigated by a well. He exchanged some of his own dryland, which was closer to the village site than the garden, for the dryland of three other farmers, which was adjacent to his garden. Such examples, however, are rare.)

If there is a large amount of more productive hereditary land, the separate parcels of land are sometimes given to succeeding generations, in which case there may be some variation in the extent of land owned by brothers. Occasionally land is endowed unequally for reasons which are largely to do with family politics, and it is often the case that the younger sons receive less than the elder in spite of the principle of equal partition. There were several examples in both villages of younger sons complaining that the elder sons had taken advantage of the early death of the father for this purpose.

On the other hand, if there is a general realisation within the family that partition of land will mean that creation of as many uneconomic holdings as there are sons, one of the sons may forgo his inheritance rights. In 1975 in Village B what would have been a normal subdivision of a quantity of 1.88 acres of gardenland between 5 sons, to parcels of 0.38 acres was modified to the subdivision of the land into four parcels of 0.47 acres, as one son, who was an electrician, agreed to a cash payment from the others instead of receiving his land. In the same village in 1969, a widow owning 0.88 acres of gardenland, instead of partitioning the land between her two sons, who had left the village to work as hospital technicians in Tanjore

District, was content to see the land endowed to a daughter, and hence to pass ultimately to the control of another family.

Moreover, land may often be given freely within the family by one brother to another, or by a paternal uncle to his nephew, if there is considered to be an unusually unequal distribution of land within the family, and if there is enough surplus land to accommodate such a gift. The two elder sons of a landowner living in the small hamlet of Village A, had received their share of hereditary land, 0.38 acres of gardenland and 1.65 acres of dryland, in 1954 and 1955, By 1969, when the younger two sons received their shares of hereditary land, the eldest son had become a successful gardenland farmer, owning 4.56 acres, and the second son a successful wetland farmer, a tenant on 1.81 acres. They therefore relinquished their shares of hereditary gardenland to the two younger brothers.

If a brother migrates from the village, the other brothers usually occupy the vacant land, until he returns. This is normally done without any payment, but in some cases of more productive land, a nominal rent is paid. Brothers who have already divided the land into separate land management units nevertheless often act in concert over decisions about the sale of existing land, or the buying of new land. Thus, if holdings of land are proving to be uneconomic, they are often sold together to a single buyer. Development of new land often requires a cooperative plan of investment by brothers who farm contiguous holdings. Cooperation is especially necessary in the case of gardenland, where there may be a need to regulate the output of water for irrigation. (Indeed gardenland is the most likely landuse type to have a single management unit controlled by more than one household.)

Land, of course, may be given as a dowry. Although this tends to happen where the landowner owns a relatively large area, it may also occur (as mentioned above), where the sons are professionally engaged outside the village, or if there are no sons to inherit the land. This means, of course, that although land is registered in the wife's name, effective control of the land passes to her husband, and thus to another lineage. As analysis of changing landownership patterns is made with respect to the patrilineage, this has important implications for mobility[1] of ownership, as it creates the possibility of upward mobility[2] through the inheritance system, which is contrary to the general pattern of either no change in ownership (if there is only one son), or downward mobility (if there is subdivision).

Generally, therefore, although the tendencies of the inheritance system are, _ceteris paribus_, to lead to a haphazardly unequal distribution of land, these tendencies are modified to some extent by the ability of the system to accommodate varying demand for land from households of succeeding gnerations.

Outside the inheritance system, despite the theoretical government control of land, the extent of land ownership, and

1 "Mobility" (of ownership) implies the gain or loss of land by the household(s) of a lineage over time.

2 Land, may, of course, be gained as well by gifts within the family, or the operation of land owned by temporary migrants.

nature of land transfers are influenced primarily by the forces of and land market. Land which is assigned on the basis of the poverty or low caste status of its recipient is often "sold" illegally. Inam land (mentioned in Chapter 4) was treated as ordinary patta land to be bought and sold before its change of status after independence. Land ceiling legislation is largely irrelevant to village residents, as individuals generally own far less than the standard maximum acreage[1], and if they did own more could generally escape the effect of legislation by the multiplication of pattas within the family.

Poramboke land is land within the village which is held by the government in order to preserve communication, drainage and settlement patterns in the face of demand for this land for agricultural use. Fines are imposed on people who "encroach" poramboke, fines which become progressively stiffer with succeeding years of occupation. The revenue administration has the ultimate power of eviction, but it is rarely used. A common form of encroachment is the marginal extension of a field which is adjacent to a stream or path onto land, which, although not physically a part of the stream or path, has been surveyed as being so. Such transgressions may be reported yearly in the revenue accounts, but with little effect! A unique case of poramboke encroachment is seen in the taking over of the tank in Village A in 1979. This is extraordinary because it involved cooperative action by a number of families, admittedly of the dominant caste (in terms of numbers), to

1 No household in either village owned more than the permitted 15 standard acres in 1978.

destroy what is arguably a valuable part of the irrigation system, and take over a relatively large area, 24.33 acres in a short time period from 1969 to 1971. However its greatest significance probably lies in the fact that the need for such an action outweighed the disadvantages to the whole village, and the tank has not been reexcavated. Poramboke land, although subject to fines and possible eviction, is treated largely in the manner of ordinary patta land; it is bought and sold, leased out, mortgaged and so on. It is even subject to "ownership" by non-residents of the village.

5.4 Forms of Tenancy

The terms of tenancy vary largely with two factors: first and most importantly, land productivity, and secondly, the willingness or ability of either party, the owner or cultivator, to pay for expenses incurred before harvest. Generally, the more productive land is, the more attractive it is to potential tenants, and thus wetland has the greatest proportion of leased land, followed by gardenland, and dryland. While the second factor is itself largely influenced by the landuse type concerned, the relative socioeconomic position of both parties is important in determining the balance of profits and expenses. Tenancy legislation in recent years may well have had a significant effect on these open market relationships, either preserving existing relationships or obstructing the creation of new ones, but it is impossible to gauge their effect on this system, and as with Land Ceiling legislation, there are ways of circumventing it.

The changing forms of tenancy are perhaps best described with reference to the three main agricultural landuse types. There are two main types of tenancy of wetland, although the second described here is not treated as such in the village. The dominant form is an agreement to pay the owner a fixed amount of paddy at each harvest. This amount is calculated to be about half of the average yield, and, although there is generally a falling off of yield for the second crop, the amount to be paid remains the same. All labour is organised and all expenses paid by the cultivator. The second form of tenancy, one which may have become more popular since the introduction of tenancy legislation, is termed "management" by the tenants. The owner pays all cultivation expenses, and receives all of the crop except a fixed amount, which may represent one tenth or less of the harvest, which is paid to the tenant. As the needed input of labour is merely organised by the "manager", there being no need for him to undertake it himself (as wetland cultivation demands intensive inputs of organised labour), the "manager" has less personal interest in the eventual yield than would be so if he were a tenant paying his own expenses and receiving the surplus after the deduction of a fixed amount. Thus, although the "manager" relationship would be perhaps the most profitable for the owner, it provides no guarantee of a reliable profit, and involves a greater interest in the cultivation process. As the majority of leasers of wetland are non-residents of the village, the first type of tenancy is by far the most popular, the second only occurring where there is a very good understanding with the tenant. "Manager" relationships exist mainly between owners and the wealthier tenant farmers, and between owners and "managers" who are already bound by another tenancy relationship of the first type.

The fixed amount paid by tenants has risen as a result of the increased yields since the introduction of HYVs. The average rent payable on one <u>kulie</u> (about 0.6 acres) had increased from 7.61 <u>mudays</u> per harvest in 1966 to 9.36 <u>mudays</u> in 1978/79 in Village A[2]. The rate at any time is fairly uniform, the

1 One <u>muday</u> is equivalent to about 24 kilogrammes.

2 According to the sample survey on agricultural operations.

standard rate being quoted at the time of the survey being 10 mudays per kulie per harvest.

Gardenland tenancy shows a great variation in terms of rent, which may be summarised in three categories. First as with wetland a fixed amount of grain per year may be paid. The type of grain used in payment could vary, but has, for the last 50 years or more,(i.e. within living memory or residents in 1978/1979), been fixed at 4 mudays per kulie per year. This form of tenancy was not practised in either village in 1978/1979, and the author could find no evidence that it had been practised since the adoption of powersets.

The second main type of tenancy is known as pangu or share tenancy, and involves the sharing in various proportions of expenses and yields. Before the introduction of pumpsets, the most significant factor influencing this balance was the ability of the cultivator to provide bullocks for the operation of the kamalai[1]. Thus if the cultivator could provide two bullocks (in the case of one kamalai), the general agreement was either that he should provide all the expenses and receive between one half and two thirds of the yield, or that he should provide one third of the expenses and receive one third of the yield. Another arrangement, called sari pangu or equal share tenancy, was made if the cultivator could only provide one bullock for the kamalai. The other bullock was provided by the owner, and labour, expenses and yield were shared equally. Although bullocks have become obsolete, pangu tenancy survives. The most common form pangu now is sari pangu, although instead

1 Bullocks were, of course, also used for ploughing.

of the provision of bullocks, the cost of electricity for the pumpset is shared. Simlarly, with other forms of pangu, the proportions of expense and yield given and received may remain the same, the cost of electricity for the pumpset becoming another expense.

The third form of tenancy in use in gardenland, is nominally a form of pangu which involves a high proportion of payment of expenses and acquisition of yield by the owner. This form, which was not found in either village in 1978/1979, existed where the cultivator could not supply any draft animals for the kamalai. If there was one kamalai for the garden, the cultivator provided one sixth of the expenses and received one sixth of the yield. If there were two kamalais, the garden being of a greater area, he provided one ninth of the expenses and received one ninth of the yield. The expense for the cultivator, however, was measured not in cash terms, but by his provision of the valkayir, or tail-rope leading from the bullocks to the iron bucket of the kamalai. This, of course, was a purely nominal outlay, and this form of tenancy may arguably be described as a form of attached labour. Such tenants were always likely to be in debt to the owner, and if ceasing to work for him, had to persuade subsequent employers to underwrite his debts. Since the introduction of powersets, there has been only one case of such tenancy in Village B and none in Village A. This may well be because of its substitution by the present employment of attached labourers who receive a fixed wage.

The extent of gardenland tenancy has been far less than that of wetland, partly because of the difference in productivity, and partly because, as it was necessary to attract tenants through pangu terms, a close contact with the cultivation process was necessary, and therefore owners who leased out gardenland would tend to be village residents.

Dryland attracts the smallest proportion of tenants, and the most favourable terms are offered to potential dryland tenants, with regard to the proportion of expenses incurred and yield acquired by the owner. Thus the most common form of dryland tenancy involves the payment of all cultivation expenses by the owner, who takes a fixed amount of grain, the equivalent of half the yearly average production. While in Village B the most likely dryland tenants are those would-be cultivators with no land at all, in Village A, dryland is often owned by non-resident wetland owners and leased to the wetland cultivators with whom they have tenancy agreements.

5.5 1978 patterns of ownership and operation of land

The descriptive indices used in this chapter will apply to households (as defined in Chapter 3). "Ownership", as used in this section, applies to the legal ownership of *patta* land, both inside and outside the boundaries of the *village ownership zone*, and the revenue village itself, and to land which is mortgaged in with possession. Attempting to distinguish between these two types of possession would have resulted in almost insuperable difficulties during data collection, and would have given little analytical advantage. "Occupation" refers to the aggregate area cultivated by each household. Thus this category includes land which is leased in and land which is leased out. *Poramboke* land, where not separately defined, is included in operated land.

The equation producing the category of operated land may be summarised as below.

(A)		(B)		(C)
Owned patta land plus Mortgaged land (with possession)	plus	Leased-in Land	minus	Leased-out Land

	(D)		(E)
plus	Poramboke	equals	Operated Land

Table 5.1 shows the number of households owning, leasing and operating land together with the total area of land for both villages for each landuse type. The coincidental numerical proximity of total households of the villages, (318 in Village A, and 317 in Village B), allows comparisons to be made directly using household numbers without showing them as a proportion of total households.

While the aggregate figures largely reflect the extent of landuse types within the village ownership zone, (Figs 4.1 and 4.2), they refer to any land owned or operated by residents of the village. Thus, the aggregate area for gardenland occupation in Village A (183.1 acres), is greater than the cultivated gardenland area within the village ownership zone, (169.94 acres).

Wetland ownership is, of course, far greater in Village A than in Village B, although the aggregate area owned in Village A represents only 38.8% of cultivated area in the village ownership zone, and wetland is owned by only 42 households. The number of households occupying wetland is far greater because of land leased in, and poramboke land occupied. There is little leasing out by village residents, and these figures illustrate the importance of leasing in of land from non-residents to the village economy. All wetland occupied by residents of Village B is owned. Wetland farming is a relatively new source of income for Village B households, all land shown in Table 5.1 being bought in the period from 1965 to 1978.

Gardenland ownership in both villages reflects the overall trends in changing area under gardenland. Although gardenland is the most important source of agricultural income in Village B, the area occupied in Village A is slightly greater, largely because of the different effects of innovation of gardenland irrigation technology on the cultivable area. There is an important difference in the number of owners and operators of gardenland between the two villages, Village B having approximately 50% more gardenland farmers. Leasing of gardenland is less than that of wetland, reflecting the higher proportional ownership by village residents. However, a more developed pattern of leasing is shown in Village B than in Village A.

The extent of dryland owned and occupied, and the numbers of households involved in dryland farming are largely similar in both Villages, and tend to reflect closely the areas of dryland within the respective village ownership zones. There is little leasing of dryland.

Thus several basic patterns of ownership and operation emerge with respect to the different landuse types, and these may be related to varying land productivity and value if the order of wetland, followed by gardenland, and then dryland, is considered to be the correct ranking of landuse types according to productivity and value. First, the area extent of ownership and operation of the different landuse types is negatively correlated with this ranking. Secondly, the proportion of households owning different landuse types is also negatively correlated. Thirdly, the area leased in as a proportion of area owned, and households leasing in as a proportion of owning households is positively correlated. Fourthly, the amount leased out by residents in each landuse category is less than that leased in, but is not related to this ranking[1]. Fifthly although there is no direct correlation between the area of poramboke encroached and the landusetype, in Village A, where the encroachment of the tank allowed a direct choice of landuse type, a greater area of wetland than gardenland is cultivated as poramboke.

Table 5.2 shows the distribution of ownership and operation of landuse types in both villages in 1978/1979. Each group shows a typical bimodal distribution, which is highly positively skewed. There are no great differences between the distributions of ownership and operational categories for each landuse type except between wetland ownership and operation in Village A. Wetland distributions differ greatly between both villages, because of the high proportion of non-owning households in Village B. The gardenland ownership and operation distributions differ in that while Village A has a higher proportion of non-farmers, it shows a greater number of owners in the higher classes. The distribution of dryland ownership and operation for both villages are largely similar.

The degree of inequality[2] of land ownership is shown in Table 5.3, both for the owners and operators of each landuse type alone and for the whole village, with respect to each landuse type. The highest degree of inequality among owners

1 The greater proportional area of gardenland leased out is related to the greater required input of regular labour than of wetland. See Section

2 The index used, the Gini Coefficient of Inequality, measures the difference between perfect equality on a cumulative frequency percentage graph (Lorenz Curve), and reality, and is shown as a percentage between 0% (perfect equality) and 100% (perfect inequality).

of a single landuse type is seen in Village A wetland owners (56.5%). This figure is considerably "modified" among wetland operators. A similarly high degree of inequality is seen among gardenland owners of Village A (54.3%), which is modified slightly among gardenland operators. Ownership of dryland in Village A is relatively less unequal, and is again modified among dryland owners. For all households in Village A, the ownership of wetland shows a very high degree of inequality, as does the ownership of gardenland, reflecting the low proportion of households owning these two landuse types. While the degree of inequality is again considerably modified for wetland operation for all households, that of gardenland remains relatively high. There is a smaller overall degree of inequality for dryland operation and ownership for all households.

Inequality of ownership and operation of Village B landuse types shows great differences from Village A regarding wetland and gardenland. The degree of inequality among wetland owners is quite small (35.9%), and although the coefficient for inequality among gardenland owners is greater (39.5%), it is less than that for dryland owners (47.6%). Moreover, while wetland ownership for all households shows a high degree of inequality even when compared with Village A, inequality is less for gardenland ownership than Village A for all households. While the degree of inequality of ownership for both landuse types tends to be modified for land operation in Village A, there is little change in Village B. Only dryland exhibits similar patterns of inequality in both villages.

Table 5.4 gives the proportions of households involved in the ownership and operation of different landuse types in combination. Both villages show that a low proportion of wetland and gardenland is owned or operated as the only landuse type, while a greater proportion of dryland farmers have this as the only landuse type. In Village A a high proportion of wetland owners own dryland[1] (42.9%), and an even greater proportion own gardenland and dryland. Similarly, 60.3% of gardenland owners also own dryland alone, and a further 30.2% own both wetland and dryland. Conversely, a small proportion of dryland owners own other landuse types, either together or separately. The pattern is changed only slightly in Village B, where the general absence of wetland ownership reduces the proportion of gardenland owners who also own wetland, either alone or with dryland. However, a remarkably high proportion of gardenland owners also own dryland.

The comparatively great difference between the proportion of households owning and operating wetland in Village A has a significant influence on the proportions of combined operation of different landuse types as compared with combinations of ownership. The proportion of dryland farmers operating dryland alone decreases from 5[illegible].6% to 37.6%, while the proportions of dryland farmers also operating wetland either alone or with gardenland increases. The proportion of gardenland operated with both wetland and dryland increase too. There is little difference between the combinations of different landuse types owned and operated in Village B.

The relationship between the ownership and operation of different landuse types may be further illustrated by an examination of the correlation between the extent of ownership

[1] Without owning gardenland.

and operation by area for households in both villages. Table 5.5a shows correlation coefficients[1] of selected landuse type ownership and operation. For Village A there is generally a high degree of correlation between all the categories shown. However, there is an especially high degree of correlation between wetland and gardenland ownership, which is slightly modified when gardenland ownership is correlated with wetland operation. Although there is broadly similar correlation between wetland ownership, wetland operation, and gardenland ownership with dryland ownership, the highest degree of correlation is in the case of wetland ownership with dryland ownership. In Village B, gardenland ownership and dryland ownership are highly correlated.

While the figures in Table 5.5a reflect correlation of ownership between <u>all</u> households, Table 5.5b shows correlation of the extent of ownership <u>within</u> groups of different landuse type owners and operators, and the extent of ownership and operation of other landuse types. Wetland owners show low positive correlations with gardenland and dryland ownership, while gardenland owners show relatively high correlations with wetland ownership and operation and dryland ownership. While wetland operators show a low degree of correlation with gardenland ownership, the degree of correlation increases with dryland ownership. Similarly, dryland owners are fairly highly correlated with wetland ownership and operation, and show a

1 Spearman's Rank Correlation Coefficient, measured on a scale from -1 (showing perfect negative correlation) to +1 (perfect positive correlation).

low positive correlation with gardenland. Unsurprisingly, in Village B, there are fairly high degrees of correlation between gardenland owners' area and dryland ownership, and between the dryland owners' area and gardenland ownership.

Thus within the basic patterns of ownership and operation (outlined above), there are important variations in the distributions of and combinations of ownership and operation of landuse types between the two villages, which largely reflect the greater ownership and leasing of wetland in Village A. A fuller explanation of these variations will be given in succeeding chapters, but the basic patterns of variation and combinations of ownership and operation may be summarised as follows.

First, whereas both villages show a positive relationship between landuse types ranked by value and productivity, (i.e. wetland, then gardenland, the dryland) and degree of inequality, for all households, this relationship is only true for owning households in Village A. In Village B there is less inequality among owning households with more valuable and productive land.

Secondly, there is greater modification of inequality within the operational categories in Village A than in Village B.

Thirdly, the relationship between various landuse types shows a fairly complex pattern in Village A compared to that of Village B. In Village B, the majority of gardenland owners also own dryland, and the extent of gardenland owned is positively correlated with the extent of dryland owned. However, in Village A, although there is a strong overall relationship between ownership of the two more valuable landuse types, for wetland owners there is a weak positive correlation between the extent of wetland owned and that of gardenland and dryland owned. However, the relationship between gardenland and dryland ownership in Village A, although weaker than that of Village B, is largely similar. Moreover, for gardenland owners there is a fairly strong positive relationship between the extent of gardenland owned and that of wetland owned and wetland operated. Whereas ownership of wetland may be related to ownership of other landuse types for the village as a whole, the accumulation of gardenland is strongly related to the accumulation and operation of other landuse types.

An approximate indication of the overall influence of the variation in ownership and operation and combinations of ownership and operation on the village as a whole may be gained from the compilation of indices of agricultural production (land operation), and agricultural land assets (land ownership). The distribution of these indices may be seen in Tables 5.6 and 5.7.

The formula for the compilation of the Index of Agricultural Profitability (IAP) is as follows:

Dryland (factor 1), plus Gardenland (factor 5) plus Wetland (factor 10) equals IAP. For all landuse categories ownership with operation (factor 1) and land leased in or out (factor $\frac{1}{2}$) are included. Poramboke land is treated as owned land.

The IAP us based on estimates of the differential productivity of landuse types, differing in proportion to the shown ratios. Leased land is assumed to produce half as much for the leaser as for the leasee.

The formula for the compilation of the Index of Agricultural Land Assets (IALA) is as follows:

Dryland (factor 1), plus Gardenland (factor 15), plus Wetland (factor 40) equals IALA. Only owned land and poramboke land are included.

While the totals for the indices, and the mean for each index show great variation between each village, Village A being far richer than Village B for both indices, the coefficients of inequality show greater overall equality for Village B.

5.6 Changing Patterns of Ownership

A fuller understanding of 1978/79 ownership patterns must be based upon a study of the history of ownership of land within the village. This section will outline changes in the distribution of ownership of different agricultural landuse types from 1947 to 1978 in Village A, and from 1926 to 1978 in Village B, the respective time periods being limited by the existence of the *chitta*. Yearly figures are given, representing a fasli.

Ownership has a slightly expanded definition in this section as compared with section 5.5, including *poramboke* land as well as land-mortgaged in with possession, as in the course of time this is treated in the same manner by occupiers as legally owned patta land. The inclusion of land which is mortgaged in with possession in the historical representation of ownership involves the acceptance of a danger of systematic bias towards underrepresentation with receding time, and also the danger that the transactions of more recent time would tend to be "telescoped". However, mortgaging in with possession is usually a step on the path towards full ownership, and where land is repossessed by the patta holder after a period of non-operation, and this information has not been gathered from other sources, it represents a temporary inaccuracy in the representation of ownership distribution. There is no reason to suspect a difference in any systematic bias towards misrepresentation of mortgaging in with possession between the village.

The method for the collection of information on changing ownership patterns involves two major stages. First the dates of existence of the household must be defined. As explained in section 5.2, the standard denominator of ownership over time is taken to be the dominant household, and the three conditions for its definition outlined in that section are used. The primary source of data is information taken from family trees on the evolution of the family over time, particularly concerning dates of formation of new households, subdivision of land, death and migration. Supplementary information was taken from dates of subdivision in the chitta, and, in the event of lack of precise information on the evolution of the family, the establishment of probable dates of marriage and formation of households using "present" ages of heads of household. Secondly, the changing area owned by each dominant household must be quantified. Again there is a necessary synthesis of sources of information. The primary source of information was taken from interviews conducted at the same time as information about family trees was gathered. The exact extent of land ownership was defined by information from the chitta. Inevitably conflicts of information arose between these two sources, and generally information derived from family trees was considered more reliable in matters regarding family evolution, as was information from the chitta on land transfers.

For wetland and dryland ownership, information was gathered from sample family trees, and applies only to land held within the patrilineages of those family trees. Because of relationships between the ownership of land and future existence of the patrilineage in the village, samples taken in 1978 in both villages of patrilineages, while being representative of the village during the year, must relate to sets of dominant households which are unrepresentative of the distribution of landownership for all dominant households in the past. This systematic bias would tend to increase with receding time. These relationships will be explored, and the extent of bias within this sampling system discussed in Chapter 6. However for the purposes of this chapter, an examination of the changes of distribution in ownership within family trees is assumed to be largely representative of patterns of change within landownership of the village as a whole.

For gardenland ownership, information is available for all gardenland ownership within both villages; from 1926 in Village B, and from 1947 in Village A. This is largely because of the advantages of collecting information on gardenland ownership discussed in section 5.1. Thus information on all gardenland ownership will be given in this section as well as that on changing ownership within the family tree.

Figs 5.2 (for Village A), and 5.3 (for Village B), show the extent of different landuse types owned within the sample family trees. Figs 5.4 (Village A), and 5.5 (Village B) show the mean extent of land owned by landowning households, and by all households within the sampke family trees. Figs 5.6 (Village A) and 5.7 (Village B) show the proportion of families owning these landuse types. Figs 5.8 (Village A), and 5.9 (Village B) show coefficients of inequality of ownership among landowners of different landuse types, and of landownership for all households within the sample family trees.

Features of the distribution of total gardenland ownership in both Villages are shown in Fig 5.10.

For the indices involved in this descriptive framework: total acreage owned, average area owned, the proportion of landowning families, and the extent of inequality of ownership, there are important variations between different landuse types, between the two villages, and over time. However the general patterns of changing ownership over time may be listed as follows:

1. For all landuse types, in both villages, there is a general upward trend in area owned. There are two exceptions to this pattern. First, in Village A, gardenland ownership shows a greater rate of increase between 1964 and 1971 (Figs 5.2 and 5.10). Secondly, in Village B, where a sharp drop in gardenland ownership from 1968 to 1970 (which is gradually recovered from 1970 to 1978), coincides with a sharp rise in dryland ownership (which is not reversed in subsequent years), (Figs 5.3 and 5.10).

2. For all landuse types, there is a general downward trend in average area owned by all households. This pattern changes for gardenland between 1967 and 1978 in Village A, where there is a rapid increase, (Figs 5.4 and 5.10), and between 1968 and 1970 in Village B where a sharp decline is followed by a gradual recovery (Figs 5.5 and 5.10).

3. For all landuse types, there is a general reflection of trends of average ownership by all households, (2.), in trends of average ownership by owners alone, except in the case of gardenland in Village B (Fig 5.10). Here the average area owned by owners alone increases from 1926 to 1949, while the average area owned by all households decreases. From 1949 to 1978, trends of average ownership by owners reflect average ownership by all households.

4. There is a positive correlation between the ranking of landuse types by productivity and value (i.e. wetland, then gardenland, then dryland), and the proportions of land owning households (Figs 5.6 and 5.7), and a positive correlation between this ranking and the degree of inequality of ownership for all households (Figs 5.8 and 5.9). This pattern changes between 1926 and 1944 in Village B, where gardenland and dryland show similar proportions of land owning households and degrees of inequality of ownership. There is no correlation between this ranking and degrees of inequality among owners alone which show changing patterns over time.

5. There is little change in proportions of dryland owners and degrees of inequality of dryland ownership.

6. There are almost exactly opposite trends in proportions of landowning households and degrees of inequality of ownership of gardenland of either village (Fig 5.10).

While in Village A there is a general increase in the proportion of landowning households (except for a slight decline from 1969 to 1978), in Village B there is a steady decrease in this proportion. Moreover, while the degree of inequality of ownership among owners increases in Village A, and the degree of inequality among all households remains steady, in Village B, the degree of inequality among owners remains steady while the degree of inequality among all households increases.

7. Wetland ownership in Village A is characterised by low but increasing proportions of landowning households, with high but decreasing degrees of inequality of ownership for all households. Landowning households show an increasing degree of inequality of ownership between 1947 and 1967, and a decreasing degree of inequality thereafter. (With a low proportion of landowning households, however, this figure is likely to vary greatly).

Fig 5.11 shows the changing area of wetland within the revenue village (Village A), which is owned by resident households. The changing extent of ownership may be divided into two periods, first 1947 to 1967, during which there is a steady decline in area owned, and secondly 1967 to 1978, when there is a gradual increase. As only part of the decline in area may be explained by purchase of land owned by Village A residents by residents of an adjacent village to the north, and as the increase in the second period is duplicated by the increase in the extent of land owned by residents of the adjacent village, the decline in ownership may be assumed to be associated with increasing purchase of land by non-residents[1] in order to lease out land to residents of either village, and that this land has been recovered through purchase by residents of either village during the second period. The average area owned by all households of Village A follows the trend for total area.

1 The non-resident owners have been identified by village of residence, and generally come from a distance from Village A which would make owner-cultivation virtually impossible.

5.7 Changing Patterns of Land Transfer.

Few attempts have been made within the literature of Indian village studies to trace the actual nature of land transfers with respect to ownership classes, a fact which is unsurprising given general constraints on data availability. The most significant exception to this general rule is Attwood (1979), who for one village in Maharastra State, taking a period of 50 years illustrated the relative mobility of total ownership from three different ownership classes for a sample of (single line) patrilineages. Land transfers were generally categorised either as Purchase/Sales or Partitions, thus enabling inferences to be drawn as to the relative effects of any observed trend towards differentiation, and of population increase on landownership mobility. Attwood's basic method is used here with some modifications.

Analysis of patterns of land transfer in this section is made with reference to three parameters, which have been selected in order to explain the descriptive indices of landownership outlined in section 5.6. The parameters, mobility of landownership between owners and non-owners, mobility of landownership among owners only, and modes of mobility of landownership, have been quantified with reference to the three main landuse types, wetland, gardenland and dryland, and apply to the lineages of dominant households.

The method for the definition of these parameters involves, therefore, the definition of classes of ownership, periods of change, modes of mobility and the lineages of dominant households.

The primary division of ownership classes is, of course, that between owners and non-owners. This division, as well as being directly quantifiable on an interval scale of area, is also a fundamental conceptual division. As shown in Section 5.5, the frequency distribution of area owned of any landuse type is typically bimodal, the larger mode representing non-ownership, and the second mode representing the high positive skew within the ownership category. The frequency distribution of ownership within the ownership category, therefore, reveals no classes or similar groups of ownership, and therefore, for the purposes of this methodology, arbitrary divisions made along this scale do not imply the recognition of discrete classes of ownership. The chosen classes of ownership relate to quartiles of the frequency distribution of ownership at the start of the various periods of change. For dryland ownership within either village a simple division according to quartiles was made. For gardenland ownership in Village A a similar division according to quartiles was made, and for gardenland ownership in Village B, a fivefold division, the lower three classes relating to the three lower quartiles, and the upper two classes relating to the upper two octiles, was made. The definition of a further class of ownership was made necessary because of the existence of owners at the end of the various periods of change who had in-migrated and acquired land. A summary of the various classes of ownership used in this section is given in Table 5.8. These classes are used with reference to Tables 5.15 to 5.24.

The definition of periods of change, henceforth termed <u>stages</u>, over which analysis of mobility is to be made was determined by two main factors. First, it was necessary to measure changing mobility, not merely the total mobility over a period of time. Therefore it was necessary to define more than one stage for each period over which data were available. Secondly, because of the limited amount of available data, even where data were complete with regard to a particular landuse type, it was necessary to define sufficiently large stages to gain reliable indicators of trends of mobility from initial ownership classes. The period over which data were available was divided as far as possible into equal stages, in order to facilitate comparisons of mobility over time, and as frequency distributions of ownership had already been grouped into yearly totals, for Village A three stages of 11, 10 and 10 years, and for Village B four stages of 13 years each were identified. The stages are thus:

Village A		Village B	
Stage A	1947 - 58	Stage A	1926 - 39
Stage B	1958 - 68	Stage B	1939 - 52
Stage C	1968 - 78	Stage C	1952 - 65
		Stage D	1965 - 78

The definition of modes of mobility must be made with reference to the methods of land transfer already outlined in Section 5.3. As analysis incorporates the three landuse types, the transfer of the land by the changing of the landuse type itself must be included in mobility. Thus, three modes of mobility have been identified: first transfer of land by financial transaction, secondly transfer through the inheritance system, and thirdly transfer by the physical change of the landuse type. A summary of the constituents of the three modes of mobility is given in Table 5.9.

The unit of ownership for each stage is taken to be the lineage of the dominant household, which represents a single line of descent from the beginning to the end of each stage. The lineages exist either as a constituent of the sample family trees, or as part of the whole village for any stage. Although most lineages are present in the village at the start and the end of each stage, those which are only present at the start or at the end of any stage, are included in the analysis for that stage. Fig 5.12 shows how this method is applied to situations of fragmentation of the family tree, and to situations of in- and out-migration.

Table 5.10 shows the rate of entry into and exit from the ownership categories of dryland and gardenland. Data for dryland were taken from sample family trees, and data for gardenland were taken from all gardenland. The number of lineages for each stage for the whole village was computed from the factor of existing families at the end of each stage and the number of lineages divided by the number of families at the end of each stage among sample family trees. (In any stage where there has been out-migration, the number of lineages for that stage will exceed the number of dominant families.) The first of the three parameters, mobility of landownership between owners and non-owners, shows clear differences between dryland and gardenland for both villages. The average rate of entry[1] into ownership is greater for dryland, and the average rate of exit from ownership is greater for gardenland. While rates of exit and entry for dryland are very similar, producing very small net rates of increase (+0.0127% and +0.0049% per year for Villages A and B respectively), the difference in rates of entry and exit for gardenland produces a net rate of exit in every stage, which generally increases with succeeding stages. Thus while mobility of ownership between owners and non-owners shows distinctive patterns in both landuse types, while the pattern is relatively stable in the case of dryland, it is dynamic in the case of gardenland.

Analysis of the second parameter of mobility of ownership, that of mobility among owners, must be made with reference to quantities of land owned by each lineage at the start of each stage. As explained above, lineages have been grouped into classes of ownership according to the actual distribution of ownership at the start of each stage. The "Net Change" column in Tables 5.15 to 5.24 shows increases, partial decreases, and total decreases[2] from the initial ownership figure, as well as the net change. Tables 5.5 to 5.24 show two indicators of change: first the change in numbers of lineages owning various classes of land as a percentage of the original

1 Entry into ownership can only be made for any lineage within each stage, which does not own land at the start of the stage. Thus although new lineages may be created during a stage by the process of family evolution, and the creation of new dominant households, they assume the landownership of the previous generation which was true for the start of the stage.

2 A partial decrease indicates that some land is retained at the end of a stage, and is shown in the column "-Some", while a total decrease indicates that all the land of that landuse type is lost, and is shown in the column "-All".

number of lineages in that class, and secondly the aggregate change in area from the initial total area, shown as a percentage of the initial total area. (With classes of non-ownership aggregated area changes could not be shown as a percentage of the initial area total, zero, and so these are shown as average changes in area per lineage).

For the second two parameters of mobility, it is necessary to evolve a method of describing overall mobility between the various classes. As it is not the intention to evolve an index of mobility, mobility must be identified with overall trends from the various classes. The identification of these trends is important, as it gives an indication of the trends of the various modes towards equality or inequality of ownership. Therefore seven patterns of mobility have been identified (Fig 5.13). These are first Downward, where there is overall net proportional decrease from ownership classes, secondly Upward, where the reverse is true, thirdly Cyclical, in which net upward mobility from lower classes is matched by downward mobility from higher classes, fourthly Anticyclical, where net downward mobility from lower classes is matched by upward mobility from the higher classes, fifthly Downward-cyclical, where net downward mobility is greater from higher classes than from lower classes, sixthly Outer-class downward, where net increases in the central classes are matched by decreases in the outer classes, and seventhly Outer-class upward, where net decreases in the central classes are matched by increases in the outer classes.

An eighth "pattern" or non-pattern of no recognisable relationship between the initial classes and proportional change may also be identified.

These patterns may be grouped into three categories according to their potential effect on the total equality of ownership of a landuse type: first those leading towards equality (Cyclical and Downward-cyclical patterns), secondly those having no systematic effect on equality (Downward, Upward, Outer-class downward, and Outer-class upward patterns), and thirdly that tending towards inequality (Anticyclical pattern).

Regarding the second main parameter of ownership mobility, that of mobility among owners, dryland ownership in Village A (Tables 5.15 and 5.16), shows a Cyclical pattern of mobility, which is stronger for lineage than for area changes. Dryland ownership in Village B (Tables 5.20 and 5.21), however shows a Downward pattern, which again is less clear for lineage than for area changes. Gardenland ownership in Village A (Tables 5.17 and 5.18) shows a distinctive Cyclical pattern for both lineage and area changes. However when change over succeeding stages is considered, although the Cyclical pattern is maintained for area changes for all stages, for lineage changes there is a change from a Cyclical pattern in Stage A to a Downward-cyclical pattern in Stage B, and finally to a Downward pattern in Stage C (Table 5.19). Gardenland ownership in Village B shows an overall Downward pattern of mobility for both lineage and area changes (Tables 5.22 and 5.23), and this pattern is consistent for all stages (Table 5.24).

There is a very distinctive relationship between the proportions of partial and total decreases in ownership from both numbers of lineages and aggregate area and the class of ownership. Lower classes show a higher proportion of total decreases than partial decreases, and higher classes the reverse. This relationship is of importance when considering the mode of mobility, the third main parameter.

Proportional changes in lineages from the various classes are generally reflected in changes in area, through the figures for area changes are generally higher than those for lineage changes. This indicates that generally the frequency distribution of changes of area from initial ownership during each stage is positively skewed for lower classes and negatively skewed for higher classes. Where this difference is exaggerated there are high skews in the distributions of change. For Village A gardenland ownership change (Table 5.19), there is increasing difference between the area and lineage changes with succeeding stages, especially in the lower classes of ownership. The frequency distribution of change of area from these classes is highly positively skewed from lower classes (a small proportion of lineages gaining a relatively large area of land).

Before considering the third main parameter, modes of mobility (MMs) of landownership with reference to classes of ownership, it is necessary to show aggregate area changes which have occurred during each stage in the three modes (as outlined in Table 5.9). Tables 5.11 and 5.12 show aggregate area transfers of land through Sales[1] (S), the

1 The term covers purchases as well as sales.

Inheritance system (I), and Physical change (P),for both villages. Dryland area for both villages, which are compiled from the data from sample family trees, show successive increases in area, largely through Sales. In Village A this increase occurs in spite of decreases due to Physical change (largely through irrigation of dryland by new wells). In Village B, however, the lowering of the water table during Stage D has increased the dryland area through Physical change. Change in gardenland area for all gardenland is largely the result of Physical change, there being little change through Sales between the residents of the village and residents of other villages. There is, of course, a great contrast between the increase through Physical change during Stage C in Village A, and the decrease through Physical change during Stage D in Village B. These changes are generally reflected in changes in area owned by the sample family trees, though here there is more potential for Sales (i.e. buying or selling to residents of the same village). Generally aggregate area changes through the Inheritance system are relatively unimportant for all landuse types, because although in themselves important, these transfers take place within the families of resident villagers, and changes which have occurred through this system are generally the result of land being given as a dowry, and thus changing hands between different patrilineages.

The volume[1] of land transfers in each stage shows

1 "Volume" of land transfers is an index of the area of land transferred through a particular mode of mobility, and is shown as a proportion of the total area for each year. The index for volume of land transfers for any stage is computed from the average of yearly volumes during that stage.

distinctive patterns common to the landuse types of both villages (Tables 5.13 and 5.14). For all dryland, by far the most common form of land transfer is through the Inheritance system, followed by Sales and then Physical change. This pattern is also true for Village B gardenland, and Village A wetland. Village A gardenland, however, shows a relatively high volume of land transfers through Sales, and a relatively low volume of transfers through the Inheritance system. This generally reflects the fact that aggregate area of gardenland is expanding, and that inheritance tranfers are less important where there is a high proportion of newly acquired land. Generally the volume of land transfer through the inheritance system is greater for dryland than for gardenland, and the reverse is true for financial transactions.

Tables 5.15 to 5.24 show increases and decreases as well as net change in each mode of mobility for dryland and gardenland for both villages, from initial area owned grouped into classes. As with the second parameter, the mobility of each mode may be identified with recognisable patterns of change according to classes of ownership at the start of each stage (Fig 5.14).

For the first mode of mobility, Sales, dryland ownership in Village A (Tables 5.15 and 5.16), shows an Outer-class downward pattern of mobility for both lineage and area changes, as does dryland ownership in Village B (Tables 5.20 and 5.21). The averaged figures for Village A gardenland show a Downward pattern (Tables 5.17 and 5.18), which obscures the trend from Cyclical to Anticyclical patterns with succeeding stages (Table 5.19). Gardenland ownership in Village B shows an Anticyclical pattern (Tables 5.22 and 5.23), which is shown to be changing over succeeding stages to the Outer-class downward pattern characteristic of dryland (Table 5.24).

For the second MM the Inheritance system, dryland ownership in both villages is characterised by cyclical or downward-cyclical patterns of mobility (Tables 5.15, 5.16, 5.20 and 5.21), and gardenland ownership in both villages by downward-cyclical patterns (Tables 5.17, 5.18, 5.22 and 5.23), which are tending to change over succeeding stages to downward patterns, the last stage for both villages (Tables 5.19 and 5.24).

For the third mode of mobility, physical change, there is no recognisable pattern of mobility for dryland in either village. Gardenland in Village A, however, shows an Upward pattern (Tables 5.17 and 5.18). Proportional changes for lineages become greater over time for higher classes, while proportional changes for area are consistently high for the lower classes of ownership (Table 5.19). Gardenland in Village B shows no overall pattern of mobility (Tables 5.22 and 5.23), but when succeeding stages are considered, stages A to C show Anticyclical patterns, while stage D shows a Downward pattern (Table 5.24).

Thus mobility has been shown to be a process which must be analysed with reference to ownership status (i.e. general mobility of ownership for the population may differ from mobility among owners only), to different types of land transfer, and to different landuse types. The implications of this analysis are concerned largely with changing patterns of land distribution, and will be discussed in Chapters 7 and 8.

5.8 Land operation and labour

In the process of production, the system of organisation of labour allows the duplication of the roles of owner, land operator and labourer for both individuals and the household (the unit of control of land operation). The classification of occupational categories in Chapter 3 which allowed for 6 occupational categories, allows for three agricultural occupational categories: farmers, farming labourers and labourers, which are not distinguished by the type of labour performed[1], but by the relationship of the labourer to the land operator. Thus, where there is no land operation for a household, the definition of the occupational category, except in a few cases[2], is "labourer", because labour is automatically performed for land operators of other households.

However, the existence of the second category, farming labourer, which distinguishes between the role of agricultural labourer for the household itself and agricultural labour for other households as well as the household itself, allows for analysis of the relationship between the extent of land operation and occupational category. Moreover the degree of correlation between land operation and occupational category may be tested for different landuse types.

1 Agriculturalists and "coolies" obviously perform different roles related to farm management and individual operations. A person may consider himself or herself to be an agriculturalist and perform only occasional farming work, such as helping out at harvest or organising labour for the farm.

2 People may consider themselves to be agriculturalists if they have no land if they are members of a non-dominant household which will inherit or has endowed land, or if they have owned land in the past.

Table 5.25 shows scores of the Chi^2 test for the correlation between land ownership and operation and occupational categories for different landuse types in both villages[1]. While all the scores indicate correlation between land ownership and occupation significant at 99.95%, the strength of the relationship between ownership and operation of different landuse types and occupation may be seen in the level of the score for each landuse type. Thus while the relationship between ownership and occupational category is stronger in Village B for dryland and gardenland, because these are the main landuse types, generally there is a stronger relationship between ownership of the more valuable landuse types and occupational category[2].

This relationship for all occupational categories is stronger for males than for females, reflecting the greater proportions of house dwellers among higher land ownership classes. For agricultural occupations only, however, there is little difference between male and female scores. Chapter 3 showed strong relationships between caste and occupation, which varied considerably with caste. These relationships, however, are not as strong as those between landownership and occupation, and this point is further emphasised by an analysis of the distribution of landownership among different

1 Because there is very little difference between ownership and operation of both dryland and gardenland in both sample villages, ownership figures, which were easier to derive from the data are given. Wetland operation, which is not synonymous with wetland operation is given separately.

2 The strength of the relationship between dryland ownership and occupational category must be viewed in the context of the correlation between the ownership and operation of different landuse types.

caste groups (Table 5.26), which shows that although there are differences of landownership between the castes, landownership distribution within each caste is characterised by high degrees of inequality of ownership.

5.9 Labour Organisation and Payment[1]

As well as the organisation of labour from the household itself, labour may be organised in a number of ways from other members of the village, or from outside the village. Although specific types of labour may be organised by more than one method, and although individual labourers may be subject to different arrangements of organisation and payment, differences of organisation reflect the value to the land operator of different types of labour, as well as the changing seasonal demand for labour. Labour organisation may be grouped into four methods according to the length of the arrangement and the method of payment: daily wage labour, contractual short-term labour, monthly wage labour, and the *jajmani* system.

5.9.1 Daily wage labour

Labour is usually organised at short notice in a seemingly arbitrary manner, by the calling of available labour by the farmer. Labourers are paid at a rate which is fixed by prevailing daily wage rates in the region at the time, according to the proportion of the day that they work. There may be a certain amount of negotiation before the work starts, but generally there is little variation from prevailing rates. Rates are customarily different for males, females and children, the ratio of payment at the time of the survey being 12 (for males):

1 This section will deal with the organisation of labour in the agricultural sector alone.

5 (for females : c.4 (for children)[1]. Payment may also be made in kind, for example for the dryland harvest, where the ratio of payment is normally 5 (for males) : 4 (for females and children)[2].

5.9.2 Contractual short-term labour

This method of labour organisation is adopted by farmers for specific agricultural operations, either requiring special skills or equipment, or for operations which have to be completed in a limited period, thus involving more intensive and arduous labour. (Some operations characterised by more arduous labour are socially delegated only to males. It is not meant to suggest that labour performed by females is not arduous! And because of the higher daily wage rates paid to males, contractual arrangements are preferred by farmers who on the one hand wish to see that the operation is completed satisfactorily, and on the other wish to minimise labour costs.) Contractual arrangements are negotiated before (and payment made on completion of) the agreed operation.

Thus sprayer operators, who own their own sprayers, are contracted to spray a certain number of drums of pesticide onto the field and paid accordingly. Ploughing by tractor is performed at a specific rate per acre. Ploughing by bullock, levelling, and transport of manure may also be subject to contractual arrangements, particularly if the labourer owns bullocks, plough or cart. The squaring of land for gardenland

1 Rs. 6, 2.50 and 2.00 respectively.

2 Measures.

cultivation, and the resquaring and weeding of land during banana cultivation, are contractually arranged because of the arduous labour which is performed by a greater proportion of males. Transplantation of rice, performed by females, and harvesting of rice, performed by males and females, which are operations which need to be completed within a short time period, and which require great amounts of labour input are contractually arranged through a kottukarin, or labour contractor. The role of the kottukarin in labour arrangement, and wage fixing is very important, and thus his function deserves some special consideration.

There are two kottukarins in either village, all male: in Village A, Sinnasamy, age 35, of the Pallar caste, and Sinnadore, age 29, of the Pillai caste, and in Village B, Ponram, age 45, and Keppana, age 38, both of the Karpillai Gounda caste. The job is sometimes hereditary, and not always carried out by males; Sinnasamy took over from his mother, who had herself inherited the job from her mother. All the kottukarins organise labour for harvesting, and while both Ponram and Keppana organise labour for transplanting from Village B, only Sinnasamy organises labour for transplanting from Village A. The kottukarin will organise a band of labourers by going around the village at between 3 and 5 a.m. calling on people to join him. The kottukarin's party travels on foot to other villages following the demand for either transplantation or harvesting work from south to north along the valley over a period of up to two months for each operation, according to the timing of rice cultivation, which is itself determined by the initial date of water release to individual village channels[1]. The kottukarins of Village B operate in 5 major villages (including Village A) over a section of the canal-irrigated strip of the valley 8 miles long, the maximum distance of travelling to work being 4.5 miles. In contrast Village A kottukarins operate in only one other village than Village A itself, the maximum distance of travelling being only 2.5 miles.

The kottukarin will negotiate the contract for specific areas of land before each operation, and once the rate is fixed there is no further bargaining. No advance is received by the kottukarin. The kottukarin will demand more for harvesting land at a greater distance from the threshing floor, and also demand more if rain threatens. Although the final amount agreed is negotiated on the spot between the farmer and the kottukarin, before the harvest begins an attempt is made to fix the rate of payment for harvesting and sometimes for transplanting in some villages by the more important farmers in the village. This is the practice in Village A. A meeting is held by about eight farmers, and the rate for the village announced to the kottukarins. Sinnasamy described how for the kalam harvest of 1977, the rate was fixed before the harvest at 17 marrakals per kulie, but eventually the average rate received rose to 26 marrakals per kulie. The method of rate fixing may vary according to

1 The normally smooth sequence of rice cropping from southern to northern villages in the valley was interrupted by damage to a sluice gate of one village in the area of Village B labour operations, through flooding, and the delay of rice cultivation to land irrigated by its channels in 1978/79.

the relationship of the kottukarin to the farmer. Ponram has four regular farmers in the southernmost of the five major villages who supply him with regular contracts. In turn they have come to rely on his regular supply of labour. Here the rate for each harvesting is not negotiated beforehand, but afterwards, when Ponram asks for as much as the farmer can afford to give. There is no attempt by kottukarins to unite to increase rates of payment, and apparently no negotiations for exchanging of contracts between them.

Payment for work for the harvest is always made in kind. The payment for the kodai crop is greater than that for the kalam crop because of the greater yield of the first crop. Rates for harvesting have increased since the introduction of hybrid varieties. Krishnasamy, who prece ded Keppana as kottukarin in Village B, and who worked for about 20 years until the introduction of HYVs noticed no systematic change in rates of kind payment for harvesting during this time. Transplantation is paid for either in kind or in cash, and the method of payment varies according to the price of rice. The payment is measured after the crop is threshed, and shared out equally between the workers, although the kottukarin may award some workers with slightly greater shares than others. The party then carries the spoils home. The kottukarin himself receives an equal share of the wage, and also an extra payment from the farmer which varies from village to village. This may be a cash payment, or may take the form of a proportion of the <u>aruvakattu</u>, or donation of an extra unthreshed bundle of paddy. Part of the aruvakattu in Village A goes to the Village temple for the upkeep of the <u>Pandaram</u> pusaris,[1] and

1 Priests, also known as pujaris.

the rest is either given directly to the kottukarin, or half of the remainder is given to the kottukarin and the rest shared equally amongst the workers.

The kottu karin is in charge of the labour force during harvesting or transplantation, and it is part of his job to persuade, cajole or threaten the workers to proceed as fast as possible. The farmer himself, having negotiated the contract, is a passive observer. Although all the kottukarins denied that they would refuse membership of a working party to anyone who requested it, they admitted that they preferred younger more active workers[1]. At least 8 people are needed to harvest one kulie of land in a day, but the kottukarin will usually take a party of at least 25. The average number taken by each kottu karin for harvest was estimated at between 25 and 30 for Sinnasamy and Sinnadore (for Village A), 60 for Ponram and 40 for Keppana (for Village B). The party contains males and females in proportion of about 1 to 2. A mixed party is considered ideal by the kottukarin, as women are considered better at harvesting and men are considered better at bundling, carrying and threshing. In both villages no preference was given to different caste groups, although in Village A there was a certain degree of loyalty from workers to the kottukarin from the same caste. Indeed the kottukarins came from castes other than the most numerically dominant caste in both villages. Krishnasamy, the former kottukarin of Village B, is a Telungu Chettiar, and says that most of his workers were of the same

1 Sinnasamy gives older workers easier jobs to do, and is not as demanding as with the other workers. However, harvesting is an extremely arduous operation, and thus the majority of harvesters are young people.

caste. However he gradually lost workers to Ponram as he grew older and was able to organise less work. For transplanting the party is of course predominantly female, with perhaps one or two men to supply the bundles of seedlings to the women.

5.9.3 Monthly wage labour

The larger farmers in either village employ attached labourers, labourers who act as part of the household labour force and are paid on a monthly basis. For the period over which they are paid, attached labourers, as they may be termed, are available for any work, agricultural or otherwise, which may be demanded by their employers. Attached labourers are thus generally extravagantly overworked, but regard their position as permanent labourers as one of privilege, because although they are paid less than the daily wage rate for the whole month, they are likely to receive a greater amount over the whole month than casual labourers. Because of this, attached labourers are usually recruited through caste or family relationships.

Attached labourers are usually employed for repetitive operations of great frequency, such as irrigation, and indeed they are mainly employed by the larger gardenland farmers in either village, although in Village A they may be used for wetland operations as well. The payment of attached labourers is a relatively new innovation, and can be assumed to have replaced the role of pangu labourers who received one sixth, or one ninth of the yield of the garden, according to whether there were one or two kamalais to the well. The change to cash payment is a response to the changing cropping patterns (the increasing proportions of longer term crops would tend to make the process of paying the pangu labourer more difficult), as well as to the increased yield and commercialisation of gardenland crops.

5.9.4 Jajmani System

The jajmani system, or relationship between patron and client involving the exchange of labour for yearly or seasonal payment in kind existed only in Village A within the agricultural sector for the organisation of water controllers, paid by a committee of the larger farmers in the village a fixed rate in paddy according to the area supervised in each madai, the area irrigated by a field distribution channel.

5.10 Summary

A consistent theme of this chapter has been the analysis of landownership, both with reference to ownership distribution and mobility, and to its relationship with occupation and therefore labour organisation. However, no attempt has been made to "class-ify" the sample villages (although, necessarily, the identification of class "fractiles" was necessary for the analysis of ownership mobility).

There are many problems associated with the "classification" of Indian village society, especially where cultural values may appear to outweigh economic status. However, whether the analysis of class is made with reference to a straightforward division of the extent of landownership (e.g. Sivakumar, 1978), or whether it embodies the definition of roles as well as landownership (e.g. Mencher, 1974), or involves the definition of the ability of the household to survive as an agricultural unit from year to year (e.g. Djurfeldt and Lindberg, 1975), the distribution of ownership of resources may be regarded as a fundamental determinant of income, roles, status etc. within the village.

It is doubtful whether the arbitrary (and, given the multiplicity of combinations of types of landownership, leasing, occupations, status, etc within households) inevitably inaccurate delineation of classes for use as a tool of analysis could aid any meaningful analysis of change. However, it is recognised that ownership distribution generally (and especially with reference to the organisation of data within this chapter) and ownership of the different landuse types in particular have profound effects on the course of change in village society. This conclusion will be developed further in Chapters 7 and 8.

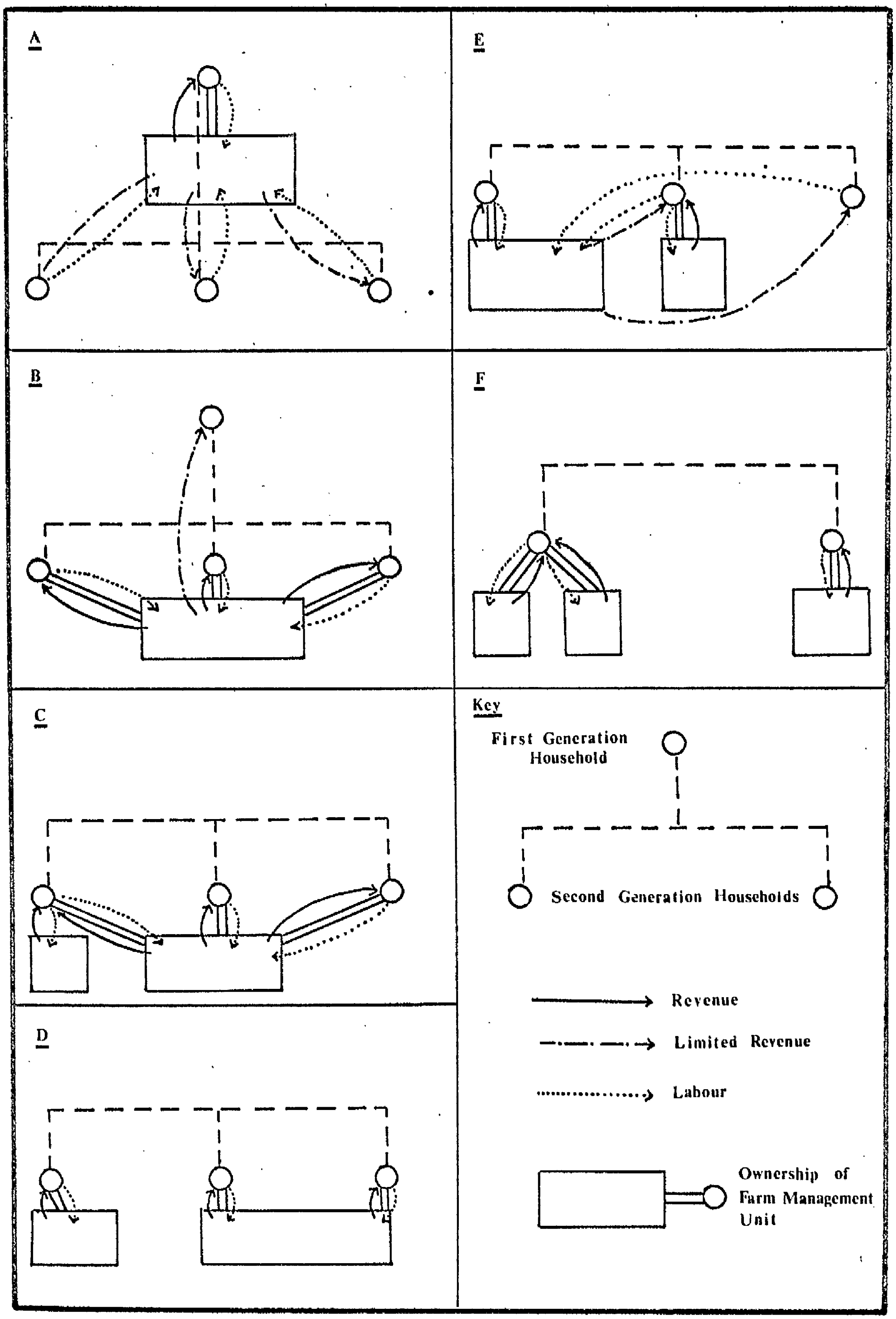


Fig. 5.1 Forms of family ownership and operation of land.

FIG 5.2 Total area owned among sample lineages, Village A 1947-78

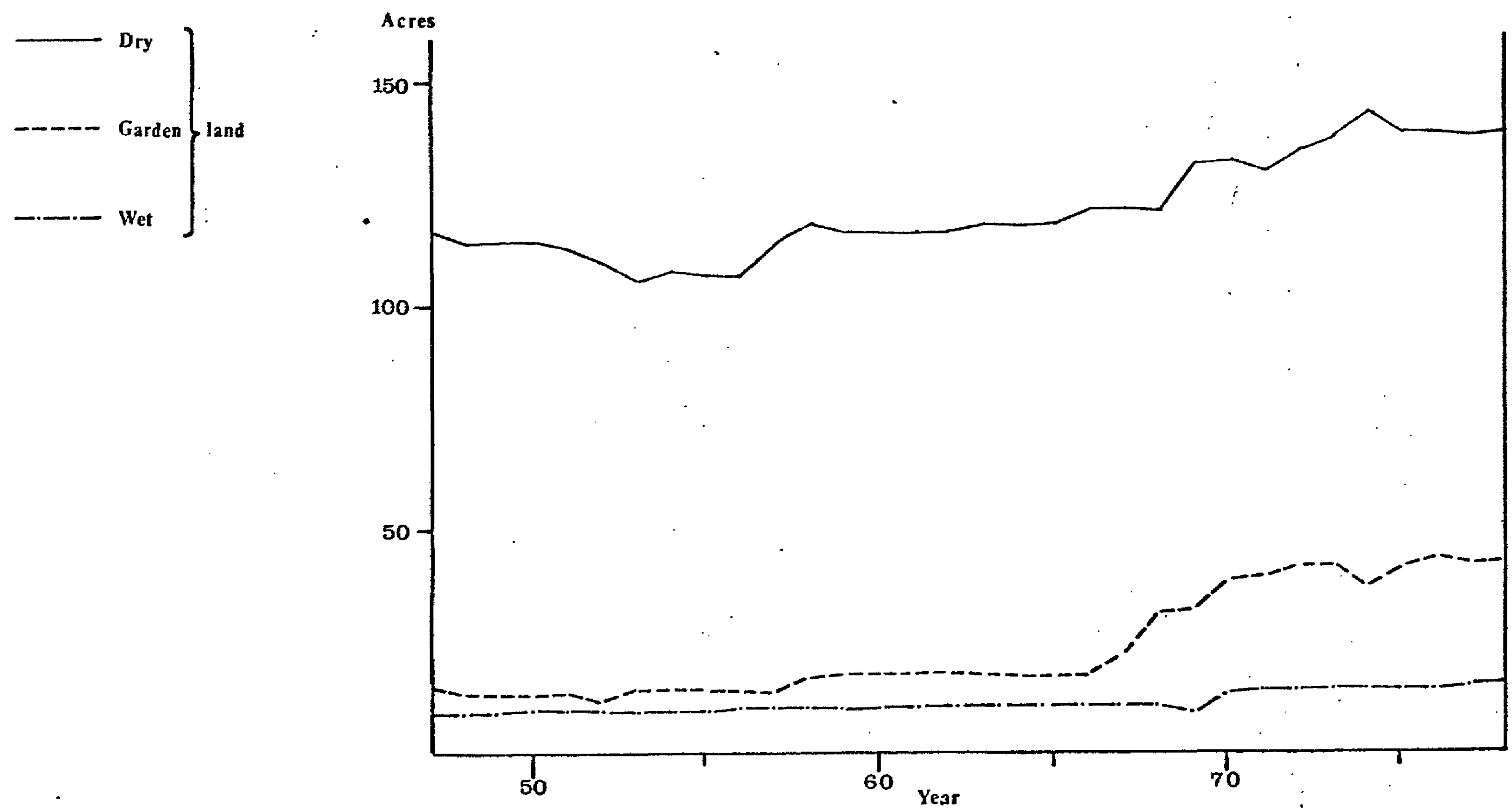
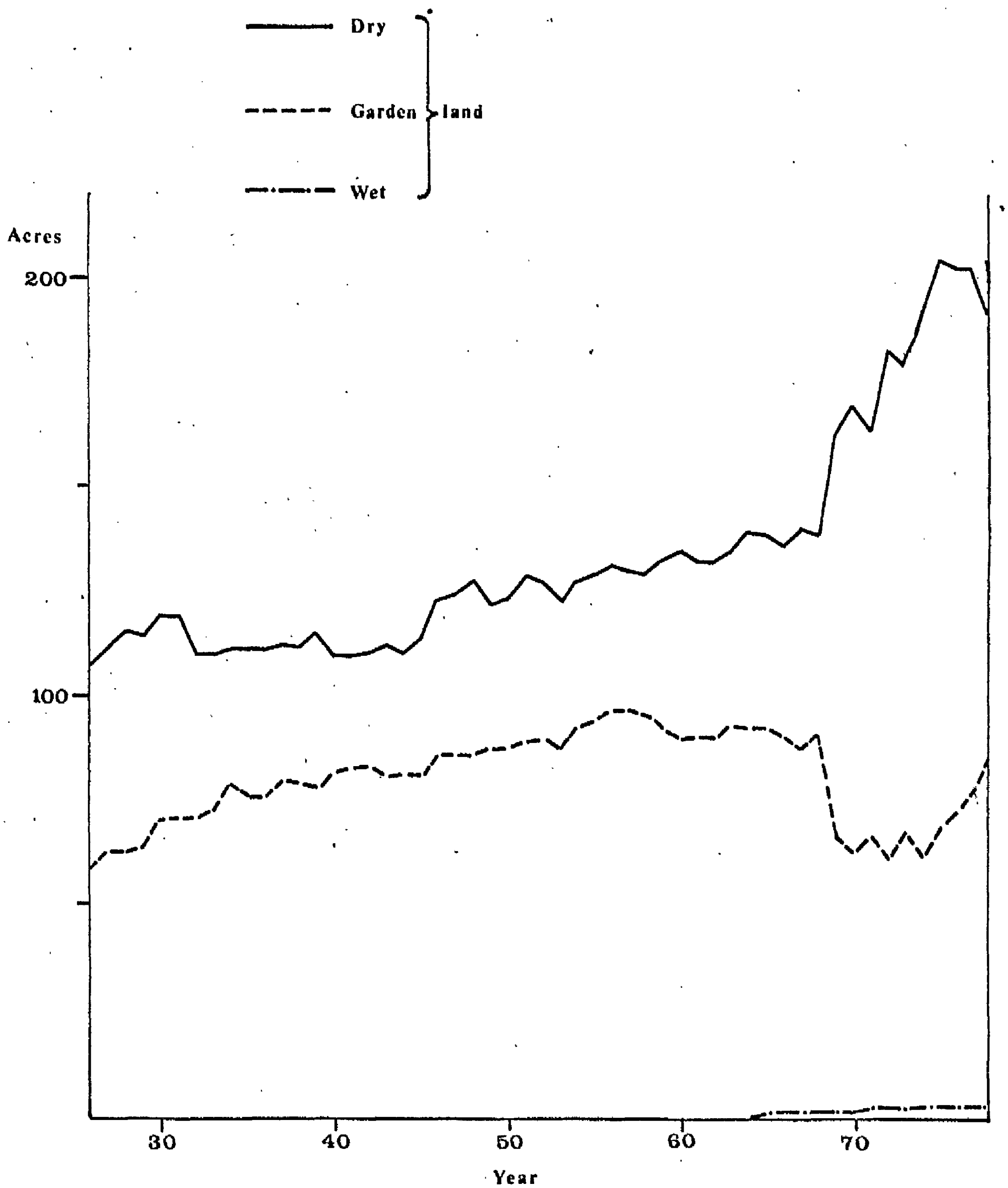


FIG 5.3 Total area owned among sample lineages, Village B 1926–78



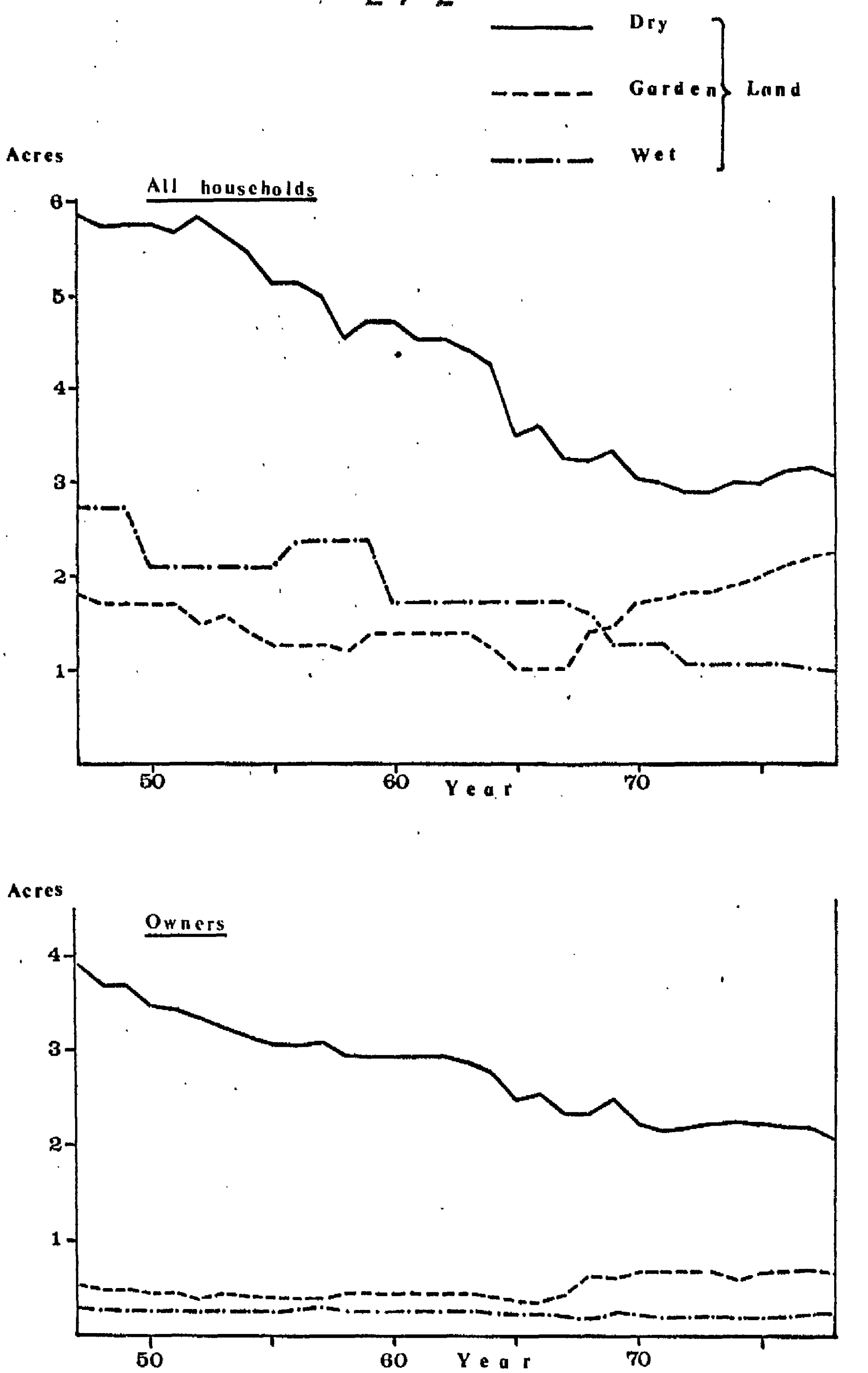


Fig. 5·4 Mean Land Ownership for Sample Lineages

Village A 1947-78

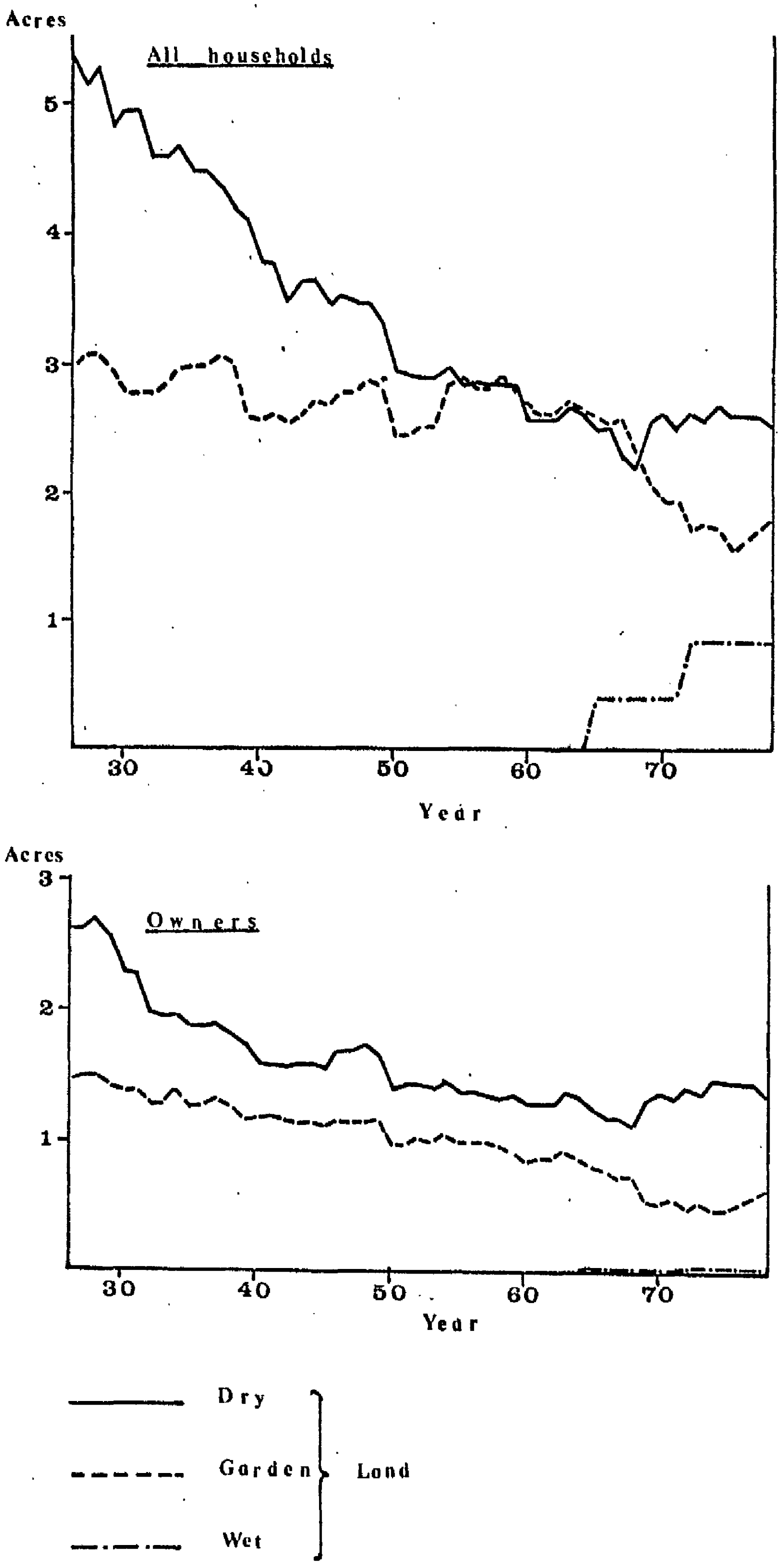


Fig. 5·5 Mean Land Ownership for Sample Lineages, Village B 1926-78

FIG 5.6 Proportion of landowning households, sample lineages, Village A, 1947-78

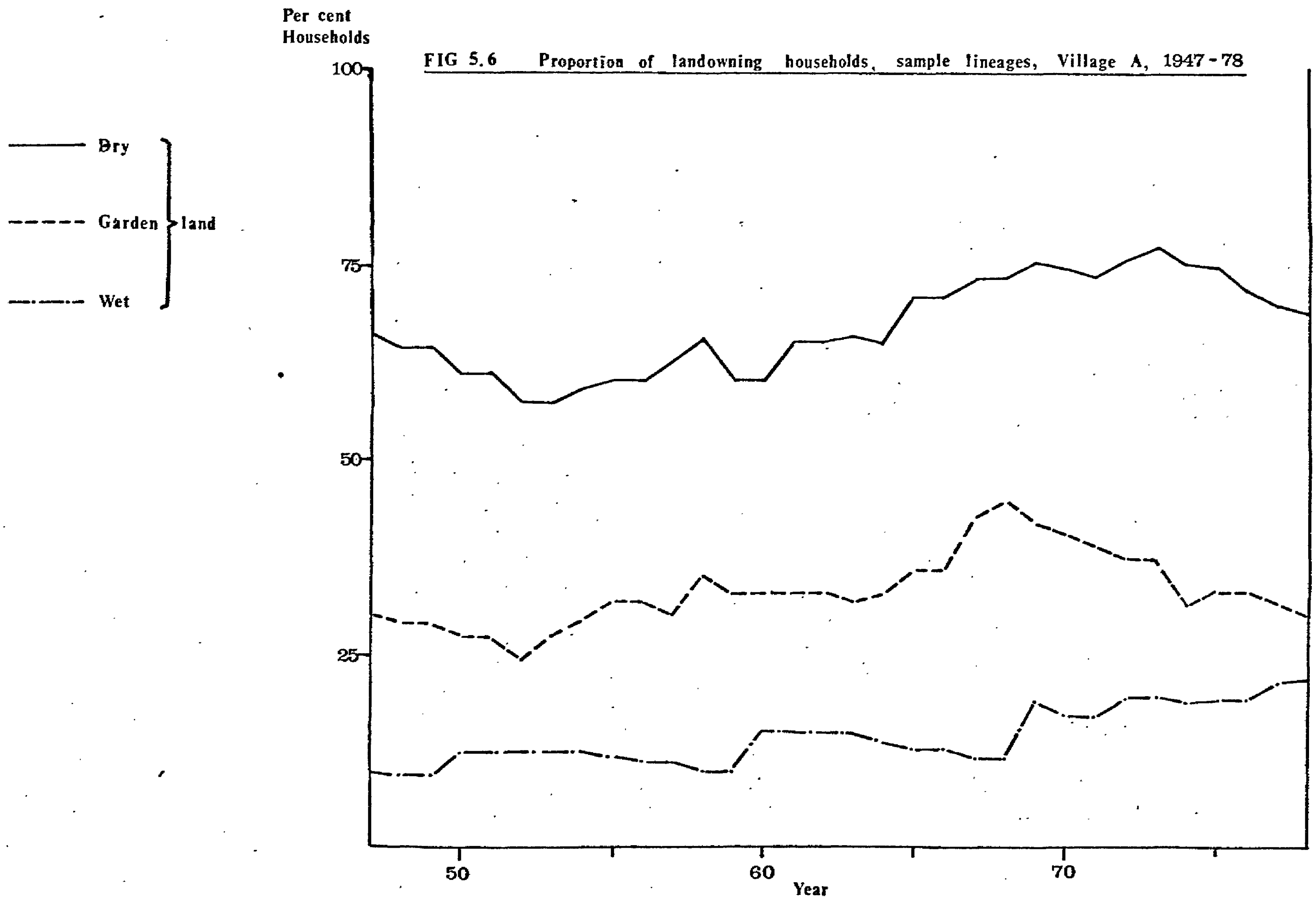
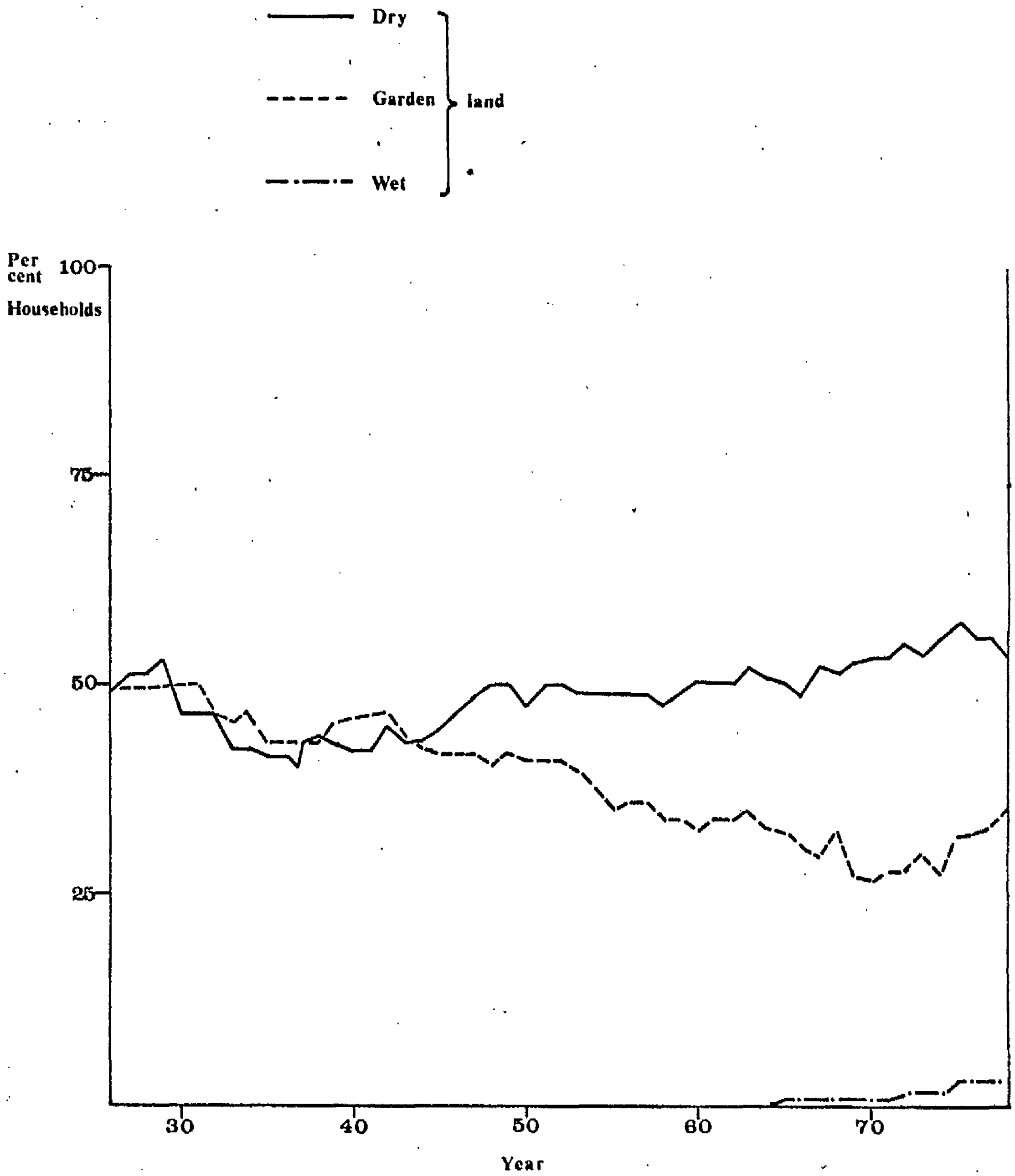


FIG 5.7 Proportion of landowning households, sample lineages, Village B, 1928-78



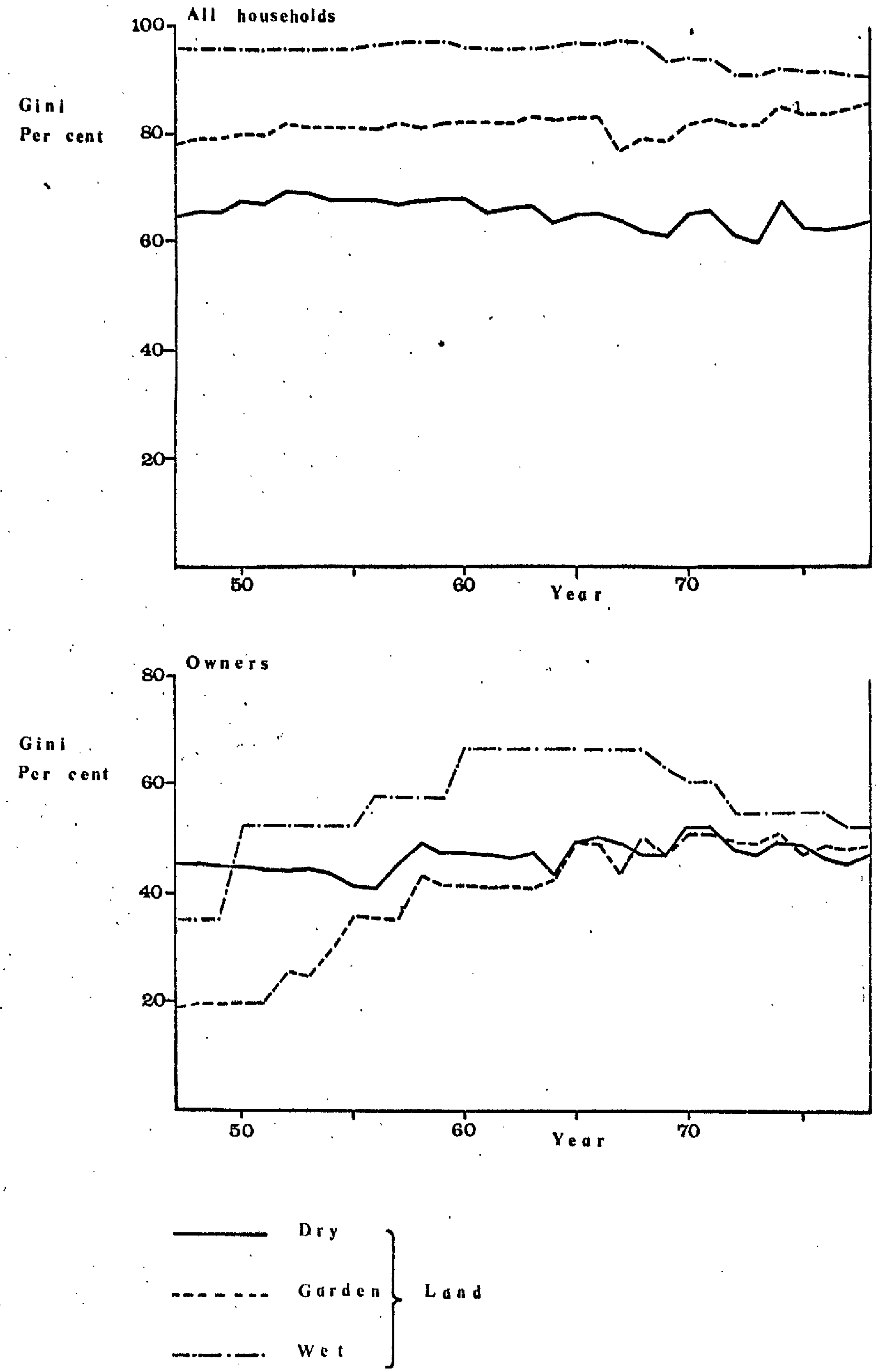


Fig. 5·8 Inequality of Ownership for Sample Lineages

Village A 1947-78

Fig. 5·9 Inequality of land ownership for sample lineages, Village B (Gini co-efficient of inequality) 1926–78

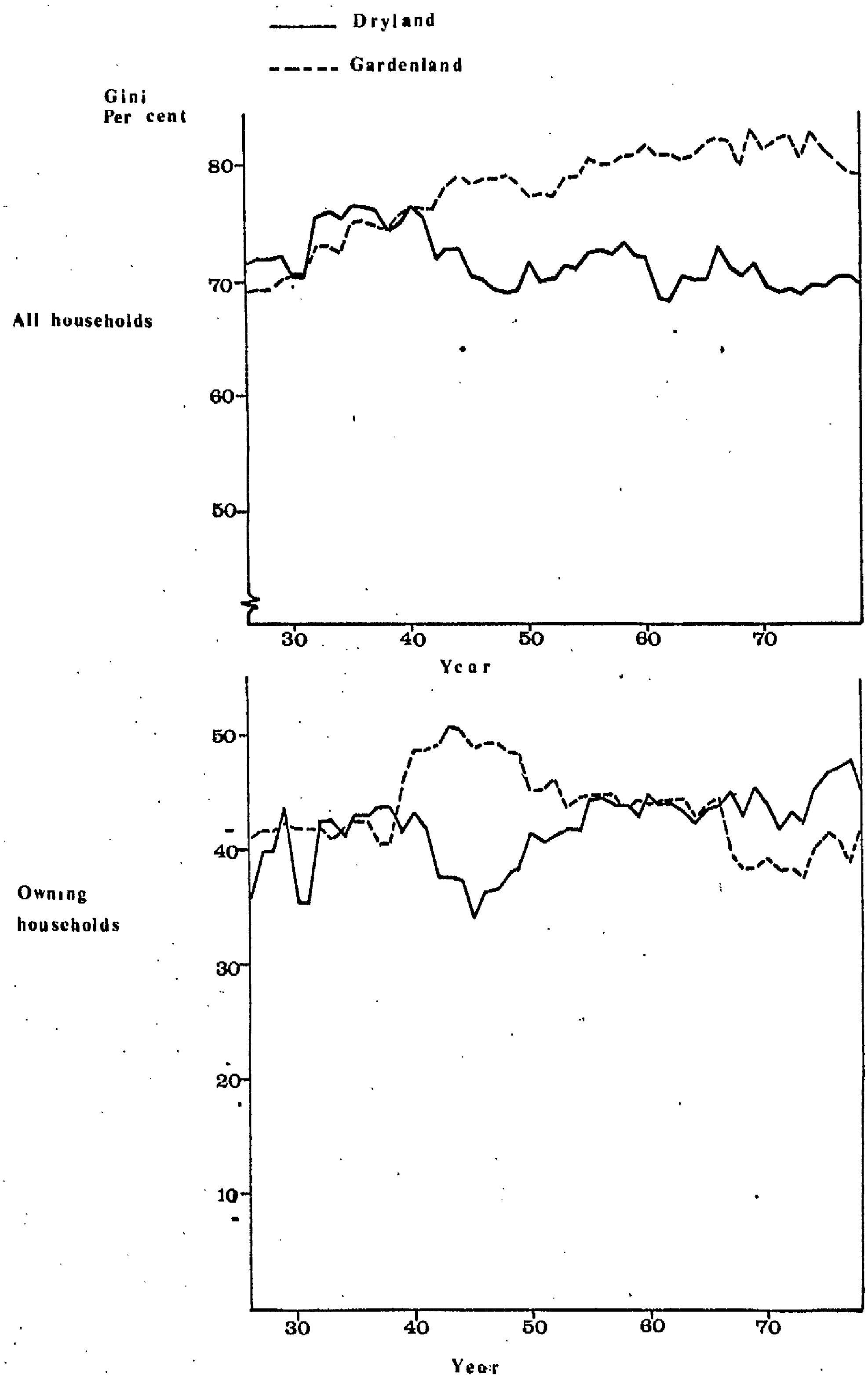


FIG 5.10 Features of Total Gardenland Ownership (continued overleaf)

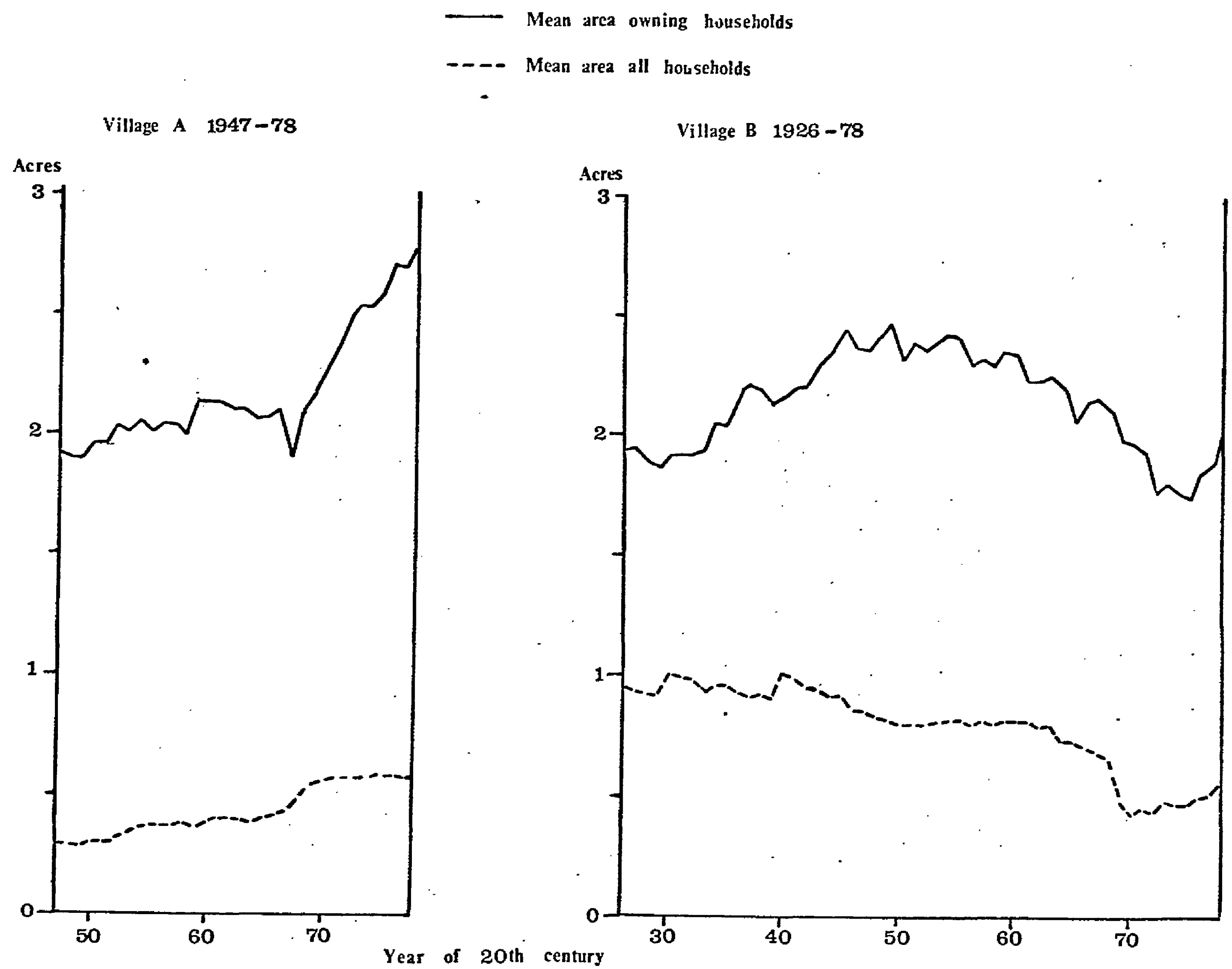
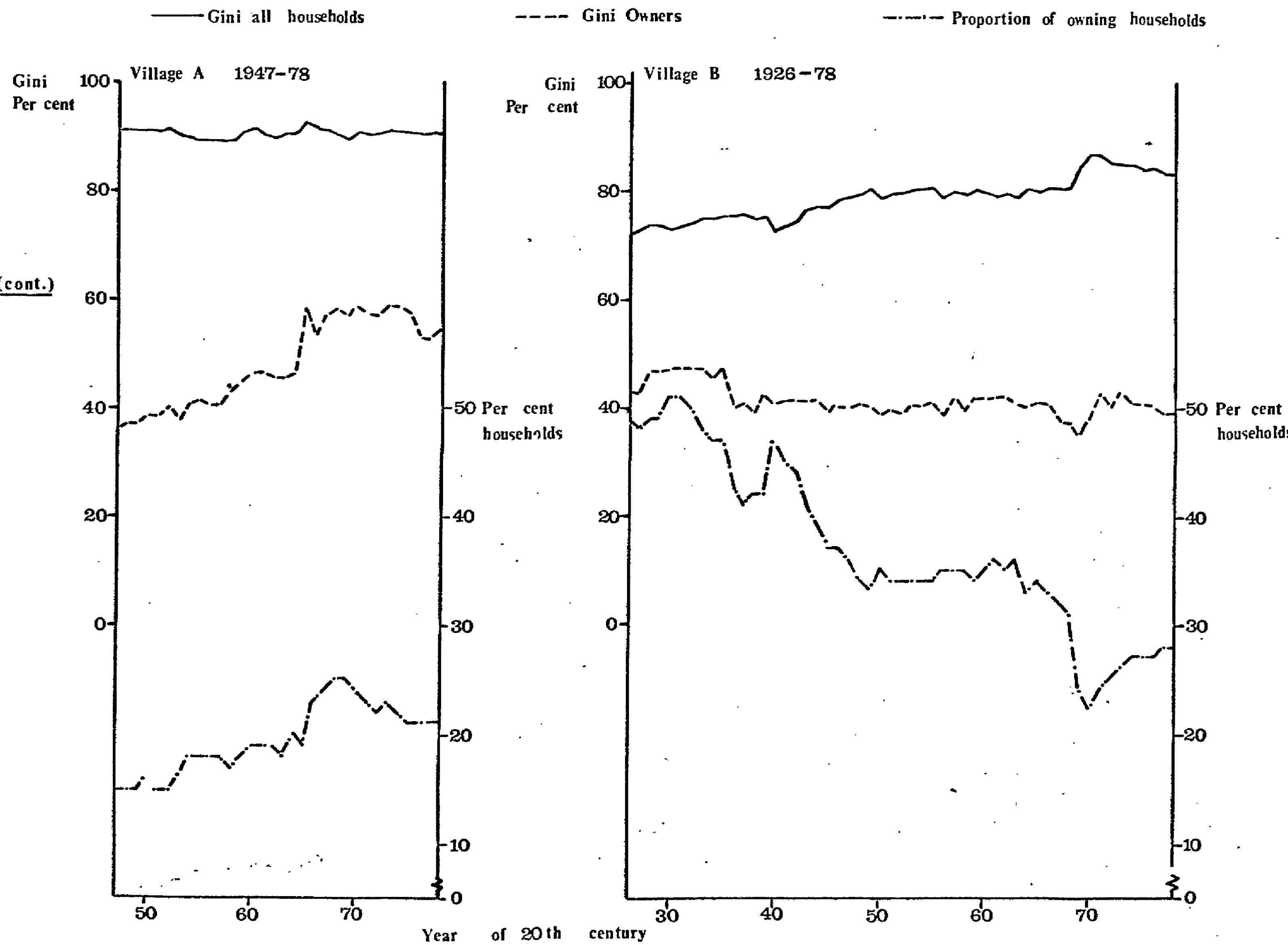


FIG 5 10 (cont.)



Gini all households
Gini Owners
Proportion of owning households
Gini Per cent
Village A 1947–78
Village B 1926–78
Per cent households
Year of 20th century

FIG 5.11

Ownership of canal-irrigated patta-land for (Revenue) Village A, 1947-78

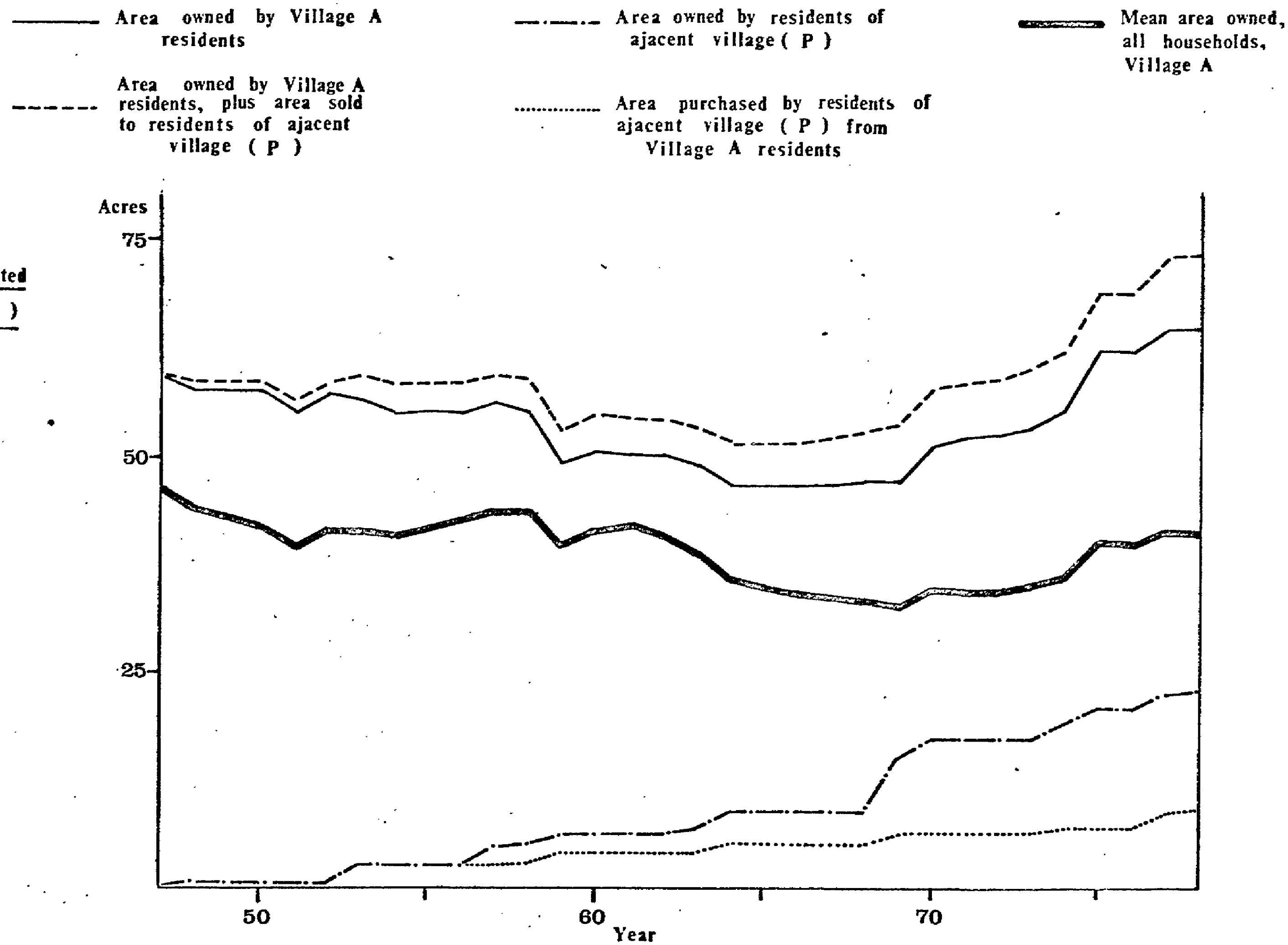
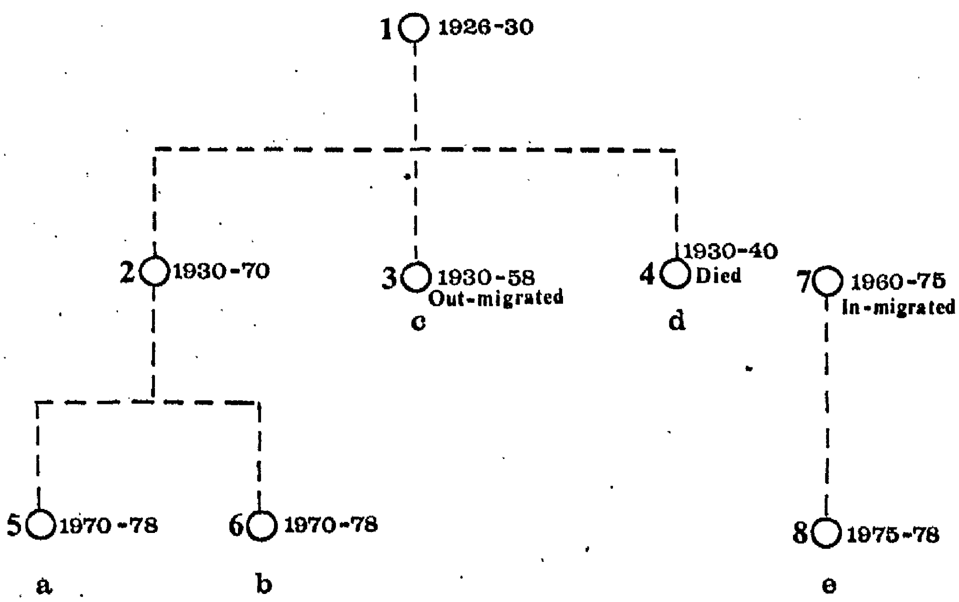


FIG 5.12 Identification of Stages for Lineages of Dominant Households
(A Hypothetical Example from Village B)

Family Tree



Stages

A 1926–39

B 1939–52

C 1952–65

D 1965–78

○ Dominant Households

Lineage	Stages identified for analysis	Comments
a	A,B,C,D	Dominant Household (DH) 5 in same lineage as DHs 2 and 1
b	D	DH6 separated from lineage a during Stage D
c	A,B,C	DH3 is same lineage as a, but separated before the end of Stage A Out-migrated during Stage C
d	A,B	DH4 is same lineage as a, but, like c, separated before the end of Stage A ; and died without male descendants in Stage B
e	C,D	DHs 7 and 8 are in same lineage. DH7 in-migrated during Stage C

FIG 5.13 Patterns of Mobility

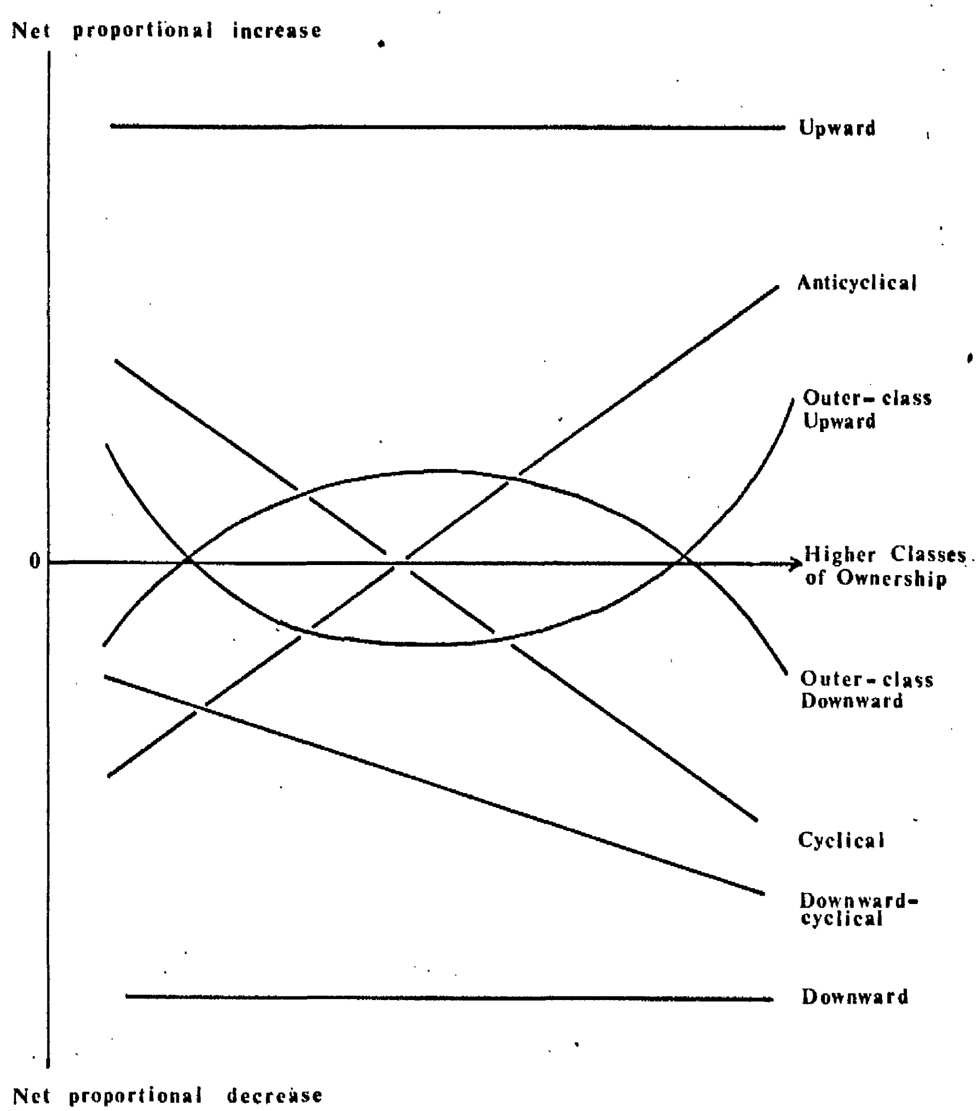


Table 5.1 Landowning and Operating Households, Area Owned and Operated, 1978

	Landuse Type		Owned & Mortgaged	Leased in	Leased out	Poramboke	Operated
Village A	Wet	Area (acres)	74.64	74.93	1.82	9.80	157.55
		Households	42	54	3	24	95
	Garden	Area	172.56	6.88	6.00	7.37	183.10
		Households	61	5	2	15	67
	Dry	Area	569.34	14.74	1.00	0	583.94
		Households	170	6	1	0	170
Village B	Wet	Area	13.86	0	0	0	13.86
		Households	11	0	0	0	11
	Garden	Area	178.01	18.37	14.33	0.60	182.65
		Households	91	11	6	2	94
	Wet	Area	519.82	5.83	3.33	5.79	528.11
		Households	161	3	1	2	164

Table 5.2 Distribution of Ownership and Operation of Landuse Types, 1978

(Patta Land only)

Acres	Village A (318 households)		Village B (317 households)	
	Ownership	Operation	Ownership	Operation
Wetland				
0	276	223	306	306
0.01- 0.50	11	18	1	1
0.51- 1.00	10	28	6	6
1.01- 1.50	4	19	1	1
1.51- 2.00	5	8	1	1
2.01- 3.00	5	9	2	2
3.01- 5.00	4	7	0	0
5.01-10.00	2	5	0	0
≥ 10.00	1	1	0	0
Gardenland				
0	255	247	226	223
0.01- 0.50	5	8	2	2
0.51- 1.00	16	16	30	29
1.01- 1.50	9	10	13	17
1.51- 2.00	8	11	14	14
2.01- 3.00	8	8	11	11
3.01- 4.00	3	3	11	11
4.01- 5.00	5	7	6	5
5.01- 7.00	3	3	4	5
7.01-10.00	4	3	0	0
10.01-15.00	0	0	0	0
≥ 15.00	2	2	0	0
Dryland				
0	149	148	156	154
0.01- 1.00	31	31	34	34
1.01- 2.00	42	43	44	46
2.01- 3.00	30	29	22	23
3.01- 4.00	22	22	20	19
4.01- 5.00	12	12	12	12
5.01- 7.00	14	12	14	14
7.01- 9.00	7	9	5	5
9.01-11.00	4	5	5	4
11.01-13.00	2	2	2	3
13.01-15.00	0	0	1	1
≥ 15.00	5	5	2	2

Table 5.3 Ownership and Operation of Different Landuse Types - Numbers and Inequality by Household, 1978

(Including Poramboke Land)

	Village A (318 Households)					Village B (317 Households)				
	A	B	C	D	E	A	B	C	D	E
Wetland Ownership	42	13.2	74.64	56.46	94.37	11	3.5	13.86	35.93	97.97
Wetland Operation	95	29.9	157.55	49.30	84.96	11	3.5	13.86	35.93	97.97
Gardenland Ownership	61	19.2	172.56	54.29	91.35	91	28.7	178.01	39.46	82.76
Gardenland Operation	67	21.1	183.10	51.19	89.84	94	29.7	182.65	39.86	82.30
Dryland Ownership	170	53.5	569.34	46.36	71.41	161	50.8	519.82	47.58	73.46
Dryland Operation	170	53.5	583.94	45.28	70.83	164	51.7	528.11	46.97	72.64

A Number

B Number as a percentage of total households

C Total acreage

D Gini coefficient for operators/owners only (percentage)

E Gini coefficient for all households (percentage)

Table 5.4 Combined Ownership and Operation of Different Landuse types, 1978

			Proportion of total Households (A)	Only landuse type owners	+ Wetland alone	+ Gardenland alone	+ Dryland alone	+ 2 other landuse types
					Given as a proportion of A			
Village A	Wetland	Ownership	13.2%	11.9%	-	0.0%	42.9%	45.2%
		Operation	30.0%	13.5%	-	4.2%	46.9%	35.4%
	Gardenland	Ownership	19.8%	9.2%	0.0%	-	60.3%	30.2%
		Operation	22.3%	8.5%	5.6%	-	38.0%	47.9%
	Dryland	Ownership	53.1%	55.6%	10.7%	22.5%	-	11.2%
		Operation	53.5%	37.6%	26.5%	15.9%	-	20.0%
Village B	Wetland	Ownership	3.5%	27.3%	-	0.0%	0.0%	72.7%
		Operation	3.5%	18.2%	-	0.0%	0.0%	81.8%
	Gardenland	Ownership	28.7%	9.9%	0.0%	-	81.3%	8.8%
		Operation	29.7%	14.9%	0.0%	-	75.5%	9.6%
	Dryland	Ownership	50.8%	49.1%	0.0%	46.0%	-	5.0%
		Operation	50.8%	50.3%	0.0%	44.1%	-	5.6%

Table 5.5 Correlation of Area Owned and Operated, between Different Landuse Types

(Spearman's Rank Correlation Coefficient)

a) for all households

Village A

	Gardenland Ownership	Dryland Ownership
Gardenland Ownership		0.5567
Wetland Ownership	0.7087	0.5896
Wetland Operation	0.6023	0.5831

Village B

	Dryland Ownership
Gardenland Ownership	0.6723

b) for owners and operators

Village A

A B	Wetland Ownership	Wetland Operation	Gardenland Ownership	Dryland Ownership
Wetland Owners (42)	-	-	0.3128	0.2818
Wetland Operators (96)	-	-	0.2829	0.4288
Gardenland Owners (63)	0.5228	0.4266	-	0.5510
Dryland Owners (169)	0.4609	0.4952	0.2593	-

Village B

A B	Gardenland Ownership	Dryland Ownership
Gardenland Owners (91)	-	0.5247
Dryland Owners (161)	0.4109	-

A = Ownership group with number ( ).
B = Ownership of other landuse type by group A.

Table 5.6 Index of Agricultural Profitability by Household, 1978

	Village A	Village B
0	125	138
0.01- 1.00	19	22
1.01- 2.00	19	31
2.01- 3.00	20	14
3.01- 4.00	14	18
4.01- 5.00	10	6
5.01- 10.00	40	38
10.01- 15.00	26	20
15.01- 20.00	10	7
20.01- 50.00	24	22
50.01-100.00	6	1
100.01-150.00	3	0
150.01-200.00	2	0
Total Households	318	317
Total Index	2730.45	1564.60
Mean Index	8.60	4.93
Gini Coefficient Operators	63.11%	57.31%
Gini Coefficient Households	77.66%	75.95%

Table 5.7 Index of Agricultural Land Assets by Household, 1978

	Village A	Village B
0	139	144
0.01- 1.00	21	21
1.01- 2.00	22	27
2.01- 3.00	21	11
3.01- 4.00	15	9
4.01- 5.00	7	2
5.01- 10.00	11	14
10.01- 20.00	21	33
20.01- 50.00	28	33
50.01-100.00	16	15
100.01-200.00	11	8
200.01-500.00	4	0
≥ 500.01	2	0
Total Households	318	317
Total Index	6412.5	3738.38
Mean Index	20.38	11.79
Gini Coefficient Owners	76.26%	64.42%
Gini Coefficient Households	86.67%	80.63%

Table 5.8 Definition of Classes of Ownership for the Analysis of Ownership Mobility

A

Class		Description
1	A	All non-owners
	B	Non-owners present in village, and gaining land
2		Owners representing 1st Quartile (Lowest)
3		Owners representing 2nd Quartile
4		Owners representing 3rd Quartile
5		Owners representing 4th Quartile (Highest)
6		Non-owners, not present in village, and gaining land

B

Class		Description
1	A	All non-owners
	B	Non-owners, present in village, and gaining land
2		Owners representing 1st Quartile (Lowest)
3		Owners representing 2nd Quartile
4		Owners representing 3rd Quartile
5		Owners representing 7th Octile
6		Owners representing 8th Octile (Highest)
7		Non-owners, not present in village, and gaining land

A. = Classes for Village A Dryland and Gardenland and Village B Dryland

B. = Classes for Village B Gardenland

Table 5.9 Constituents of Modes of Mobility

Mode of Mobility	Constituents +	Constituents -	Symbol used in Tables 5.11 to 5.24
Sales	Buying	Selling	S
	Mortgaging in with possession	Mortgaging out with possession	
Inheritance System	Inheritance (from father)	Bestowal (on sons)	I
	Land received as a dowry	Land given as a dowry	
	Land received from a member of immediate family as a gift	Land given to a member of immediate family as a gift	
	Land occupied without charge, owned by member of immediate family	Land given for occupation to member of immediate family	
Physical Change			P
a) Dryland	Assigned Land		
	Encroached Land		
	Formerly irrigated land left dry	Land irrigated or re-irrigated	
b) Gardenland	Dryland irrigated or re-irrigated by well	Land left dry	
	Encroached Land	Land given over to canal irrigation	
c) Wetland	Encroached Land		
	Land given over to canal irrigation		

Table 5.10 Entries into and Exits from Dryland and Gardenland Ownership

	Stage	Changing Lineages Entries (+)	Exits (-)	Net	Total Lineages	%age Entries Lineages/Year	%age Exits Lineages/Year	%age Net Change Lineages/Year
Dryland (Sample Lineages)	A	2	2	0	40	0.4545	0.4545	0
	B	2	1	+1	54	0.3704	0.1852	+0.1852
Village A	C	2	3	-1	68	0.2941	0.4412	-0.1471
	Average					0.3730	0.3603	+0.0127
	A	3	4	-1	67	0.3444	0.4592	-0.1148
Village B	B	10	7	+3	89	0.8643	0.6050	+0.2593
	C	2	4	-2	123	0.1251	0.2502	-0.1251
	D	9	9	0	154	0.3245	0.3245	0
	Average					0.4146	0.4097	+0.0049
Gardenland (Whole Village)	A	2	11	-9	253[1]	0.0719	0.3953	-0.3234
	B	5	10	-5	297	0.1683	0.3367	-0.1684
Village A	C	4	24	-20	337	0.1187	0.7122	-0.5935
	Average					0.1196	0.4814	-0.3618
	A	15	26	-11	213	0.5417	0.9390	-0.3973
	B	19	33	-14	279	0.5238	0.9098	-0.3860
Village B	C	7	27	-20	327	0.1647	0.6351	-0.5004
	D	12	40	-28	349	0.2645	0.8816	-0.6171
	Average					0.3737	0.8414	-0.4677

1 Calculated from the survey of family lineages. Although the number of lineages for a stage exceeds the number of dominant households, and all households, this may be accounted for by out-migrating lineages during Stages.

Table 5.11 Transfers of Land through Sales (S), the Inheritance System (I) and Physical Change (P), Village A 1947-78

A. Dryland (Sample)

Year	Area Owned (Acres)	Transfers of Land over succeeding stages by S	I	P
1947	116.89			
1958	118.06	+1.19	0	0
1968	121.34	+7.28	+1.65	-5.20
1978	133.86	+19.79	0	-7.25

B. Gardenland (Total)

Year	Area Owned	Transfers of Land over succeeding stages by S	I	P
1947	76.62			
1958	95.46	-4.32	0	+23.16
1968	141.41	-5.63	-0.31	+51.93
1978	185.66	+9.42	-2.26	+37.00

C. Gardenland (Sample)

Year	Area Owned	Transfers of Land over succeeding stages by S	I	P
1947	16.08			
1958	16.49	+0.05	0	+0.26
1968	31.80	+5.56	+1.78	+7.97
1978	42.31	+0.40	-1.64	+11.75

D. Wetland

Year	Area Owned	Transfers of Land over succeeding stages by S	I	P
1947	8.71			
1958	9.41	+0.64	0	+0.06
1968	9.38	-0.55	0	+0.52
1978	13.38	+2.38	0	+1.62

Table 5.12 Transfers of Land through Sales (S), the Inheritance System (I) and Physical Change (P), Village B 1926-78

A. Dryland (Sample)

Year	Area Owned	Transfers of Land over succeeding stages by		
		S	I	P
1926	107.06			
1939	114.17	+12.63	0	-5.52
1952	126.69	+15.10	0	-4.41
1965	138.23	+10.37	+1.17	0
1978	187.79	+32.51	0	+12.71

B. Gardenland (Total)

Year	Area Owned	Transfers of Land over succeeding stages by		
		S	I	P
1926	163.10			
1939	189.53	-2.15	0	+28.58
1952	221.47	+1.86	0	+30 .08
1965	218.02	-3.76	0	-0.31
1978	182.18	+3.62	-4.23	-35.23

C. Gardenland (Sample)

Year	Area Owned	Transfers of Land over succeeding stages by		
		S	I	P
1926	58.71			
1939	77.54	+2.96	+1.37	+14.50
1952	90.01	-1.52	+3.88	+10.11
1965	92.36	-1.61	+2.53	+1.43
1978	89.64	+13.29	-1.27	-14.74

Table 5.13 Volume of Land Transfers, Village A
(Through Sales (S), Inheritance (I) and Physical Change (P))

A. Dryland

Stage	S	I	P
1947-1958	0.0193	0.0547	0
1959-1968	0.0069	0.0970	0.0045
1969-1978	0.0557	0.0537	0.0087
1947-1978	0.0279	0.0708	0.0044

B. Gardenland (Total)

Stage	S	I	P
1947-1958	0.0286	0.0254	0.0238
1959-1968	0.0556	0.0431	0.0414
1969-1978	0.0355	0.0359	0.0221
1947-1978	0.0409	0.0354	0.0299

C. Gardenland (Sample)

Stage	S	I	P
1947-1978	0.0351	0.0588	0.0254

D. Wetland

Stage	S	I	P
1947-1978	0.0230	0.0627	0.0071

Table 5.14 Volume of Land Transfers, Village B

(Through Sales (S), Inheritance (I) and Physical Change (P))

A. Dryland

Stage	S	I	P
1926-1939	0.0168	0.0776	0.0047
1940-1952	0.0297	0.0555	0.0034
1953-1965	0.0173	0.0465	0.0036
1966-1978	0.0258	0.0836	0.0361
1926-1978	0.0224	0.0658	0.0119

B. Gardenland (Total)

Stage	S	I	P
1926-1939	0.0246	0.0581	0.0121
1940-1952	0.0284	0.0418	0.0116
1953-1965	0.0247	0.0744	0.0039
1966-1978	0.0284	0.0488	0.0876
1926-1978	0.0265	0.0558	0.0288

C. Gardenland (Sample)

Stage	S	I	P
1926-1939	0.0232	0.0630	0.0148
1940-1952	0.0193	0.0507	0.0057
1953-1965	0.0216	0.0486	0.0063
1966-1978	0.0210	0.0565	0.0973
1926-1978	0.0213	0.0547	0.0310

Table 5.15 Village A Dryland Ownership Change[1] for Lineages, Sample Lineages

(Proportional change from classes shown as a percentage of original total lineages)

Class	S			I			P			Net Change			
	+	-	Total	+	-	Total	+	-	Total	+	Some	All	Total
1 A	9.9	0	+9.9	0	0	0	2.4	0	+2.4	11.3	0	0	+11.3
1 B	83.0	0	+83.0	0	0	0	16.7	0	+16.7	100	0	0	+100
2	15.2	15.9	-0.7	14.4	7.9	+6.5	0	0	0	27.7	10.4	9.7	+7.6
3	31.2	22.9	+8.3	12.5	2.5	-12.5	0	8.3	-8.3	27.5	26.9	10.8	-10.2
4	17.6	4.2	+13.4	0	46.4	-46.4	0	0	0	4.8	36.8	4.8	-36.8
5	17.2	34.4	-17.2	0	47.7	-47.7	0	3.7	-3.7	6.7	65.0	0	-58.0
6	10.0	0	+10.0	0	0	0	0	0	0	100	0	0	+100

1 Mean Change for all Stages

Table 5.16 Village A Dryland Ownership Change[1] for Area, Sample Lineages

(Proportional change shown as a percentage of original total area)

	Class	S +	S -	S Total	I +	I -	I Total	P +	P -	P Total	Net change +	Net change Some	Net change All	Net change Total
Average Area	1 A	0.19	0	+0.19	0	0	0	0.06	0	+0.06	0.27	0	0	+0.27
	1 B	1.96	0	+1.96	0	0	0	0.36	0	+0.36	2.31	0	0	+2.31
% age	2	12.0	7.6	+4.4	8.7	5.5	+3.2	0	0	0	20.2	2.2	9.4	+8.6
	3	70.5	15.6	+54.9	0.4	14.6	-14.2	0	22.9	-22.9	56.3	17.9	10.9	+27.5
	4	13.0	2.2	+10.8	0	42.4	-42.4	0	0	0	0.1	27.6	3.9	-31.4
	5	2.3	8.7	-6.4	0	26.0	-26.0	0	0	0	2.0	36.2	0	-34.2
Average Area	6	2.24	0	+2.24	0	0	0	0	0	0	2.24	0	0	+2.24

1 Mean Change for all Stages.

Table 5.17 Village A Gardenland Ownership Change[1] for Lineages, Sample Lineages

(Proportional change from classes shown as a percentage of original total lineages)

Class	S +	S -	S Total	I +	I -	I Total	P +	P -	P Total	Net change +	Net change Some	Net change All	Net change Total
1 A	1.6		+1.6	0.13	0	+0.13	2.76		+2.76	4.34	0	0	+4.34
1 B	35.0	0	+35.0	0	0	0	67.5	0	+67.5	100	0	0	+100
2	4.8	21.2	-16.4	7.9	22.8	-14.9	32.3	4.3	+27.9	35.7	16.8	14.5	+4.4
3	16.7	34.0	-17.3	0	16.6	-16.6	10.4	0	+10.4	20.8	8.3	38.2	-25.7
4	12.2	26.6	-14.4	5.8	35.8	-30.0	10.0	1.8	+8.2	24.3	36.1	20.3	-32.1
5	12.1	17.8	-5.7	1.3	58.8	-57.5	26.3	0	+26.3	20.2	47.8	18.5	-47.1
6	50.0	0	+50.0	100	0	+100	0	0	0	100	0	0	+100

1 Mean Change for all Stages.

Table 5.18 Village A Gardenland Ownership Change[1] for Area, Sample Lineages

(Proportional change shown as a percentage of original total area)

	Class	S +	S -	S Total	I +	I -	I Total	P +	P -	P Total	Net change +	Net change Some	Net change All	Net change Total
Average area	1 A	0,03	0	+0,03	0	0	0	0,05	0	+0,05	0,08	0	0	+0,08
	B	0,63	0	+0,63	0	0	0	1,28	0	+1,28	1,93	0	0	+1,93
% age	2	15,1	7,1	+8,0	13,8	13,9	-0,01	115,9	4,8	+111,1	85,1	3,8	23,5	+57,8
	3	15,3	36,7	-21,4	0	11,9	-11,9	14,8	0	+14,8	27,5	4,7	41,1	-18,3
	4	12,3	25,5	-13,2	3,3	23,2	-19,9	7,6	2,2	+5,4	16,5	22,7	21,4	-27,9
	5	6,9	8,3	-1,4	0,1	40,8	-40,7	11,6	0	+11,6	15,9	39,2	7,2	-30,5
Average area	6	0,26	0	+0,26	1,06	0	+1,06	0	0	0	1,32	0	0	+1,32

[1] Mean change for all Stages.

Table 5.19 <u>Village A Total Gardenland Ownership Change for Lineages and Area</u>

(Proportional change shown as a percentage of original total lineages or area)

	Mode of Mobility	S			I			P			Net change		
	Class	Stage A	Stage B	Stage C	Stage A	Stage B	Stage C	Stage A	Stage B	Stage C	Stage A	Stage B	Stage C
Lineages	2	+10.0	-37.5	-21.8	0	-18.8	-26.1	+60.0	+6.2	+16.6	+60.0	-25.0	-21.8
	3	-33.3	-18.7	0	0	-37.5	-12.5	0	+12.5	-18.8	-33.3	-31.2	-12.5
	4	0	-26.7	-16.6	-41.2	-26.6	-22.2	0	+13.3	+11.2	-35.4	-40.0	-44.5
	5	-23.2	-5.5	+11.6	-61.5	-61.1	-49.8	0	+44.4	+34.6	-61.6	-50.0	-26.8
Area	2	-45.4	-15.8	-5.2	0	-9.3	-27.8	+109.0	+72.9	+151.8	+154.0	+47.0	+119.7
	3	-33.8	-9.7	-20.2	0	-22.7	-13.1	0	+27.3	+17.1	-33.8	-5.2	+16.2
	4	+5.9	-16.0	-28.5	-32.7	-17.6	-13.3	0	+17.0	-0.9	-23.2	-16.6	-43.0
	5	-8.9	-4.7	+9.4	-42.7	-41.7	-37.7	0	+22.6	+12.1	-57.6	-23.8	-16.1

Table 5.20 Village B Dryland Ownership Change[1] for Lineages, Sample Lineages

(Proportional change shown as a percentage of original total lineages)

Class		S			I			P			Net change		
	+	-	Total	+	-	Total	+	-	Total	+	Some	All	Total
1 A	10.3	0	+10.3	0.4	0	+0.4	1.60	0	+1.60	11.0	0	0	+11.0
B	76.1	6.8	+69.3	12.5	12.5	0	11.3	0	+11.3	89.2	0	0	+89.2
2	12.6	32.3	-19.7	1.9	3.6	-1.7	3.8	2.3	+1.5	16.1	15.8	20.1	-16.2
3	38.1	7.5	+30.6	0	45.1	-45.1	4.2	21.7	-17.5	20.4	34.0	14.8	-28.4
4	17.2	7.7	+9.6	0	28.5	-28.5	4.7	1.2	+3.5	17.2	29.0	3.6	-15.4
5	16.2	41.1	-24.9	3.1	49.5	-46.5	5.0	6.9	-1.9	10.6	67.7	3.1	-60.2
6	100	0	+100	0	0	0	0	0	0	100	0	0	+100

1 Mean change for all Stages

Table 5.21 Village B Dryland Ownership Change[1] for Area, Sample Lineages

(Proportional change shown as a percentage of original total area)

	Class		S			I			P			Net change		
		+	-	Total	+	-	Total	+	-	Total	+	Some	All	Total
Average area	1 A	0.18	0	+0.18	0.03	0	+0.03	0.02	0	+0.02	0.19	0	0	+0.19
	B	1.20	0.06	+1.14	0.69	0	+0.69	0.14	0	+0.14	1.77	0	0	+1.77
% age	2	15.4	27.4	-12.0	4.6	1.5	+3.1	6.6	1.2	+5.4	25.4	7.4	21.4	-3.4
	3	36.4	5.0	+31.4	0	40.2	-40.2	7.6	11.7	-4.1	17.1	15.3	14.7	-12.9
	4	6.7	10.7	-4.0	0	17.3	-17.3	1.9	0.3	+1.6	14.5	16.6	3.2	-5.3
	5	3.9	8.9	-5.0	1.2	29.3	-28.1	1.6	1.2	+0.4	3.3	31.0	3.1	-30.8
Average area	6	2.34	0	+2.34	0	0	0	0	0	0	2.34	0	0	+2.34

1 Mean change for all Stages.

Table 5.22 Village B Gardenland Ownership Change[1] for Lineages, Sample Lineages.

(Proportional change shown as a percentage of original total lineages)

Class		S			I			P			Net change		
		+	-	Total	+	-	Total	+	-	Total	+	Some	All	Total
1	A	5.9	0.2	+5.7	0.8	0.5	+0.3	2.9	0	+2.9	8.2	0	0	+8.2
	B	71.6	1.6	+70.0	10.8	4.2	+6.6	25.6	0	+25.6	96.9	0	0	+96.9
2		9.7	45.0	-35.3	1.0	7.8	-6.8	3.5	7.0	-3.5	12.2	8.0	51.8	-47.6
3		12.5	29.6	-27.1	3.8	10.7	-6.9	4.8	9.3	-4.5	13.6	6.9	41.1	-34.4
4		19.9	21.1	-1.2	0	20.8	-20.8	10.3	8.7	+1.6	16.2	29.1	18.3	-31.2
5		14.4	19.5	-5.1	1.6	50.7	-49.1	5.7	8.7	-3.0	8.2	51.4	10.2	-53.4
6		34.0	22.7	+11.3	0	51.9	-51.9	16.8	7.7	+9.1	21.6	56.4	8.4	-43.2
7		100	0	+100	0	0	0	0	0	0	100	0	0	+100

1 Mean Change for all Stages

Table 5.23 <u>Village B Gardenland Ownership Change[1] for Area, Sample Lineages</u>

(Proportional change shown as a percentage of original total area)

	Class		S +	S -	S Total	I +	I -	I Total	P +	P -	P Total	Net change +	Net change Some	Net change All	Net change Total
Average area	1	A	0.08	0	+0.08	0.02	0	+0.02	0.04	0	+0.04	0.13	0	0	+0.13
		B	0.90	0.03	+0.87	0.19	0.06	+0.13	0.45	0	+0.45	1.44	0	0	+1.44
% age	2		9.9	39.4	-29.5	3.3	7.5	-4.2	2.2	5.9	-3.7	15.5	6.5	46.3	-37.3
	3		14.2	30.3	-16.1	3.9	8.4	-4.5	3.8	10.0	-6.2	13.7	3.7	39.7	-29.7
	4		14.2	15.2	-1.0	0	13.4	-13.4	3.2	7.4	-4.2	13.4	14.1	17.7	-17.8
	5		4.1	12.4	-8.3	1.8	31.5	-29.7	4.8	2.9	+1.9	4.6	31.5	9.5	-36.4
	6		7.7	4.9	+2.8	0	42.5	-42.5	8.2	4.2	+4.2	5.9	34.9	6.8	-35.8
Average area	7		-	-	-	-	-	-	-	-	-	-	-	-	-

1 Mean change for all Stages.

Table 5.24 Village B Total Gardenland Ownership Change for Lineages and Area

(Proportional change shown as a percentage of original total lineages and area)

Mode of Mobility / Class	S				I				P				Net change			
	Stage A	Stage B	Stage C	Stage D	Stage A	Stage B	Stage C	Stage D	Stage A	Stage B	Stage C	Stage D	Stage A	Stage B	Stage C	Stage D
Lineages																
2	-58.3	-54.5	-8.0	-20.0	-16.7	0	-4.0	-6.7	0	0	-4.0	-10.0	-75.0	-54.5	-24.0	-36.7
3	-21.7	-39.1	-42.3	+18.5	-8.7	0	-15.4	-3.7	0	+4.3	+3.8	-25.9	-30.4	-39.1	-42.3	-25.9
4	+5.0	-8.3	-12.9	+11.5	0	-16.7	-45.2	-26.9	0	+8.3	+9.6	-11.5	+5.0	-25.0	-54.8	-50.0
5	-10.0	+6.2	-31.8	+15.4	-65.0	-18.7	-59.1	-53.8	+15.0	0	0	-23.1	-65.0	-18.8	-59.1	-61.5
6	+38.5	+21.7	+6.7	-21.7	-46.2	-65.2	-40.0	-56.5	+30.7	+21.7	+6.7	-37.8	-30.8	-60.9	-33.3	-47.8
Area																
2	-52.6	-45.1	-1.5	-18.6	-18.6	0	+9.9	-8.0	0	0	-5.6	-9.2	-71.2	-45.1	+2.8	-35.8
3	-20.7	-37.8	-33.2	+27.6	-4.1	0	-4.1	-5.9	0	+2.8	+2.1	-29.4	-24.8	-34.9	-39.2	-7.7
4	+3.1	-9.9	-5.2	+8.1	0	-8.6	-26.7	-18.2	0	+3.4	+1.2	-21.4	+3.1	-15.1	-30.7	-30.9
5	-6.8	-8.2	-20.1	+1.9	-50.9	-7.9	-30.9	-29.2	+17.9	0	0	-10.1	-37.7	-16.1	-51.1	-37.3
6	+5.9	+5.1	-0.5	-1.3	-40.0	-55.9	-20.4	-36.3	+14.6	+4.8	+4.4	-14.2	-20.6	-46.0	-15.1	-50.1

Table 5.25 Relationship between Landownership and Occupational Category[1]

Occupational Categories 1-6

Land Ownership/Operation[2]	Village A		Village B	
	Male	Female	Male	Female
Dryland Ownership	121.01	69.98	155.90	139.75
Gardenland Ownership	225.78	209.89	394.93	319.56
Wetland Ownership	232.29	90.05	-	-

Occupational Categories 1-3

Dryland Ownership	99.14	56.94	132.45	130.10
Gardenland Ownership	195.91	184.36	281.07	310.90
Wetland Ownership	197.58	73.98	-	-

1 Scores for Chi^2 Tests (all significant at 99.95%) for Land ownership/operation and Occupational Categories for both sexes, for 10 degrees of freedom for all Landuse Types except Wetland Ownership.

2 Three divisions within each Landuse type are used: No ownership, lower 50% quantile, and upper 50% quantile.

Table 5.26a Landownership by Caste

Village A

	Caste	H	% O	Area	Mean Area	G OW	G All
Dryland Ownership	Thevas (Village)	106	55	265.3	2.50	51.8	73.8
	Thevas (Hamlet)	24	71	43.9	1.83	28.5	50.3
	Pillais	67	51	126.8	1.89	43.0	71.5
	Others	121	50	140.1	1.16	36.9	69.0
	Village - Hamlet[1]	294	52	532.2	1.81	47.5	72.9
Gardenland Ownership	Thevas (Village)	106	23	83.4	0.79	55.1	80.3
	Thevas (Hamlet)	24	79	37.3	1.55	50.7	61.4
	Pillais	67	15	42.4	0.63	56.2	94.0
	Others	121	9	16.6	0.13	32.5	94.4
	Village - Hamlet	294	15	142.4	0.48	54.1	93.3
Wetland Ownership	Thevas (Village)	106	19	39.3	0.37	52.0	91.3
	Thevas (Hamlet)	24	8	1.2	0.05	7.3	95.8
	Pillais	67	21	34.1	0.51	58.9	91.9
	Others	121	5	2.1	0.02	31.1	97.1
	Village - Hamlet	294	14	75.5	0.26	55.5	94.1
Wetland Operation	Thevas (Village)	106	42	85.5	0.81	51.9	79.9
	Thevas (Hamlet)	24	21	5.3	0.22	43.8	90.2
	Pillais	67	33	47.5	0.71	44.3	82.3
	Others	121	19	21.0	0.17	44.1	89.8
	Village - Hamlet	294	31	154.0	0.52	50.5	85.0
I.A.L.A.	Thevas (Village)	106	59	3086.5[2]	29.1[2]	76.0	85.8
	Thevas (Hamlet)	24	83	656.2	27.3	51.0	59.5
	Pillais	67	52	2263.5	33.8	72.3	85.8
	Others	121	50	475.0	3.93	64.9	82.4
	Village - Hamlet	294	54	5825.1	19.81	79.8	89.1

H	Households
% O	Percentage Owning/Operating Households
Area	in Acres
Mean Area	Mean Area Owned/Operated by All Households
G OW	Gini Coefficient for Owners/Operators, Percentage
G All	Gini Coefficient for All Households, Percentage
I.A.L.A.	Index of Agricultural Land Assets

1 i.e. "Village minus Hamlet"

2 for Sum of Index

Table 5.26b Landownership by Caste

Village B

	Caste	H	% O	Area	Mean Area	G OW	G All
Dryland Ownership	Telungu Chettiars	138	59	280.4	2.03	50.1	70.5
	Kurumba Goundas	104	50	160.0	1.54	47.7	74.1
	Others	75	36	81.5	1.08	40.1	79.3
Gardenland Ownership	Telungu Chettiars	138	42	114.0	0.83	39.3	74.7
	Kurumba Goundas	104	26	48.9	0.47	43.9	85.8
	Others	75	8	15.2	0.20	18.9	94.5
Wetland Ownership	Telungu Chettiars	138	4	8.2	0.06	38.6	99.8
	Kurumba Goundas	104	3	3.9	0.04	51.4	99.0
	Others	75	3	1.7	0.02	5.9	98.7
I.A.L.A.	Telungu Chettiars	138	67	2298.3[1]	16.65[1]	61.5	74.5
	Kurumba Goundas	104	50	1060.0	10.19	72.6	86.5
	Others	75	39	380.1	5.06	64.5	86.6

H	Households
% O	Percentage Owning/Operating Households
Area	in Acres
Mean Area	Mean Area Owned/Operated by All Households
G OW	Gini Coefficient for Owners/Operators, Percentage
G All	Gini Coefficient for All Households, Percentage
I.A.L.A.	Index of Agricultural Land Assets

[1] for Sum of Index

Chapter 6

Relationships between Population and Agriculture

6.1 Introduction

a. This chapter will attempt to analyse the relationship existing over time between population, which is to be considered as a village-level variable, and the agricultural village[1]. This "macro-analysis" on the scale of the village is of course inherently biased to omit the important relationships which exist between variables such as sex, caste, the distribution of landownership, and employment. However, "macro-relationships" will be analysed in subsequent Chapters within the framework of village change as a whole.

b. In the context of one of the main foci of the thesis, that of the analysis of change at village level in a situation of increasing population, the relevance of the concept of population determinism to change in the sample villages is considered. Boserup (1965), at a regional scale, most importantly, has outlined the hypothesis that changes in agricultural landuse and technology are primarily related to changes in the density of population. As the frequency of cropping increases with population density, the input of labour increases, but the output per man hour decreases, and a point is reached when it is more profitable to switch to a

1 As defined in Chapter 4.

more intensive system of cultivation involving the use of higher technology. In spite of the fact that this theory was developed with reference to African systems of cultivation, and that it applies to a comparatively very large period of time, and to a regional rather than village change, it provides a model of change whose main components are population and the agricultural system.

c. The subsequent sections will examine the evidence for and relationship between population levels and agricultural change and evolve an hypothesis of the relationship between increasing population and intensification of production in the light of Boserup's model. The reciprocal relationship between production and migration (as a regulator of population) will then be examined, both with reference to the changing capacity for production and changing employment patterns in the village.

6.2 Population growth and agricultural change

6.2.1 Evidence for the relationship between population growth and agricultural change in the sample villages.

a. Fig 6.1 shows changing population totals and total land area owned from the late 19th century in both villages. Population and land area are shown as an index of 1915[1] figures, taken as 100. While population has consistently increased over this period, except between 1951 and 1961 in Village A, the extent of land area owned in the village ownership zone reaches a point between 1885 and 1915 in Village A, and at about 1929 in Village B from which there is only a very small marginal increase. Ownership is here assumed to be an accurate measure of the extent of agricultural land (see Chapter 4).

b. That the extent of land area cultivated had not reached the full extent of land area available for cultivation by the time of the survey in 1978/79 (Fig 4.1), is an indication of the variability of soil fertility, as outlined in Section 4.2. As land is taken into cultivation, remaining uncultivated land is comparatively less fertile (though there is no real change in its fertility). The comparative advantage of different locations with respect to soil fertility are compounded by the relationship between soil and slope, and both villages' site location at the base of slopes falling within the boundaries of the village ownership zone (Fig 4.3), mean that

1 The date of the second settlement.

the productivity of remaining land and hence its attractiveness to potential cultivators continually decreases as land is taken into cultivation. Thus in spite of increasing demand for production from population, an effective limit to the expansion of total land area was reached by 1915 in Village A and by 1929 in Village B.

c. Between 1915 and 1978/79 in both villages intensification of total agricultural production has taken place within the spatial limitation of canal- and ground-water availability. ("Intensification" is used here, as with Boserup, in terms of the frequency of cropping.) As shown in Chapter 4, each landuse type is characterised by distinctive patterns of production and hence intensity of production, although there have been significant variations through time, which are largely a reflection of water use. Therefore changing intensity of production may be related to proportional changes in various landuse types. Table 6.1 gives the proportional area under dryland, gardenland and wetland in both villages' ownership zones at 5-yearly intervals from 1915 to 1978/79. (The actual extent of landuse types is shown in Appendix 1.) Thus in Village A, where the distribution channel is generally unable to irrigate land on its western side, only a very small increase in wetland area was possible, and the main sign of intensification is seen in the proportional increase of gardenland area, the area available for which was limited by the increasing water table depths to the west of the village until the introduction of powersets, from which time it was only limited by availability of canal water in the east of the village and the ability to pump it to the west. Thus the area under gardenland increased slowly until 1965 and rapidly thereafter. In Village B, intensification, only possible as the proportional increase in gardenland cultivated, takes place between 1915 and 1953 and is limited thereafter by the availability of groundwater. The subsequent fall in the proportional area under gardenland after the introduction of powersets was related to falling water tables resulting from the greater output of powersets, and not to falling demand for agricultural production. The process of intensification through change from dryland to gardenland cultivation itself tends to accentuate the difference in productivity between the two landuse types, as generally dryland which is more suitable for groundwater exploitation, tending to be at the base of slopes and therefore more fertile, is taken over leaving less fertile land.

d. Fig 6.2 shows the changing man-land ratios for different landuse types in both villages from 1915 to 1978. While man-land ratios for dryland of both villages and wetland of Village A decline consistently over this period, ratios for gardenland of Village B rose until 1940 and declined thereafter, and for gardenland of Village A have risen consistently throughout this period.

e. Intensification within the landuse types themselves has taken place within only one landuse type, gardenland. This is largely because the potential for change within the other two landuse types is restricted; dryland cultivation patterns are largely determined by seasonal rainfall patterns, and the double paddy crop of the wetland could not be made more intensive without changes in the regime of canal water availability. Gardenland, while subject to fluctuating cropping patterns, shows evidence of intensification between 1915 and 1978. Appendix 3 illustrates the predominance in gardenland areas of millets: ragi, cholam, samai and horsegram. Unfortunately no distinction is made in the 1915 Settlement Register between gardenland and dryland crops; however, we may assume that while cash crops were also grown[1], gardenland cropping patterns were dominated by short term rainfed and well-irrigated millets. Between 1915 and 1960/61 in Village A and 1966/67[2] in Village B we can assume the progressive introduction of longer term crops and a greater frequency of cropping. Evidence for the greater intensity of well irrigation is seen in the falling average well depths in Village B between 1885[3] and 1960/61. That the maximum gardenland area for Village B was reached in the period from 1953 to 1958 (229.84 acres), and had declined by 1967 (218.34 acres) before the introduction of powersets, is an indication of increasing competition for available water within the less advanced system of *kamalai* irrigation, resulting in marginal falls in the total area of gardenland. Gardenland cultivation, however, continued to rely on a mixture of rainfed and well-irrigated crops before the introduction of powersets. The

1 Tobacco and vegetables in Village B, and Tobacco and Cotton in Village A (Cotton was grown mainly as a rainfed crop).

2 The dates of the first available *adangal* (crop record) for each village.

3 Well depths were recorded in the 1885 settlement register, and therefore refer to a time between 1885 and 1915.

change in cropping patterns thereafter is well documented and dramatic. Greater reliability of water availability throughout the year has allowed longer term crops (and thus a greater intensity of cultivation as defined in Chapter 4), and decreased the reliance within gardenland areas on rainfed millets.

The intensification of gardenland cropping patterns is related to the process of the increasingly important commercialisation of agriculture. Pre-powerset cropping patterns were characterised by greater cultivation of millets for consumption by the farmers family. Very few of the present gardenland crops are consumed by the farmers, even though food crops are grown. The process of commercialisation has not affected dryland cultivation, and has affected wetland cultivation less than gardenland. However, the increased yields of hybrid paddy varieties, as well as improved government-sponsored markets must have led to a greater proportion of wetland produce being sold.

f. Encroachment of poramboke land may be seen as evidence of the villages' growing demand for agricultural land. Because the encroachment of poramboke is an illegal act, it may be argued that it represents a great demand which outweighs political and economic constraints for the individual farmer as well as any possible resulting disadvantages to the village as a whole. The encroachment of tank land in Village A can be seen as a collective act by a large section of the village. While encroachment increases the total area of agricultural land available to the village, it also tends to increase proportionately the area under more intensive landuse types, as the attraction of the greater productivity of gardenland and wetland compensate for any penalties incurred.

g. To illustrate the relationship between growing population and the collective demand for agricultural land, the changing relationship between total households and landownership in the sample family trees may be examined. Table 6.2 shows the total numbers of dominant households in the sample family trees for various years from 1947 in Village A and from 1926 in Village B. While the total numbers of dominant households, like that of total households for the village itself increase over this period, the proportion of actual households in sample families to total households, calculated from the ratio of dominant to non-dominant households documented in the village in 1978/79, increases consistently from 1947 (or 1926) to 1978/79. The reasons for this increase will be discussed in Chapter 7, and while they mean that the sample is inherently biased towards including members of higher ownership classes, and increasingly so with receding time, the rates and methods of acquisition of agricultural land illustrates the collective response to growing demand for agricultural land, a response which is limited less by the physical constraints on the extent of different landuse types within the village, and more by the forces of supply and demand for land of different productivity and value.

Treating changing household numbers and the area under various landuse types owned by the sample households in a factor-product relationship[1], Table 6.3 shows for various dates, coinciding with the stages of change outlined in Chapter 5, the total product (area of land under different types), the average product (the average area owned by each dominant shousehold), the marginal product (the increase in area from the previous date divided by the increase in numbers of households), and the elasticity of response (the marginal product divided by the average product). For Village B gardenland figures for 1965 and 1978 are given for both gardenland and gardenland plus former gardenland (land unirrigated because of discontinued well operation). Similarly figures for these years are given for both dryland and dryland minus former gardenland.

While marginal product and the elasticity of response for dryland of both villages tend to increase over time, especially so for dryland in Village B, for gardenland in Village B there is a decrease over time in these two indices and for gardenland in Village A an increase for 1958 to 1968, and a slight decline for 1968 to 1978. Wetland for Village A shows a low figure for these indices until 1968 to 1978. The total product and average product for the various landuse types reflect the changing total area under each in the village ownership zone as well as the increasing total population.

The variation in marginal product and elasticity of response over time may be explained by two factors. First, the changing areas under each landuse types because of physical change (as shown in Tables 5.11 and 5.12), through

1 As with Upton 1976.

irrigation of dryland areas, encroachment of tank land, land becoming dry after discontinued well operation etc. While gardenland for Stage A increases and for Stage D decreases in Village B, and for Stage B and to a lesser extent Stage C increases in Village A, there is little relative change for dryland in either village through physical change (except an increase for Stage D in Village B), and only in Stage C (through encroachment of tankland) for wetland in Village A. Secondly the growing difference in productivity and value between dryland and the more productive landuse types, especially gardenland. Thus increasing competition for an increasingly productive landuse type, gardenland in Village B has meant decreasing elasticity of response over time, and conversely increasing elasticity of response for dryland, which occurs in dryland minus former gardenland to a lesser extent. That this increasing elasticity of response for dryland is duplicated in Village A, is a reflection of the decreasing relative productivity and demand for dryland in both villages under different circumstances of relative physical change. The low elasticity of response for wetland and gardenland in Village A except under circumstances of physical change reflects their higher value.

6.2.2 A Model of Population increase and agricultural change

Because of the lack of historical data which directly illustrates the relationship between village population levels and agricultural change, conclusions about the deterministic influence of population increase on agricultural production must be drawn from assumed relationships between population and agriculture, using variables which act largely as surrogates for more relevant, if unobtainable variables. Thus while labour availability and demand for agricultural production are represented largely by changes in total population and households, historical evidence for changes in agricultural production relies largely upon data on changes in areas under different landuse types, changing cropping patterns and cultivation practices.

The decreasing availability of land for agricultural production, and increasing population totals in either village over the period from the time of the first Census in 1881 to the time of the survey in 1978 have resulted in an accelerated decline in man-land ratios. The reaction of the agricultural system to this decline is determined by factors outside the village as well as from within, and also by the importance of the agricultural sector in the village itself. However, a general model of the village-level reaction of the agricultural system to declining man-land ratios may be summarised as follows:

Demand for increased agricultural production, either for subsistence consumption or for commercial profit, because of increasing population levels, leads to the marginal extension of cultivated land area, and the differential intensification of agricultural production, through increased inputs of labour within utilised levels of agricultural technology.

Boserup links increased production in African agricultural systems to greater intensity of cultivation. Changing technology is seen as an indigenous response to falling productivity of labour with increased inputs of labour per unit area. In the more developed Indian society local technological change may be related to regional and national technological availability rather than indigenous need. However, within levels of technological availability the extension of cultivated area and intensification of production may be related to increased demand for production[1].

From 1915 to 1978, the use of technology in both villages falls into two distinct periods[2]: before and after the introduction of "green revolution" technologies about 1967/1968. The first technological period is characterised by the use of canal and kamalai irrigation, the bullock drawn plough, biological fertilisation methods, and the cultivation of local varieties. The second technological period is characterised by the partial or total substitution of these technologies by electric pumpsets, the tractor drawn plough, chemical fertilisers, pesticides, and high yielding and sometimes new varieties. It has been shown in Chapter 4 that agricultural technology has profoundly influenced land productivity, the area under different landuse types, cropping patterns and intensity of cultivation, and labour demand patterns. It also has been shown that the expansion of the

1 Intensification is made possible by the increased availability of labour.

2 Henceforth termed "technological periods".

agricultural system is limited by the nature of and distribution of land and water resources, and because of differences in resources between the villages, the use of similar technology, especially the technology of irrigation, has resulted in different changes in the cultivation of either village.

In both villages intensification within the first technological period occurred as a response to the decreasing overall availability of land. Although intensification, in the form of greater proportionate use of gardenland, occurred in Village B before 1929, the estimated date of effective limits to expansion of agricultural land, the main period of expansion of gardenland occurred after this date. Effective limits to expansion were reached by 1915 in Village A, and the expansion of gardenland area, the only possible effective course of intensification, took place steadily, if less markedly between 1915 and 1967.

During the second technological period the increased output of electric powersets resulted in the decline of gardenland area in Village B, and its expansion in Village A, while the intensity of cultivation was increased in both villages. The demand for intensification was still present in Village B, as seen in the expansion of area irrigated where possible from "surviving" wells, and the gradual if incomplete recovery of gardenland cultivation through deepening wells.

The trend to intensification, through the greater proportional cultivation of more productive landuse types, is accelerated by two factors concerned with the process of expansion. First, the process of expansion from a base near to the village site (a core of fertile dryland around the site of Village B, and the band of wetland next to the site of Village A) where more fertile land is taken over for more intensive cultivation. Secondly, encroachment of poramboke land which is more readily put to more intensive forms of cultivation.

Commercialisation, or the greater proportionate cultivation of cash crops, cannot be directly related to the increased demand for agricultural production, or availability of labour but rather to the physical response of the agricultural system to new technology. Gardenland is the only landuse type in which changes in the intensity of cultivation have been possible. The change in cropping patterns to longer term commercial crops was made possible in the second technological period by the greater output and seasonal reliability of powersets. It is possible also that a greater commercialisation of wetland cultivation was made possible by the greater productivity of wetland after the introduction of high yielding varieties.

6.3 Changing agricultural production and migration

The preceding section (6.2.2) has argued that changing production levels, the evidence for which is seen in areas under different landuse types, and other surrogate variables, were influenced by increasing population levels. However, an important reciprocal relationship is recognised in the limiting effect of village production levels on population operating through the mechanism of migration, and perhaps mortality. Although the processes of in- and out-migration may be seen to operate selectively on different sections of the agricultural society (as defined by classes of land operation), and will be explained in this context in the following chapter (on the relationships between Population and Class), they are treated here, as is the process of change in agriculture itself, as part of a total village-level process of change, and thus are assumed to act as uniform forces on all sections of the village.

Changing agricultural cultivation practices and production may be seen as affecting population levels in two major ways: first by limiting the profitability of agricultural production, whether for subsistence consumption or for commercial profit, and secondly by limiting employment patterns through labour demand for cultivation.

6.3.1 Agricultural Production

The preceding section (6.2) used changing population totals and area under different landuse types to illustrate a state of "population pressure" through changing man-land ratios (see Fig 6.2), to which a response was shown to be the marginal extension of agricultural land and differential intensification of agricultural production. Within the two identified levels of utilised agricultural technology, increased inputs of labour with increased population, are assumed to have resulted in decreasing labour productivity, and thus the overall profitability of agricultural production; without changes in the technology of agricultural production, production would always increase more slowly than demand.

Permanent migration may be seen as a response of the village to the changing profitability of agricultural production. (It may be argued that mortality, especially in a more closed village society, acts as a regulator of population levels in this way. However the practical application of this argument is limited by the recognised supra-village variations in mortality caused by more immediate factors than food availability.)

6.3.2 Agricultural Employment

Labour demand, estimated in monthly totals for the year of the survey, shows seasonal demand in labour for both males and females of both villages[1]. The availability of census data on the employment status of individuals in both villages allows the calculation of the monthly percentage employment

1 See section 4.6.4.

of available agricultural labour, if work on village operated lands is assumed to be performed exclusively by village residents. Table 6.4 shows that while seasonal variations in labour demand may easily be identified, and there is greater employment for females than males in both villages, and generally greater employment for residents of Village A then Village B, for all groups there is underemployment of labour for all months[1].

The extremely low percentage employment figures, especially for males probably deserve some upward revision. First the absence of other coolie labour from this calculation, both agricultural labour carried out in other villages (especially in wetland villages for harvesting), and non-agricultural coolie labour[2] would tend to increase under-estimation of total demand for casual labour for agricultural labourers within the village. Secondly, it is likely that the Count overestimated the numbers of persons involved in agricultural work, both through the questionable recognition of "farmers" as persons contributing to agricultural labour (see section 8.2.3b), and through the overestimation of participation rates towards both extremes of age for the occupational categories. Thirdly there may be some under-estimation of labour requirement within the village, involving, perhaps, overlooked operations. This could also result from the systematic underestimation of family labour requirements, as this labour is unpaid.

1 Monthly divisions may tend to "dissolve" peaks of demand for very intensive operations such as harvesting.

2 For example, well digging.

However, the figures refer to the percentage of employment for 8 hours per day for all the days of the month. National figures of numbers of days worked per person per year probably overestimate the actual labour input because labour is not always required for a full day's labour (Bardhan 1977). It is moreover, the relative distribution of employment which is important here.

Because no quantitative estimate is available for seasonal labour demand profiles for years before the time of the survey in 1978, and because of the lack of consistent official census data on the changing employment status of individuals, changing employment patterns may not easily be identified. However, using estimations of directions of change in total and seasonal labour demand, and using changing population totals as a surrogate for the agricultural labour force, relative changes in the total and seasonal employment of available labour may be deduced.

Within the limited flexibility of change imposed by the restricted cultivation practices of different landuse types, changes in labour demand brought about by the introduction of new agricultural technology tended to increase total demand for female labour, and decrease demand for male labour, and that while peaked demand especially for female labour generally increased, constant demand decreased. However, within the two technological periods changing demand for labour has been largely influenced by changes in areas under the different landuse types.

The intensification of cultivation through the expansion of the more productive landuse types during the first period of technological utilisation increased total labour demand proportionately. However, changing land areas during the second period, especially under gardenland, have meant that with new cultivation practices, in Village B total demand for male labour has decreased, and that for female labour increased and in Village A demand for male labour has remained steady, and for female labour has increased spectacularly. Both villages' populations. however, have increased at similar rates from 1915 to 1978, and thus the differences in employment patterns (and migration as a response to changing employment patterns) are the result primarily of changing cultivation practices.

While labour demand patterns for different landuse types are assumed to have remained largely static during the technological periods, the intensity of labour input may have increased as a response to "population pressure". However decreasing labour productivity would act as a spur to migration, as with falling profitability of agricultural production.

6.3.3 Migration

While permanent migration may be seen as the only form of migration which is a response to the changing productivity of the agricultural sector, the village-level response to the underemployment of agricultural labour may be divided into three stages. First, daily travel from the village while remaining resident in the village. Secondly, temporary migration from the village seeking short term or seasonal employment. Thirdly, permanent migration from the village seeking either permanent employment or a more favourable location for temporary or seasonal employment.

Each response represents a progressively greater expression of underemployment for resident village agricultural labour, as each stage of migration for employment involves progressively greater disadvantages and difficulties for the migrants. Farmers in the normal course of cultivation, unless they have specific personal reasons for not doing so, tend to use labour from their own village, not only because of the advantages of employing labour in a jajmani system[1], but because of the disadvantages of arranging for the employment of unknown labour in advance. Therefore workers seeking agricultural employment outside the village are at a disadvantage in competition with resident labour, as well as the difficulty of having to travel, in most cases, unpaid to work[2]. This means that a geographical limit is set to the possible range of daily travel to work.

The relative percentages of monthly employment of agricultural labour is reflected in the pattern of daily migration of workers seeking employment outside the village. The most obvious form of daily migration is seen in the troop of labour to wetland areas of Kambam Valley for transplantation and harvesting. 34% of sample families in Village A, and 39% in Village B had at least one member who did harvesting work

1 "Jajmani" is used here in the sense of the development of patron-client relationships involving the repeated hiring of labour and reciprocal economic depence of the worker on his patron.

2 The major alternative form of travel is the bus, but the cost of the fare would make such an action uneconomic, especially for women, with their relatively smaller daily wage.

for a kottukarin organised party for the second harvest in 1978/79. However, of the workers from sample survey households undertaking harvesting, in Village A (26 workers), 42% worked only in their own village, whereas workers from Village B (27) had to travel to other villages. The fact that Village B residents are prepared to travel over a far greater distance to work, and that kottukarins are able to maintain a larger labour force over a longer period than for Village A residents, may well be explained by the relatively low percentage employment totals for Village B, as well as the need to obtain paddy for consumption.

The average age of workers undertaking kottukarin-organised labour tend to be less than that of the total agricultural workforce, and the majority of the workers fall between the ages of 18 and 32, because of the arduous nature of the work. The average age of 26 persons contributing to the kalam harvest pongal[1] in 1978/79 (from the troop of labourers[2] organised by Sinnadore, the kottukarin from Village A), was 20 years. The average age of workers among the sample survey households who undertook kottukarin organised harvesting labour from Village A was 27 years (23 years for those who travelled outside the village for work), and from Village B 25 years. The average age of the total agricultural labour force in Village A was 30.6 years, and in Village B 31.3 years. Thus although harvesting provides an alternative opportunity for employment for part of the year, it is effectively limited

1 A sacrifice to the Village god Karuppasamy.

2 These labourers attended for most of the harvest.

to a small section of the agricultural labour force.

Daily outmigration of labour for other operations, especially for gardenland cultivation appears to take place at a greater rate from Village B than from Village A. Information on the demand for labour within walking distance of the village is naturally of great interest to village workers, and most villagers are aware through word of mouth of changing opportunities of engagements with specific farmers as well as geographical variations in seasonal employment prospects within this area. The larger more developed villages in Kambam Valley are generally characterised by large consolidated estate-type gardenland farms, where intensive operations require large numbers of labourers. Daily migrations to such villages take place especially from Village B.

Temporary migration from the village has taken place to two major areas in the region. First, temporary migration to the southern end of Kambam Valley in <u>Purattasi</u> (T.M.6). Parties are usually made up from the village, and stay in the area, either with relatives, or in the open, for two to four weeks. Workers negotiate with farmers on the spot for daily employment. There are two methods of payment; by cash for piece work, and in kind for a proportion of the second (re-) harvest of the crop. One reason stated by some for going was to obtain groundnuts for consumption. Secondly, parties may be made up to travel for longer periods, which are not limited to particular seasons do daily paid labour on the cardamom and tea plantations in the Cardamom and Varushanad Hills surrounding the Kambam Valley to the west, south and east (see Fig 2.1). There are few direct contacts with estate owners in the hills, and very few residents of the sample villages own land there[1]. Most labour from the valley is recruited by kangaris, the representatives of the estate owners, who travel from village to village, and pay advances to potential workers.

Those undertaking estate work tend to be young adults, whereas those doing groundnut harvesting may go as a young family. 18% of sample survey households from Village A, and 25% from Village B had members who had at some time undertaken work in tea or cardamom plantations, while 43% from Village A, and 58% from Village B had members who had at some time undertaken groundnut harvesting work. The high figure for Village B residents is perhaps remarkable in the context of the greater percentage employment for females (largely for dryland weeding) for T.M.6. In the opinion of many residents of Village A, the trend towards seeking outside employment in the estates, or groundnut harvesting, was decreasing.

The third stage of migration may be seen as a response to both changing profitability of agricultural production, and changing employment patterns. The next chapter will show the influence of social status and employment on the mechanism of migration. However, differences in the volume of permanent migration between the villages (Fig 3.6 and Table 3.10) are consistent with changes in production and employment trends in both villages. Both villages, from 1948 to 1977, according to data gathered from the family

1 Residents of other villages in Kambam Valley situated adjacent to the Cardamom Hills often own large tracts of estate land.

trees of resident heads of household in either village, have been characterised by increasing volumes of both in- and out-migration. Although this data may be subject to increasing underestimation with receding time[1], relative differences in the proportions of migrating groups from recorded family trees tend to show that total migration is related to trends in agricultural production and employment (Sections 6.3.1 and 6.3.2). Table 6.5 shows migrating groups as a percentage of the total recorded dominant households for 10 year periods from 1948 to 1977. While the initial rate of out-migration for Village A is higher and in-migration lower than that of Village B, these trends are reversed by the time of the most recent decade of migration.

An examination of the distribution of the variables of the four groups of migration data (in- and out-migration for both villages) as shown in Table 6.6, using the Chi^2 distribution indicates that there are few differences between the distributions of variables of (though not the volume of) in- and out-migration for both villages[2]. The two exceptions to this general rule are first that the distributions of Size (of Destination) for out-migrating groups are significantly different (at 95%) reflecting the tendency of Village B out-migrants to have destinations in greater proportions in villages rather than in towns, and secondly that the distributions of Mode of Migration for in-migrating groups are significantly different (97.5%)

1 Migration patterns over these periods are consistent with the differing rates of growth for each village, and with the composition by age and sex of the villages in 1978 (Count). Moreover the difference in growth rates of Periyakulam Taluk amd the sample villages from about 1951 seems to suggest increasing out-migration from about this time

2 I.e. out-migration compared for both villages, and in-migration compared for both villages.

reflecting the proportionally greater number of in-migrants to Village B having no family connection[1].

However, there are important differences between the distributions of variables of in- and out-migration for each village, and especially for Village A. While the distributions of demographic variables (Age, Sex, Spouse, and Total Migrants) are largely similar for out- and in-migrants, except in Village A where there are principal female in-migrants in greater than expected proportions, the distribution of Occupation in the village (Occupation at Origin for out-migrants, and Occupation at Destination for in-migrants) is significantly different for both villages. This reflects the tendency for in-migrants to both villages to take up occupations outside the agricultural sector in greater proportions than the relinquished occupations of out-migrants (proportions within the agricultural sector being similar). The distributions of other variables show significant differences between out- and in-migrants. For Mode of Migration for Village A this reflects the smaller proportional in-migration with no family connection, for Location for both villages, this reflects the tendency of in-migrants to originate largely from the Periyar region itself, and for Size the tendency for out-migrants to go to towns in greater proportions than in-migrants originate from towns.

1 This trend is consistent with the generally held view in the region that Village A is a "less than friendly" place because of the presence of the Kalla Theva caste. The extent to which this view is held or the extent to which it has itself limited migration to Village A is difficult to gauge. However it may be emphasised that total migration to Village A is greater than to Village B.

The similarity of the distributions of out-migration and in-migration variables suggests that either form of migration is largely uniform in process, and that differences in the villages' resource bases affect the volume of total migration rather than its basic characteristics[1]. The differences in the characteristics and volume of out- and in-migration for the same village suggest that although migrating groups are characterised by similar distributions of demographic variables, migration acts as a valve for surplus population, while the village itself restricts the potential for in-migration. The latter conclusion is suggested by the distribution of non-demographic variables; the Mode of Migration shows the majority of in-migrations taking place through family connections, Location and Size show that the majority of in-migrants originate from rural and regional locations, and Occupation variables indicate that in-migrants are restricted to non-agricultural occupations in greater proportions. Caste, too, may perform a role in restricting in-migration; the development of a caste system which is numerically dominated by two or three castes (as is the case in both sample villages) may be brought about by processes encouraging the out-migration of other castes, the resulting smaller proportional numbers of which restrict the potential for subsequent in-migration.

1 There are however important differences between the four groups regarding relationships between migration variables (Chapter 7).

6.4 Summary

This chapter has involved a recognition of the overall relationship between the growth of the village population and the growth of the agricultural village. The strength of this relationship is seen both in the demonstrated corresponding intensification of agricultural production and population increase, and increasing out-migration which may be related to the increasing limitations on resource and occupational availability with increasing man-land ratios.

Two further general points may be made. First, that this relationship is emphasised in the nature of the physical expansion of the agricultural village, which tends, apart from wetland ownership (though not wetland operation), to be well defined by the extent of the village ownership zone. Thus changes in the agricultural production processes within this zone will have direct effects on the population of the village, and the course of intensification within this zone will be affected by the nature of population change within the village.

Secondly, that intensification, although it has not necessarily meant that commercialisation of agricultural production must follow, has generally resulted in the commercialisation of gardenland cultivation because of the possibilities of producing commercial crops rather than millets in a changed environment.

FIG 6.1 Indices of Changing Population and Land Area Owned, 1885-1978 (1915 = 100)

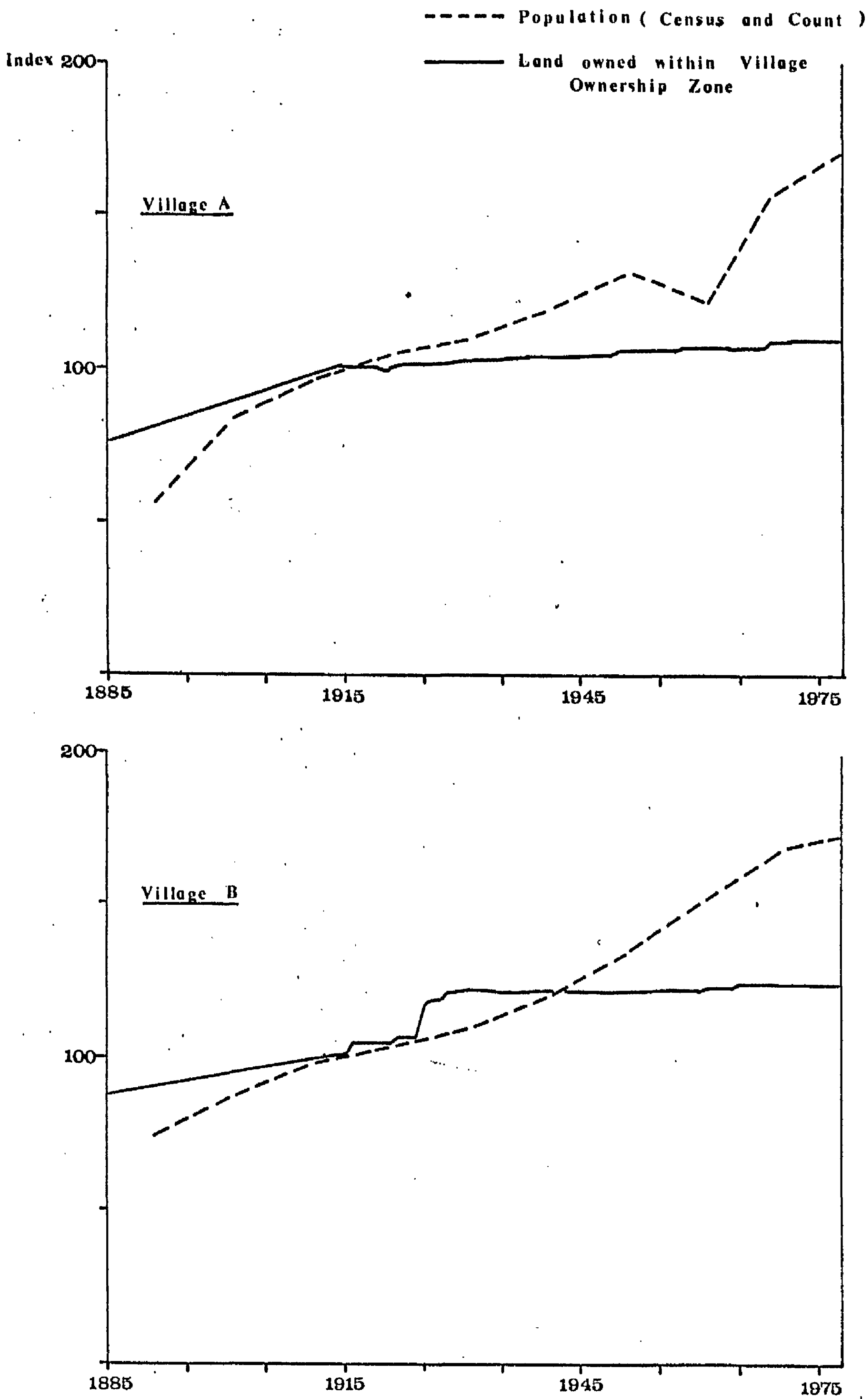


Fig. 6·2 Man-land Ratios for Landuse Types within Village Ownership Zone, 1915-1978

(assuming direct linear growth of population between decennial Census totals)

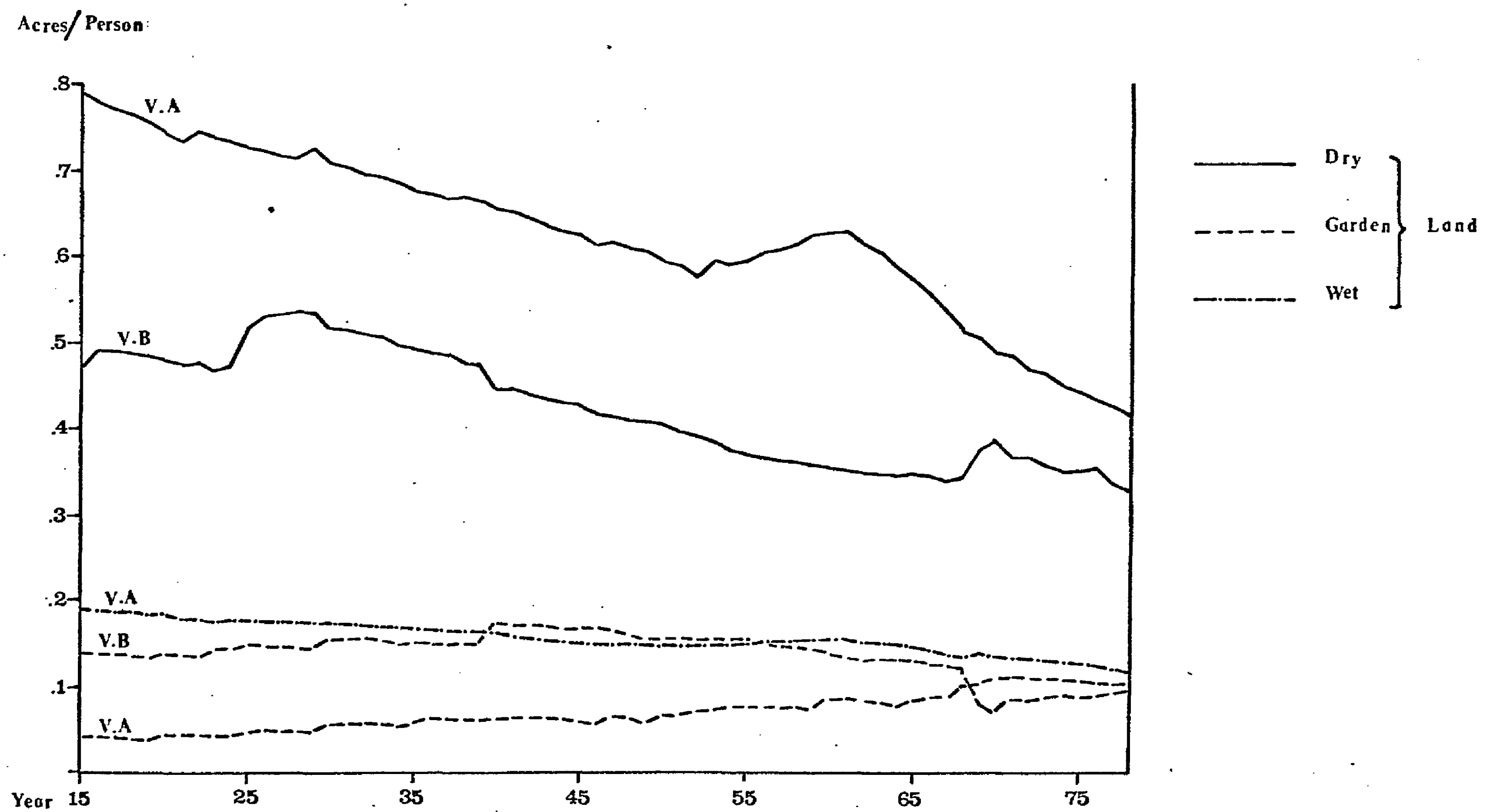


Table 6.1 Proportion of Land in Various Landuse Types, 1915-1978
(for Village Ownership Zones, shown as percentage)

	Year	Dryland	Gardenland	Wetland
Village A	1915	77.5	4.0	18.5
	1920	76.8	4.3	18.9
	1925	76.5	4.8	18.7
	1930	75.37	6.2	18.4
	1935	75.0	6.6	18.4
	1940	74.6	7.2	18.3
	1945	74.6	7.2	18.3
	1950	73.7	8.1	18.2
	1955	72.3	9.5	18.2
	1960	72.3	9.6	18.1
	1965	71.7	10.2	18.1
	1970	66.4	15.0	18.7
	1975	65.7	15.8	18.5
	1978	65.1	16.4	18.5
Village B	1915	77.0	23.0	0
	1920	77.4	22.6	0
	1925	78.0	22.0	0
	1930	76.5	23.5	0
	1935	76.3	23.7	0
	1940	72.1	27.9	0
	1945	73.8	26.2	0
	1950	72.2	27.8	0
	1955	71.1	28.9	0
	1960	71.7	28.3	0
	1965	72.4	27.6	0
	1970	84.3	15.7	0
	1975	80.0	20.0	0
	1978	76.2	23.8	0

Table 6.2 Number of Dominant Households among Sample Lineages, and the Estimated Proportion of Sample Lineage Dominant Households among All Village Households, 1926-78

	Village A		Village B	
	Dominant Households	Proportion among all Village Households	Dominant Households	Proportion among all Village Households
1926	-	-	41	27.3%
1947	30	13.1%	-	-
1950	33	13.5%	88	37.2%
1955	35	14.7%	94	38.8%
1960	40	18.5%	104	42.8%
1965	48	20.4%	112	42.9%
1970	59	22.3%	122	42.9%
1975	63	22.8%	139	49.2%
1978	64	22.8%	140	50.4%

Table 6.3 Responses of Land Area to Population Growth, Sample Villages

Village A

	Year	Total Area	Households	Average Product	Marginal Product	Elasticity of Response
Wetland	1947	8.71	30	0.27	-	-
	1958	9.41	40	0.25	0.0700	0.2800
	1968	9.38	52	0.18	-0.0025	-0.0139
	1978	13.38	64	0.21	0.2500	1.1905
Dryland	1947	116.89	30	3.90	-	-
	1958	118.06	40	2.95	0.1170	0.0397
	1968	121.34	52	2.33	0.2733	0.1173
	1978	133.86	64	2.09	1.0433	0.4976
Gardenland	1947	16.08	30	0.54	-	-
	1958	16.49	40	0.44	0.041	0.0932
	1968	31.80	52	0.61	1.2758	2.0915
	1978	42.31	64	0.66	0.8758	1.3270

Village B

Year	Households	Total Area		Average Product		Marginal Product		Elasticity of Response	
			-DG[1]		-DG		-DG		-DG
Dryland									
1926	41	107.06		2.61		-		-	
1939	66	114.17		1.73		0.2844		0.1644	
1952	88	126.69		1.44		0.5691		0.3952	
1965	112	138.23	135.21	1.23	1.21	0.4808	0.3550	0.3909	0.2934
1978	140	187.79	174.35	1.34	1.25	1.7700	1.3985	1.3208	1.1188
Gardenland			+DG[2]		+DG		+DG		+DG
1926	41	58.71		1.43		-		-	
1939	66	77.54		1.17		1.2550		1.0735	
195[illegible]	88	[illegible]		1.03		0.5668		0.5503	

1 Minus former gardenland (relevant 1965 and 1978)
2 Plus former gardenland (relevant 1965 and 1978)

Table 6.4 Monthly Percentage Employment[1] of Village Agricultural Labour on Village-Operated Land, 1978

Tamil Month	Village A Males	Village A Females	Village B Males	Village B Females
1	12.5	14.8	10.0	3.9
2	2.5	13.7	2.6	5.5
3	24.4	19.6	7.2	10.6
4	8.4	51.2	7.2	17.0
5	12.5	52.3	8.5	14.2
6	2.8	44.0	6.5	37.3
7	3.5	23.7	2.8	13.4
8	26.2	38.6	5.1	12.2
9	12.0	71.9	5.5	48.5
10	6.4	58.3	4.3	19.7
11	3.5	19.0	2.1	14.0
12	12.3	29.6	3.6	10.2

[1] Assuming labour employed on village-operated lands is resident in the village.

Table 6.5 The Rate of Migration, 1948-1977
(The Decennial Proportion[1] of Out-migrating Groups to Resident Dominant Households).

	Village A		Village B	
Period	Out-Migrants	In-Migrants	Out-Migrants	In-Migrants
1948-1957	7.9	0.9	5.4	1.5
1958-1967	16.1	3.2	18.2	4.2
1968-1977	32.0	13.4	46.0	9.1

1 Given as a percentage

Table 6.6 Crosstabulation of Distributions of Migration Variables according to Groups of In- and Out-Migration for both Villages

Variable	Village A Out- v Village B Out-	Village A In- v Village B In-	Village A Out- v In-	Village B Out- v In-
Age	N	N	N	N
Sex	N	N	97.5%	N
Spouse	N	N	N	N
Total Migrants	N	N	N	N
Occupation*	N	N	99%	99.5%
Mode of Migration	N	97.5%	99.5%	N
Location	N	N	97.5%	99.5%
Size	95%	N	99.5%	N

* Occupation at Origin for Out-Migrants, and Occupation at Destination for In-Migrants

Chapter 7

Relationships between population and class

7.1 Introduction

a. This chapter will attempt to assess the extent to which demographic processes have determined (and in turn been influenced by) the formation of classes of ownership and operation of land, and the development of labour and employment characteristics in the village. This relationship will be analysed in the context of two demographic processes. First, within the village the process of household evolution and associated land accumulation or loss, and the eventual transfer of land through the inheritance system in a context of population increase. Secondly, the mechanism of the regulation of the village population through migration, itself acting as a regulator of proportions of classes of ownership and availability of labour for employment.

b. The emphasis in this chapter will be on intra-village processes, and thus, although the differences between the villages will continue to be emphasised where relevant. The processes are assumed to be operating in both villages at different levels of importance and intensity. The difference between the villages is primarily one of the availability of resources for agricultural production; both have widely similar characteristics of population increase, migrational patterns, distributions of landownership in its widest context, and employment characteristics, and therefore relationships between variables are treated primarily in isolation from their village context.

c. Previous chapters have illustrated the possibility of the fragmentation of family owned land as a result of the inheritance system (Chapter 5), as well as the possibility of the expansion of land ownership and operation of the more productive landuse types with increasing demand for production from the village as a whole and the sample family lineages as a group (Chapter 6). The process of the development of the household as a cycle has also been illustrated (Chapter 3). The question of the existence of a relationship between the stage of household development and the extent of landownership is raised in this chapter, particularly with reference to the corresponding fluctuations in demand for production and availability of labour on household operated land.

This question is particularly relevant where the extent of land ownership or operation might be related to the need for production for subsistence consumption. If the dominant form of production were for subsistence needs, not only would the extent of landownerhsip be related to the labour availability of the household, but it would also be limited by the needs of the household. If, on the other hand, the dominant form of production were for commercial purposes, farmers would attempt to maximise agricultural area regardless of subsistence needs in order to maximise profits.

The relationship between household development and land ownership and operation would ideally be analysed with the use of time series data on changing household size and land ownership and operation, as well as details of the changing patterns of household individuals. These data, which require a detailed longterm survey or the existence of supplementary information on births and deaths and other statistics rèlevant to the household, could not be gathered within the constraints of time imposed on the survey.

However, evidence for this relationship may be sought first in the analysis of modes of mobility from various classes of ownership (a concept outlined in Chapter 5), which is used in this chapter with special reference to the transfer of land through the inheritance system in a situation of increasing population, and secondly in the analysis of the relationship at the time of the survey between ages of the heads of individual households and the extent of land ownership and operation. This analysis will be made with special reference to different landuse types.

d. Migration, which has been discussed in Chapter 6 with reference to changing production capabilities and demand for labour for the village as a whole, is discussed in this Chapter as a regulator of different classes of ownership and of numbers of individuals in different types of employment. The relationship between classes of ownership of different types of landuse at the start of the various stages of land transfer (as outlined in Chapter 5), and outmigration is analysed together with the correlation of key variables of migration totalled in Chapter 3.

7.2 Household development and landownership and operation

7.2.1 The inheritance system

The dominant patterns of transfer of ownership of land through the inheritance system for all stages[1] and landuse types in both villages are those which tend towards equality (Section 5.7); land is lost from greater numbers of lineages and in greater proportions to the initial extent of ownership from the higher classes of ownership through the inheritance system mode of mobility. Three possible separate, yet possibly interconnected, explanations for this process may be identified:

1. There are more surviving male heirs to lineages of higher ownership classes.

2. Land is gradually accumulated during the development of the household until it is divided among the male heirs, and the process subsequently restarted.

3. Land is lost through the two other modes of land transfer (financial transactions and physical change) more quickly between stages from the lineages of lower ownership classes.

The first explanation would be consistent with greater life expectancy among richer families, or families who accumulated land, or higher fertility among (ultimately) richer families.

1 As used in Section 5.7.

It would also result from a systematic tendency among the heirs of households from lower classes or classes of non-ownership to migrate permanently[1]. Table 7.1 shows correlation coefficients for area owned and the number of male heirs at each occasion of land transfer to the succeeding generation. This is done for years available in the village records[2] grouped into stages (as defined in Chapter 5) for different landuse types. Figures are given for ownership of dryland and gardenland among sample families (thus including non-owners), and for total gardenland ownership[3]. Generally "r" indicates a weak positive correlation between area owned and numbers of heirs, and there appears to be no systematic difference between the tests on the sample families, including both owners and non-owners and total owners for gardenland. Where there is a stronger positive correlation, such as in Stage B in Village A for gardenland transfers among sample families (r=0.507), it is an isolated phenomenon.

Thus the tendency towards equality or "cyclical" mobility in the proportional transfer of land through the inheritance system may not be explained by any systematic tendency for the heirs of land of higher ownership classes to survive in greater numbers by the time of land transfer.

While upward mobility is limited generally to financial transactions and physical change, and this process may appear

1 1947 to 1978 in Village A, and 1926 to 1978 in Village B.

2 The correlation coefficient r=0.0124 was obtained from analysis of the relationship between wetland ownership in all stages in Village A, and the number of inheriting males.

3 Assuming migrants made no claim to village land.

to be complementary to downward mobility through the inheritance system, the second explanation is weakened by differences between proportionate lineage and aggregate area changes from different classes, which produce the general pattern of skewed distributions of change from all classes of ownership. Thus accumulation, while taking place during the development of some households, tends to be limited to a proportion of households which accumulate land dynamically rather than gradually. Moreover, the rather simplistic conveyor-belt type theory of the second explanation may be shown to be logically impossible where land resources are limited. Land, of course, must be sold by some households in order to be bought by others, thus implying downward mobility for some households of the village at least during the course of household development.

Although landuse types at different stages have been characterised by changing patterns of transfer through the other modes of mobility (and these patterns have significant effects on the distribution of landownership), land is accumulated by and lost from all classes, if in different and changing proportions. However a consistent phenomenon is that land is lost completely in greater proportions from lower ownership classes.

Thus the third explanation of this pattern appears to be the most consistent with available data, although it may be incomplete with reference to varying patterns of transfer through other modes of mobility.

7.2.2 Stage of household development and land ownership and operation

The concept of the cyclical development of the household, already outlined in Chapter 3 with reference to the relationship between the age of the head of household and household size, is further developed here with reference to land ownership and operational changes during the course of household development.

Chayanov (1966) has outlined a theory of the relationship between the stage of development of the household and the area of land leased in for cultivation[1]. The amount of land cultivated is determined by an equilibrium of the relationship between demand for output and labour availability reached at each stage of household development. Chayanov's model states that for a household of a given composition, the marginal utility of output rises, while the marginal disutility of required labour increases with output. Thus an equilibrium level of output is reached when the marginal utility of output equals the marginal disutility of labour.

This process is linked to the cyclical development of the household; land is leased in proportion to the growing demand for consumption and subsequent availability of labour within the household as children are born and grow up. As children reach maturity, they marry, leave the family, and restart the process of land accumulation, while the size of the first generation farm declines as the household discontinues the leasing in of land.

1 Data used by Chayanov refers to late 19th century and early 20th century Russian rural society.

It is not the purpose of this section to test the theory itself. However, the model does provide a mechanism in the concept of the stage of development of the household, for the mobility of landownership, and thus an explanation for the distribution of the extent of land operation by each household (termed by Chayanov "demographic differentiation"). Two basic assumptions of Chayanov's theory are that labour for land controlled by the household is procured from within the household itself and is not leased out, and that land may be leased in with facility[1], two assumptions which are plainly untenable in the context of C20th Indian village society, where caste and increasingly class stratification have determined the development of hierarchical relationships of landownership and labour organisation within the agricultural sector, and where the extent and efficiency of leasing varies between different types of landuse, and is limited by political constraints.

However, it is important for the analysis of mobility of land operation and ownership in a situation of increasing population density to gauge the extent to which demographic factors have influenced the distribution of land operation and ownership. While the application of Chayanov's theories has many weaknesses with reference to the study area, there remains the possibility that within the village, the organisation of household labour for production allows

1 Hunt (1978) has argued that Chayanovian theories may not be applicable where there is a developed division of labour between the sexes, where population pressure is high, or where educational opportunities are great. The former two conditions apply to this area.

a direct relationship between the growth in demand for production and associated growth in availability of labour during the course of household development and accumulation of agricultural land.

Because Chayanov's theories about land operation were concerned with leasing in rather than ownership of land (little consideration being given to the process of land inheritance) analysis based on his theories is further weakened. However, because land transfer may be made through Sales, and Physical Change, and thus to some extent reflect changing demand for land, and because land may be lost through the inheritance system in the case of multiple heirs which is common in a situation of increasing population, cyclical patterns of land accumulation through the course of household development may occur.

Using census data on age and employment characteristics of household individuals, and household ownership data, this section will attempt to test the relevance of the concept of the cyclical development of land ownership and operation corresponding to the stage of household development.

During the course of household development the number of members rises with the birth of children. Chayanov shows indices for consumers and workers (to indicate the demand for household income and availability of labour) based on scores for different age groups, gradually rising during the course of household development. The ratio of the consumer index to the worker index, the dependency ratio, increases until a point where the eldest child reaches the age of a worker (14 years), and from that time gradually decreases (see Table 7.2). As the number of children grows in a young household, the dependency ratio rises, and the adult workers are compelled to work harder (and cultivate a larger area) until the children come of age and the dependency ratio is restored to its initial value. (By this time the size of the family farm has increased.)

Although Table 7.2 does not admit the possibility, the consumer and worker indices will also decline from the time when adult offspring start to leave the household (and the size of the family farm decreases). Thus these three indices, as well as that of household size, although they are indicators of the stage of household development with regard to demand for and capacity for the extension of agricultural production, will fluctuate during the course of household development. Thus they are of little use in themselves as indicators of the stage of household development.

However, as the stage of household development will vary with the age of the household, time itself represents a uniform linear variable with which other household variables may be tested. The age of the household is dependent either upon the time of separation of young couples from the household of the previous generation to form new households, or, less frequently, upon the time of the assumption of the headship of the household from a previous generation. Therefore, assuming similar ages of marriages[1] and separation of young adults to form new households, in the majority of cases the age of the household may be assumed to vary directly with the age of the head of household.

It is necessary to test for the existence of a relationship between the stage of household development and both the real (according to the Count) availability of workers in the household and the theoretical (according to the age classifications of Chayanov) worker availability. If there is a significant relationship between the age of the head of household and indices of consumer and worker scores for different households, the former index may be considered an appropriate index for the stage of household development.

Thus the analysis of the relationship between household development and the extent of land ownership and operation is embodied in two stages: first, analysis of the correlation of demographic variables concerned with household development with the age of the head of household, and secondly, analysis of the correlation of agricultural ownership and operational variables with the age of the head of household. The variables used for each set of statistical tests may be henceforth termed "demographic" and "agricultural" respectively.

The demographic variables used include family number, the consumer index and worker index according to scores for

1 The possibility that different rates of partitioning of families, and different practices of the formation of joint families could have an effect on the relationship between household development and the extent of land ownership and operation is discussed in Section 7.4.

different age groups, and the dependency ratio (consumer index/worker index), according to Chayanov. Also shown are a modified worker index based on the same age scores as with Chayanov, but only for actual workers according to the 1978 Census and a modified dependency ratio based upon the consumer index and the modified worker index.

The agricultural variables, as well as total land ownership and operation for each land use type, include an index of agricultural income and an index of agricultural assets (as defined in Chapter 5), as attempts to represent realistically the total amount of accumulation of agricultural land. An index which is often used in village studies, that of total area owned (with no calculation for differences in productivity), is also included.[1]

Demographic and Agricultural variables were grouped and tested for their relationship with the age of the head of household using the Chi^2 distribution. This method of analysis was chosen as being the most appropriate: first because it allows testing for the existence of differences between the observed and expected distributions of grouped co-variables, and secondly because this non-parametric test allows the crosstabulation of skewed distributions. Moreover, presumed inaccuracies of age estimation (ages of adults in the Count generally proximated to multiples of 5 or 10), mean that the ages of heads of household are more conveniently grouped.

1 Mencher (1974) has complained with Beleille (1972) that, in village studies, statistical conventions (of accounting of land assets) often do not reflect production realities.

Tests were carried out both for all households and for dominant households (as defined in Chapter 5). The existence of non-dominant households particularly in the early stages of household development might be seen to produce an artificial statistical relationship between the stage of household development and the extent of land ownership. The heads of non-dominant households while not enjoying the land title would in fact receive a proportion of the farm management unit (as in Fig 5.1 A), and thus their subsequent ownership of land, delayed if the older generation had decided, for any reason, not to divide the farm management unit, would be initially a result of transfer through the mode of inheritance and thus not represent (to a greater or lesser degree than for other households) their demand for land. Therefore the exclusion of non-dominant households from the test for the relationship between the stage of household development and the extent of land ownership would eliminate from this relationship the effect of the inheritance system on mobility of land distributions[1].

In either village the proportions and age groups of non-dominant households were broadly similar (Table 7.3), showing concentrations especially in the lowest age group and to a lesser extent in the highest age group. This reflects the patterns of changing control of family land with the cycle of household development.

Table 7.4 shows the results of all tests, showing the degree of significance (95% to 99.5%) for the Chi^2 statistic.

1 However, the test for all households is relevant to the extent that it represents within the total system of land transfers the effect of the stage of household development on land ownership and operation.

The absence of any significant relationship between variables (significant at less than 95%) is shown as "N".

There is a strong relationship between the age of the head of household and all demographic variables for total households (dominant and non-dominant combined) in both villages, showing that the age of the head of household may generally be considered a suitable representation of the stage of household development.

A major difference is seen between the villages, however, in the strength of the relationship between the age of the head of household and agricultural variables. For total households in Village B there are apparently strong relationships between the age of the head of household and almost all land ownership variables. (Tests for wetland ownership and operation were not possible given the small number of wetland farmers.) For Village A, however, only for the "rogue" variable[1] total area operated and for wetland ownership was there any relationship between agricultural variables and the age of the head of household.

For dominant households only for Village B, as might be expected (because of the effect of elimination of inheritance as an explanatory factor), the relationships between agricultural variables and the age of the head of household are generally weaker, and are "eliminated" for total area owned and for gardenland operation. For dominant households for Village A, however, there are significant relationships for wetland ownership, stronger than

1 I.e. the undefined variable so often used in village studies of total land area.

for total households, and for wetland operation. This phenomenon may be explained by the tendency of some non-dominant households with younger heads of household to own or operate a small amount of land before inheriting their share of family land. This may either be in the form of poramboke land (classed here as owned), or a small area of leased-in land. However, the significant point to note here is that the subtraction of non-dominant households from total households does not greatly affect the relationship between the stage of household development and "agricultural" variables.

The effect of the relationship between the stage of household development and landownership on the age distribution of the total population, for major groups of landownership and operation may be seen in Fig 7.1 (for Village A) and Fig 7.2 (for Village B). For Village A, there is no significant difference between the age distributions of owners and non-owners of dryland and gardenland, or between the operators and non-operators of wetland. However, the age distribution of individuals in households owning wetland is significantly different from individuals in non-owning households (at 97.5% Chi^2 statistic[1]). For Village B for dryland especially, where the distribution of age groups is significantly different for owners and non-owners, and for gardenland less importantly (here there is no statistical difference for total age groups), there are striking differences in the proportions in certain age categories. For non-owners of both landuse types, the 0-2 and the 18-22

1 For four age groups.

age groups appear to possess greater numbers than for owners; correspondingly for owners of both landuse types there are proportionately greater numbers in the 3-17 age groups.

These observations would appear to be consistent with a pattern of accumulation of land by some households which initially contained proportionately greater numbers of young adults (aged 18-22) and young children (0-2), and which thereafter developed into households containing proportionately greater numbers of older children (3-17). That this pattern does not appear to be present in Village A may be explained for dryland and gardenland ownership by the absence of any significant relationship between the stage of household development and the extent of land owned or operated. Patterns for wetland ownership in Village A, however, although not characterised by the striking differences in age categories which are characteristic of Village B, are consistent with the relationship between grouped landownership and the age of the head of household outlined above. Whether these features result from differences in the pattern of household organisation between classes, or whether they reflect the changing stages of the normal family cycle, will be discussed in the summary.

7.3 Landownership and migration

7.3.1 Landownership and migration of dominant households

The relationship between the extent of landownership at any time and the probability of subsequent outmigration may be analysed using the methodology which has been used for the analysis of the mobility of ownership of different landuse types (Section 5.7). Because of the process of multiplication of the numbers of households over time through the cycle of household evolution, a single indivisible demographic unit, the lineage of the dominant household[1], is used, allowing tests for the correlation of migration during any time period with the extent of landownership at a previous time point.

Time is grouped into "stages" of change between single time points within the period of availability of landownership data. Analysis is also made of the relationship between landownership and migration over longer time periods between the already defined time points. Thus three time periods are defined for Village A (10 years, 20 years and 31 years), and four time periods for Village B (13 years, 26 years, 39 years and 52 years). Stages are grouped according to the length of the stage, and figures of migration from different classes aggregated in order to allow analysis of the comparative effects of differing time periods on migrational patterns.

1 The migrational patterns of non-dominant households or individuals are not part of this analysis.

Classes of ownership of gardenland and dryland within sample families, and total gardenland ownership are defined according to the actual distribution of landownership among dominant households at the start of each period of analysis.

The data used to analyse patterns in fact refers to the presence or non-presence in the village at any time point of the lineage of the dominant household. In the great majority of cases the non-presence in the village of the lineage of the dominant household indicated that the household had indeed outmigrated rather than deceased, or been absorbed by another lineage. Thus, although the migrational survey of the whole village covered the great majority of family trees in existence in the village during the respective periods of consideration, the complete disappearance of landowning households from the village, which had been present during earlier stages, begs the question of the mode of their departure. However, the non-presence of a lineage may be seen as a more complete expression of the final result of any process of regulation which may be shown to exist in either village.

The results of Chi^2 tests for the relationship between classes of landownership and subsequent outmigration over different time periods are shown in Table 7.5. There are significant relationships between total gardenland ownership and migration in both villages over different periods, Village A showing a strong relationship for 10 year periods, and Village B for 26, 39 and 52 year periods, reflecting the tendency of households of lower ownership classes to migrate. The difference between the two villages may be explained in that first in Village A the 1947 and 1958 distributions of ownership applied to a comparatively small area, and are thus probably less representative of the distribution of productive land assets in the village as a whole, and secondly in Village B the greatly increased volume of outmigration from all classes of ownership for 1965 between 1965 and 1978, because of falling water tables, meant that the test for 13 year periods showed no systematic trend.

Although, because of the comparatively small volume of outmigration from Village A, significant tests on the relationship between landownership and migration from sample families were not possible, for Village B tests found significant relationships. Gardenland ownership among sample families (which is unrepresentative of the total ownership because of the sampling system), shows a weak significant relationship with subsequent migration over 13 years (and a strong relationship over 52 years). Dryland ownership is strongly related to outmigration over 13, 26, and 39 years. The weaker overall relationship between gardenland ownership and migration among sample families, as compared with total ownership, may perhaps be explained in that sample family households are better "survivors" (sample families were selected from households existing in the village in 1978). However, among sample families there is a systematic tendency for smaller, or non-owners of dryland to migrate.

Thus with variations caused by the fluctuating gardenland total areas, migration of households may be assumed to vary with ownership of land. The length of time over which this relationship is true may vary.

7.3.2 Migration characteristics and employment

The distributions of the 11 migration variables, collected from the Family Lineage Survey, grouped according to in- and out-migration (Chapter 3), showed significant differences between the villages, which may be explained in terms of the changing availability of resources in either village (Chapter 6). The processes involved in migration to and from the villages, however, may not be explained purely in terms of the supply and demand of human and agricultural resources of the villages as a whole. In order to examine the processes of migration internal to the village, migration variables were grouped and tests carried out to gauge the significance of relationships between variables, using the Chi^2 distribution.

The Chi^2 test was considered the most appropriate as it allows the crosstabulation of variables of nominal (e.g. Caste) and grouped internal (e.g. Age) scales. An insufficient total population meant that tests were not possible. Where there is an intrinsic relationship between variables, caused by the overlapping of the determinants of data grouping, and therefore an automatically statistically significant correlation between variables, the relevant test is omitted.

Table 7.6 shows in matrix form the results of tests between all variables (excluding cases of intrinsic dependence, marked "ID"). The 11 variables may be grouped into four major groups of related variables: demographic, occupational, origin/destination, and time related variables.

The first five variables, Age, Sex, Spouse, Total Migrants, and Caste, may be termed demographic variables. Although migrating demographic units are untypical of households in general, tending to be younger and smaller, they are characterised by the same trends in the development of the household as resident households. Thus Age is related to Spouse, reflecting greater numbers of married principal migrants of higher ages, and Total Migrants, reflecting larger migrating demographic units with older principal migrants. (There is an intrinsic dependence between Sex and Spouse, as the principal migrant is more likely to be an adult male than an adult female, and between Spouse and Total Migrants, as Spouse represents another migrant and married migrants are more likely to be part of larger migrating demographic units.) Caste is not systematically related to other demographic variables. Age, however, is strongly related to Sex, reflecting greater proportions of migrating female principal migrants of higher ages.

Occupational variables (Occupation at Origin and Occupation at Destination), although not efficient indicators of wealth or classes of landownership (in the sense used in Chapter 5), provide a crude categorisation of the economic function of principal migrants in the village society[1]. Thus although within the agricultural sector only two occupational categories are allowed, the strong relationship between the extent of land

1 A categorisation which is perhaps consistent with the doubtful efficiency of memory over a maximum period of 30 years.

operation and agricultural occupation for the whole household (Section 8) means that it is a reasonable assumption that for migration data "Farmers" may be treated as operators of gardenland or wetland, and "Agricultural Labourers" as owners of dryland alone or landless. Within this crude dichotomy (the agricultural sector is the dominant sector for migrating groups), therefore, the "class"-related factors of migration may be analysed.

The more important occupational variable for the analysis of migration in its village context is Occupation at Origin for out-migrants and Occupation at Destination for in-migrants, and may be seen as response to village conditions. The analysis of Occupation at Destination for out-migrants, and Occupation at Origin for in-migrants allows the further illustration of the contexts of cases of individual migrations.

The third major group, origin/destination variables, Mode of Migration, Location and Size, are included to analyse the context of individual cases of migration. A significant proportion of migrations takes advantage of caste connections, facilitating acceptance into other close-knit societies. The Mode of Migration is separated into four categories which reflect the difference in agricultural productivity within the Kambam Valley, as well as distance from the villages, and Size separated into two categories, (Village and Urban[1]).

The fourth group, of one variable, Time, completes this categorisation.

1 Using the Census of India 1971 definition of an urban settlement as a settlement of greater than 15,000 population.

Although there are important variations between the four groups of migration data (in- and out-migration for both villages), relationships between variables are characterised by patterns which display a degree of consistency which suggests that similar processes are operating. The general trends, taking each variable in turn are listed below. (Where a relationship is already detailed, repetition is avoided).

1. Age is not systematically related to other variables (except other demographic variables) except for Village B out-migration, where Age is related to the occupational variables, with fewer younger farmers migrating. (The general tendency of students to migrate at younger age does not greatly affect the overall relationship).

2. Sex is generally related to occupational variables, reflecting the greater proportional numbers of female principal migrants of no occupation, or in the agricultural sector.

3. Spouse is generally related to occupational variables, especially for out-migrating groups, with greater proportions of principal migrants with agricultural occupations at origin and destination with spouse, and less with no occupation, wage earners (especially at destination), and students without spouse. Spouse is also related to origin/destination variables, where for out-migrating groups greater numbers of married principals migrated to villages, and to locations

within the Periyar Region.

4. Total Migrants is generally related to occupational variables for outmigrants only. The number of out-migrants tends to be greater for agricultural occupations, and smaller where the principal migrant has no occupation, is a student (at origin), or a wage earner or in business (at destination). There is also generally a significant relationship between Total Migrants and origin/destination variables, larger units tending to migrate to places of general family connection, and smaller groups to locations of no connection. (This relationship is not strong for in-migrants as most migrations into the sample villages are associated with family connections). Larger migrating demographic units tend to migrate to and from locations within the Periyar Region, and to and from villages rather than towns.

5. Caste is in all four groups related to occupational variables, the dominant castes in either village tending to have predominantly agricultural occupations, and other castes a variety of occupations. Caste is not systematically related to other variables.

6. Occupation at Origin is strongly related to 7. Occupation at Destination, although there is some mobility of occupation at migration, with a decrease in the proportion of agricultural labourers, though not of farmers, and an increase in the proportions of wage earners and businessmen for out-migrants. Occupation at Destination is related for out-migrating groups

(as is the occupation at origin for Village B out-migrants) to the Mode of Migration, agricultural occupations tending to be associated with general family connections, especially through the wife's birthplace. Occupation at destination is strongly related to the location and size of the destination for out-migrants from both villages, those agricultural occupations tending to migrate in greater proportions to locations inside the Periyar Region, and to villages, though agricultural labourers migrate in greater proportions outside the region and to towns rather than to villages from Village A. For in-migrating groups, relationships between occupational and origin/destination variables were weaker, and did not appear to be systematic.

8. Mode of Migration is related to other origin/destination variables in that migrations with no general family connection tend to take place to and from locations outside the Periyar Region, and to urban rather than village locations (though this relationship is confused by the Census of India classification by which many locations of essentially rural character especially in the Periyar Region (wet) are classified as towns by virtue of the size of their populations).

9. Location and 10. Size are closely related, urban locations of origins and destinations tending to be in greater proportions in the Periyar Region (wet) than in the Periyar Region (dry).

11. Time does not appear to be strongly or systematically related to other variables except for occupational variables

of Village B out-migrants where there are greater proportions of farmers migrating in later time periods. Thus the possibility that the greater accumulation of data on migration from the family trees in later time periods could have resulted from the identification of temporary migration as permanent migration, appears to be small, as later migrants are characterised by similar distributions of demographic, occupational, and origin/destination variables.

7.4 Summary

The general effect of demographic processes on the formation of classes of ownership will be assessed in this section with particular reference to the process of population increase.

For India many studies, for example Kessinger (1974), Singh (1979) and Krishnaji (1980), have noticed in village communities the statistically significant relationship between the extent of a household's land ownership and its organisation. The dominant pattern is one of a positive correlation between land area operated (and to a lesser extent land area owned) and family size. This relationship is complex, involving multidirectional causal links. Generally, however, four processes may be recognised which may explain the relationship between household organisation and the extent of ownership and operation, as well as having a direct influence on the distribution of classes of ownership and the proportions of the population in various forms of employment for the village as a whole:

1. The cycle of household evolution.
2. Partitioning rates.
3. Migration.
4. Growth rates.

Without a time series analysis it is very difficult to deduce from isolated data the direction of causation; for example it is impossible to determine whether the regulation of family size is a response to a set of economic conditions determined by the extent of land ownership and operation or whether changing family size determines the extent to which land is bought or sold or leased in or out. However, the analysis of single time point data with reference to other demonstrated processes over time, allows inferences as to the direction of causal links to be drawn. The four processes listed above will be investigated in turn below.

1. The cycle of household evolution

It seems to be clear from the analysis of the relationship between the age of the head of household and "agricultural" variables, that for dryland and gardenland ownership in Village B and for wetland ownership and wetland operation (to a lesser extent) in Village A, accumulation of land takes place over the course of the cycle for a significant proportion of households. That the age of the head of household is strongly related to Chayanovian indices of the stage of the cycle (family size, consumer and worker indices, and the dependency ratio for both theoretical and real occupational distributions) has been demonstrated, although it is impossible to infer from this relationship that these factors have a deterministic influence on landownership or operation. Moreover, the process of land accumulation cannot be seen to be closely dependent upon factors associated with the family cycle for five reasons.

First, it has also been demonstrated (Section 7.2.1) that the number of surviving male heirs at the time of the transference of property to the younger generation is not related systematically through time to the size "class" of landownership for any landuse type. The almost universal tendency for the pattern of transfer through the inheritance system to be "cyclical"[1], therefore, does not represent a stage in the Chayanovian system of expansion dependent upon the number of workers (in this case male workers[2]) in a family[3]. (The inheritance system, however, because of this pattern, should be viewed as a mechanism, however inefficient, leading to the redistribution of wealth in a situation of declining man-land ratios - it is the only "mode of mobility" which is consistently "cyclical".)

Secondly (as explained in Section 7.2.1), in a situation of limited land resource availability (and especially in one of declining man-land ratios) a conveyor-belt type system of land accumulation throughout the household's life is impossible for all households. As land is accumulated through the "financial transfer" mode of mobility during the course of household development, it must in a closed system be lost in equal quantities. Therefore any systematic process of land transfer (such as differentiation or polarisation) through the acquisition of land by higher

1 I.e. showing a cyclical pattern of transfer as defined in Chapter 5.

2 Although the inference is drawn from the number of males, rather than people in the succeeding generation, the existence of male labour is more important to the Indian farming household.

3 I.e. "demographic differentiation" or the phenomenon of inequality of ownership/operation geared to the family cycle.

ownership classes from lower ownership classes, is not inconsistent with a positive relationship between accumulation and the age of the head of household (and therefore other indices of households development) for a proportion of households.

Thirdly, as has been pointed out for Asthapuram-Kanthapuram by Sivakumar (1980),

> the vast range of inequalities is not explainable in terms of demographic factors.

This view is strengthened by the lack of any success in the statistical explanation of landownership distributions through the use of linear or staged linear regression analysis (the independent variable being age of the head of household or other household demographic variables). This is because of the highly skewed distributions which exist at any stage of household development.

Fourthly, Chayanovian theories do not explain why such a significant proportion of households at any given stage of household development, for both villages, even allowing for the existence of a non-agricultural sector, do not own land.

Fifthly, in Village A for gardenland and dryland ownership and operation there is no significant relationship between land accumulation and the stage of household development.

2. Partitioning rates[1]

Krishnaji (1980) and Singh (1979) have pointed out the

1 I.e. the timing of partition during the development of the household, rather than the number of subdivisions from the original household.

advantages of delayed partition for higher ownership groups, including advantages of allowing diversification of economic activities, of pooling of technologies and labour, and of trading, pointing out that while there are no forces which arrest the process partition for lower income families, for whom intra-family income sharing may be difficult. Moreover, Krishnaji, (op.cit.) points out that life expectancy among agricultural labouring classes may encouragepartition realised through early marriage. Moreover, Epstein's (1962) bland statment that

> economic development, whether or not it brings about economic changes, will almost invariably result in the breaking up of joint family ties

has been challenged by the research of Kolenda (1970) on Lokiland Village, Maharastra, showing that for the period from 1819 to 1967 that "joint family living had not declined", by Kessinger (1974) showing that for Vilyatpur there was only a slight decline in property groups composed of more than one adult male, and Hill (1980), showing that for six villages in rural Karnataka, among richer households the incidence of jointness was greater.

Although there are no data as to the extent of nucleated or joint families in either of the two sample villages, there exist, especially in Village A among higher ownership groups, extended households which are organised to maximise the advantages of economic cooperation. The attached labour, employed by richer households, moreover, may be seen as an extension of a household's labour power, being continually available for work only on household owned or operated land. Therefore households employing attached labourers may be considered extended farm management units, if not households. If landowning households do undergo partition, however, some of the advantages of extended households may be retained (for non-dominant household) by their involvement in the farm management unit.

There is no evidence to suggest that there has been a systematic decline in household size in either of the villages, with economic development. Although the maintenance of average family size, with a certain amount of fluctuation (see Table 3.7) may be consistent with a gradual decline in the proportion of extended family units, and the increase in the numbers of household individuals under the age of marriage (with decreasing mortality), there is no reason to believe that economic development as such has contributed to a decline in the proportion of extended households.

3. Migration

The rate of migration for dominant households[1], has been shown to be negatively related to the extent of landownership at the start of "stages" (as defined in Chapter 5 (Section 7.3.1), although there may be fluctuations, especially in Village B.

It has also been shown (in Chapter 3) that the proportion of out-migrating groups having agricultural labourers as principal migrants is greater than those having farmers as principal migrants, and that employment for

1 Or non-survival of a household to the next generation.

outmigrants is related to the agricultural sector at origin (while for in-migrants is related to the non-agricultural sector) (Chapter 6). If the proportion of migrating households of agricultural labourers were shown to be related positively with age, this would tend to explain to some extent the observed relationship between the age of the head of household and "agricultural" variables. However, it has been shown that for out-migration occupation is related within the agricultural sector to age, there being fewer farming (than agricultural labourer) principal migrants of the younger age groups, thus suggesting that the proportion of migrating households in the agricultural labourer class is related negatively with age.

Moreover, it is likely that the younger and smaller composition of migrating groups (shown in Chapter 3) is, especially for out-migrants related to the age stucture of the agricultural labourer occupational category (Fig 3.3) which shows greater proportional numbers in the 18-22 age group. For Village B, the effect of greater proportional out-migration of males in the younger age groups is seen in the age structure of the village (Fig 3.1). For both villages in general, the greater proportional out-migration of younger age groups especially within the agricultural sector would tend to decrease the proportion of younger non-owning and non-operating households.

The out-migration of sections of agricultural labouring households would tend to decrease their size, making their development into extended households less likely. Moreover, migration from households of higher ownership classes may be seen as a less than total break with the village. Kessinger (1974) notes that the extent of land acquired in Vilyatpur was related to the number of a family's relatives living abroad, because of remittances invested in the family's landbase.

Migration, therefore, may be seen as a mechanism which tends to regulate both the proportions of households in the village and their individual size, and thus the balance of the supply and demand for labour. This view is reinforced in that it operates in age specific categories, and tends, therefore, to lessen the effects of the age-wise distribution of land, rather than cause it, by "squeezing out" surplus labour in a situation of increasing population. Kessinger (1974), recognises that out-migration has always been an important factor in the demographic history of Vilyatpur, being negatively related to landownership. Bardhan (1977) has recognised internal (i.e. rural to rural) migration (which is the dominant form of migration for the agricultural sector of the two villages) as an "adjustment factor" for labour supply in the rural economy, quoting N.S.S.[1] data to show that

> the composition of the working rural migrants is more heavily weighted by agricultural labourers .... than the composition of the total working population.

Moreover Bardhan (op.cit.) notes that with increases in population, there is likely to be an increasing concentration of population in the younger age groups competing for available employment.

1 National Sample Survey

4. Growth rates

Higher fertility among households of lower ownership classes may have the effect of increasing the proportions of population in younger age groups. Because of the younger overall age distributions of lower ownership classes for Kerala, Krishnaji (1980) infers that this represents higher fertility matched by higher mortality rates, a situation which encourages early partition.

However, for the sample villages age distribution data show that for a significant proportion of households, especially in Village B (Fig 7.2), accumulation is related to the stage of household development; growth rates alone cannot account for differences of age distribution between classes of ownership.

However, the higher fertility of lower ownership classes may be inferred in the sample villages from the juxtaposition of two demonstrated processes: first the relationship between ownership and migration patterns, and secondly the lack of any significant relationship between the numbers of surviving male heirs at the time of dissolution of family property and the class of ownership. If fertility for both classes were similar, this would imply that, with the greater proportional out-migration of lower ownership classes, especially in the younger age groups, there would be a positive relationship between class and the number of inheriting sons. As this is not so , the greater proportional non-survival to the stage of inheritance, of lower ownership classes, would result from a combination of higher fertility and higher out-migration (combined perhaps with higher mortality).

Thus Krishnaji's (1980) observation that the larger family size among the "upper" sections of the peasantry in Kerala is maintained "in spite of possibly low birth rates ... by low rates of partitioning" probably has some validity, Krishnaji ignores the process of accumulation through the development of the household.

Thus it has been demonstrated for the two sample villages the stage of household development is significantly related to mobility (though not necessarily because of demographic factors concerned with the family cycle), and that the inheritance and migration systems play an important role in land redistribution, especially where there is increasing population.

There are, however, important differences in the relationship between the stage of household development and the extent of landownership and operation for both villages. The greater importance of the family cycle, in explaining changes in landownership for a significant proportion of the population, for Village B is seen in the fact that the age of the head of household is related to all agricultural variables for total households, whereas (apart from the "rogue" variable total operated area) this is true only for wetland ownership in Village A. For Village B, this relationship is stronger for dryland than for gardenland. That, however, for Village A the age of the head of household is not significantly related to dryland or gardenland ownership or to wetland operation, and that this relationship among dominant households should be stronger for wetland ownership than for wetland operation (where changes in the demand for consumption and availability of household labour would be expected to act more strongly on areal extent, because of the flexibility provided by leasing) indicates that the relationship between the age of the head of household and the extent of wetland operation is the result of a factor other than the family cycle.

The distinctive age distribution of individuals of households owning wetland (Fig 7.1), showing proportionately higher numbers in the older age groups, seems to indicate that this factor may be identified as either a slower rate of partition (leading to extended family households), or a slower rate of partition combined with lower fertility (as Krishnaji, 1980, suggests). It is probably a combination of both, given the combination of the general overall relationship between out-migration and non-ownership of land, and the lack of a significant relationship between numbers of heirs at partition and ownership class.

The implications of this conclusion are relevant as stated in the introduction to this chapter (Section 7.1(c.)), to the relationship between the nature of agricultural production (whether subsistence or commercial) and the strength of the family cycle factors in determining the extent of land operation. For the poorer resource village, Village B, where there had been, at the time of the survey, only recent emergence from a traditional system of agriculture dominated by the polyculture of millets with some cash crops, a significant subsistence economy may be presumed to have existed (which continued to be true for dryland for most dryland farming households) which is reflected in the relationship between age and landownership. Because of the lack of such relationships, except where connected with the formation of extended family households, in Village A the wetland (and new gardenland economy) cannot be presumed to have been a subsistence economy. That for the possible subsistence sector, dryland, there are not demographic relationships with landownership may be explained in the light of the strong relationships between the ownership of different landuse types (examined in Chpater 8).

These views are difficult to reconcile with Kessinger's (1974) view of the property group (lineage) characterised by the stable ownership of land in a generally non-polarised distribution, continually adjusting (either through leasing in or out, or through technological change to improve labour productivity, or through migration) to changes in the size of the family induced by the cycle. Similarly it is difficult to accept the total rejection of independently acting demographic forces, by others, including Krishnaji (1980), who states

> the ability of poor peasants surviving on tiny bits of land to acquire additional land (or other assets) remains no more than an unrealistic possibility[1].

1 Attwood (1979) most importantly has shown that a simplistic "Marxist" set of hypotheses involving the unilinear polarisation of ownership is not applicable to the Indian village, where upward and downward mobility of ownership both among owners and between owners and non-owners is a major process.

Perhaps one of the main problems plaguing this debate is the lack of any attempt to separate landuse types, or to categorise land values. These, as we have seen, have a profound influence on the production process and ownership transfer system. The "rogue" of total area owned or operated, which appears so often in the village studies of India has the extraordinary ability to confuse meaningful analysis.

FIG 7.1 Age Comosition of population by land ownership or operation, Village A (Numbers/5 Yrs)

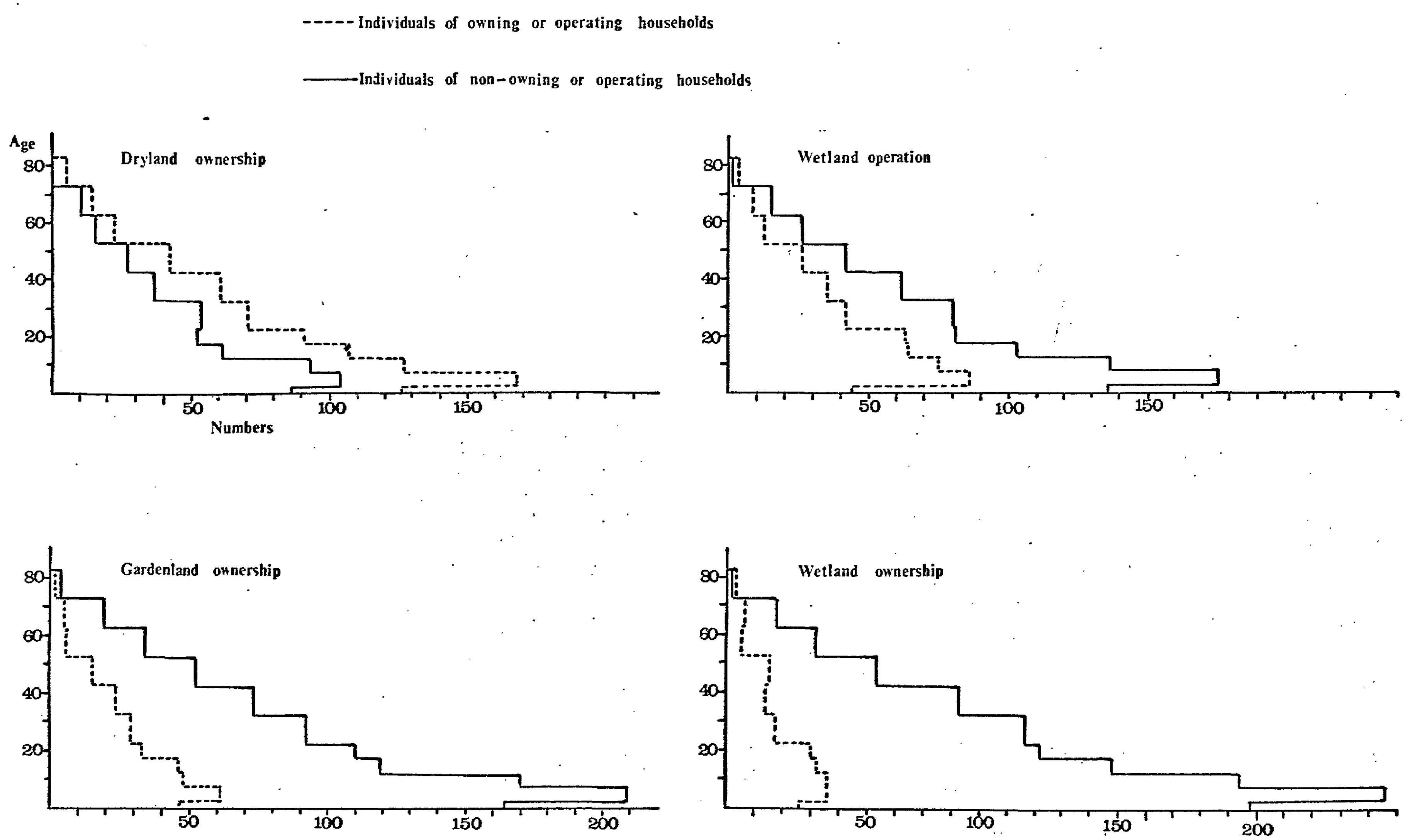
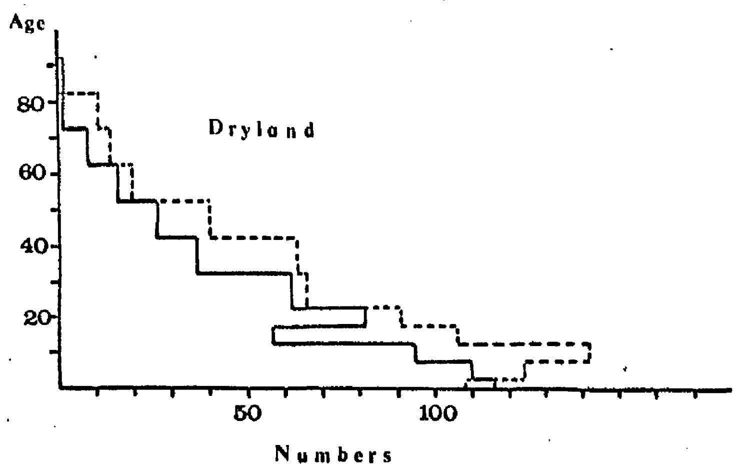


Fig. 7.2 Age Composition by Land Ownership

Village B (Number/5Yrs)



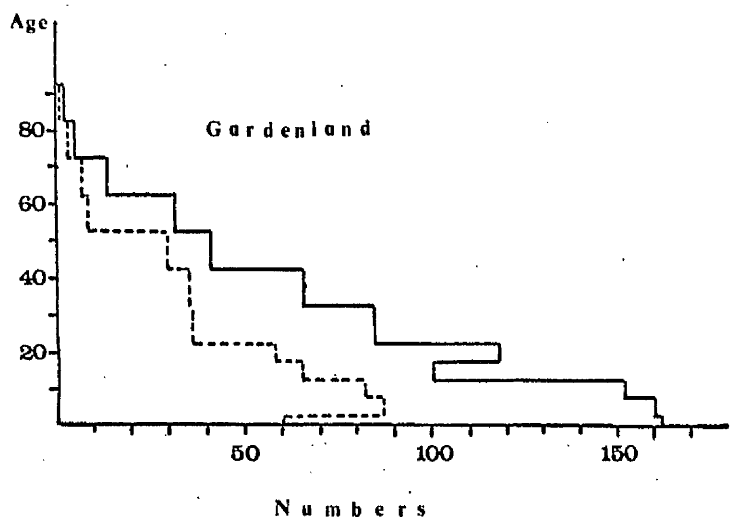


Table 7.1 Correlation[1] of Number of Directly Inheriting Male Heirs at each Occasion of Land Transfer through the Inheritance System, and Area Owned at the time of Transfer

Village A

	Stage A	Stage B	Stage C
Dryland Sample	-0.227	0.054	0.057
Gardenland Sample	0.063	0.507	0.000
Gardenland Total (Owners only)	0.193	0.118	0.332

Village B

	Stage A	Stage B	Stage C	Stage D
Dryland Sample	-0.010	0.005	-0.009	0.000
Gardenland Sample	0.1059	0.4520	-0.2891	0.1859
Gardenland Total (Owners only)	0.011	0.013	0.016	0.009

1 Correlation Coefficient

Table 7.2 Indices of Household Development (after Chayanov, 1966)

Years of family's existence	Married Couple	Children 1	2	3	4	5	6	7	8	9	Consumer Index	Worker Index	Dependency Ratio
1	1.8										1.8	1.8	1.00
2	1.8	0.1									1.9	1.8	1.06
3	1.8	0.3									2.1	1.8	1.17
4	1.8	0.3									2.1	1.8	1.17
5	1.8	0.3	0.1								2.2	1.8	1.22
6	1.8	0.3	0.3								2.4	1.8	1.33
7	1.8	0.3	0.3								2.4	1.8	1.33
8	1.8	0.3	0.3	0.1							2.5	1.8	1.39
9	1.8	0.5	0.3	0.3							2.9	1.8	1.61
10	1.8	0.5	0.3	0.3							2.9	1.8	1.61
11	1.8	0.5	0.3	0.3	0.1						3.0	1.8	1.66
12	1.8	0.5	0.5	0.3	0.3						3.4	1.8	1.88
13	1.8	0.5	0.5	0.3	0.3						3.4	1.8	1.88
14	1.8	0.5	0.5	0.3	0.3	0.1					3.5	1.8	1.94
15	1.8	0.7	0.5	0.5	0.3	0.3					4.1	2.5	1.64
16	1.8	0.7	0.5	0.5	0.3	0.3					4.1	2.5	1.64
17	1.8	0.7	0.5	0.5	0.3	0.3	0.1				4.2	2.5	1.68
18	1.8	0.7	0.7	0.5	0.5	0.3	0.3				4.8	3.2	1.50
19	1.8	0.7	0.7	0.5	0.5	0.3	0.3				4.8	3.2	1.50
20	1.8	0.9	0.7	0.5	0.5	0.3	0.3	0.1			5.1	3.4	1.50
21	1.8	0.9	0.7	0.7	0.5	0.5	0.3	0.3			5.7	4.1	1.39
22	1.8	0.9	0.7	0.7	0.5	0.5	0.3	0.3			5.7	4.1	1.39
23	1.8	0.9	0.9	0.7	0.5	0.5	0.3	0.3	0.1		6.0	4.3	1.39
24	1.8	0.9	0.9	0.7	0.7	0.5	0.5	0.3	0.3		6.6	5.0	1.32
25	1.8	0.9	0.9	0.7	0.7	0.5	0.5	0.3	0.3		6.6	5.0	1.32
26	1.8	0.9	0.9	0.7	0.7	0.5	0.5	0.3	0.3	0.1	6.9	5.2	1.32

Years	Score	
1	0.1	Consumers
2 - 7	0.3	Consumers
8 - 13	0.5	Consumers
14 - 18	0.7	Workers
≥ 19	0.9	Workers

——— Dividing Line between Consumers and Workers.

Table 7.3 Proportions of Non-dominant Households to Total Households in Different Age Groups by Head of Household

	Age Group of Head of Household			
	0-32	33-42	43-52	53-62
Village A	22.9%	6.3%	1.3%	17.1%
Village B	30.2%	7.7%	2.6%	12.3%

Table 7.4 Relationship between Agricultural and Demographic Variables and the Age of the Head of Household

(Using Chi^2: Significant Relationship shown; "N" indicates Not Significant all 95%)

Agricultural Variables

	Village A		Village B	
	All Households	Dominant Households	All Households	Dominant Households
I.A.P.	N	N	99.5%	95.0%
I.A.L.A.	N	N	99.5%	97.5%
Total Operated Area	95.0%	N	97.5%	N
Dryland Ownership	N	N	99.5%	99.0%
Dryland Operation	N	N	99.5%	97.5%
Gardenland Ownership	N	N	99.5%	99.0%
Gardenland Operation	N	N	95.0%	N
Wetland Ownership	95.0%	99.0%	-	-
Wetland Operation	N	97.5%	-	-

Demographic Variables

	Village A	Village B
	All Households	All Households
Family Number	99.5%	99.5%
Consumer Index	99.5%	99.5%
Worker Index	99.5%	99.5%
Dependency Ratio	99.5%	99.5%
Modified Worker Index	99.5%	99.5%
Modified Dependency Ratio	99.5%	99.5%

Table 7.5 Relationship between the extent of Landownership and Out-migration (using Chi^2)

Data definition

	Length of Period	Aggregated Stages
Village A	10 years	1947-58, 1958-68, 1968-78
	20 years	1947-68, 1958-78
	31 years	1947-78
Village B	13 years	1926-39, 1939-52, 1952-65, 1952-78
	26 years	1926-52, 1939-65, 1952-78
	39 years	1926-65, 1939-78
	52 years	1926-78

	Landuse type	Period 10 years	20 years	31 years
Village A	Total Gardenland (Owners)	1	N	N
	Sample Families	Insufficient data to produce significant tests.		

		Period 13 years	26 years	39 years	52 years
Village B	Total Gardenland (Owners)	N	1	1	1
	Sample Family Gardenland	3	N	N	1
	Sample Family Dryland	1	1	1	N

1 Significant at 99.5%
2 " " 99.0%
3 " " 97.5%
N Not Significant

Table 7.6 Crosstabulation[1] of Migration Variables

Out-Migration Village A

	Variable Number										
Variable (and Number)	1	2	3	4	5	6	7	8	9	10	11
1. Age	-	99.5	99.5	99.5	N	N	N	N	N	N	N
2. Sex		-	ID	N	N	99.5	99.5	ID	N	95	N
3. Spouse			-	ID	N	99.5	99.5	ID	99.5	99.5	N
4. Total Migrants				1	N	N	99.5	99.5	97.5	N	N
5. Caste					-	97.5	N	N	N	99.5	N
6. Occupation Village A						-	99.5	N	N	N	N
7. Occupation Destination							-	99.5	99.5	99.5	N
8. Mode of Migration								-	N	N	N
9. Location of Destination									-	99.5	N
10. Size of Destination										-	99.5
11. Time											-

Out-Migration Village B

	Variable Number										
Variable (and Number)	1	2	3	4	5	6	7	8	9	10	11
1. Age	-	95	99.5	N	N	99.5	97.5	N	N	N	N
2. Sex		-	ID	97.5	N	N	97.5	ID	N	N	N
3. Spouse			-	ID	N	99.5	99.5	ID	97.5	99.5	N
4. Total Migrants				-	N	99.5	99	99.5	99.5	99.5	N
5. Caste					-	99.5	99.5	N	99.5	N	N
6. Occupation Village B						-	99.5	99.5	99.5	99.5	99.5
7. Occupation Destination							-	99.5	99.5	99.5	99.5
8. Mode of Migration								-	99.5	99.5	N
9. Location of Destination									-	99.5	99.5
10. Size of Destination										-	N
11. Time											-

In-Migration Village A

	Variable Number										
Variable (and Number)	1	2	3	4	5	6	7	8	9	10	11
1. Age	-	N	N	N	N	N	N	N	N	N	N
2. Sex		-	ID	N	N	99.5	99.5	ID	N	N	N
3. Spouse			-	ID	99.5	99.5	99.5	ID	N	N	99.5
4. Total Migrants				-	N	N	N	N	N	99.5	N
5. Caste					-	99	99.5	95	N	N	N
6. Occupation Origin						-	99.5	99	N	99	99
7. Occupation Village A							-	99.5	N	N	99.5
8. Mode of Migration								-	N	95	95
9. Location of Origin									-	99.5	N
10. Size of Origin										-	N
11. Time											-

In-Migration Village B

	Variable Number										
Variable (and Number)	1	2	3	4	5	6	7	8	9	10	11
1. Age	-	97.5	95	97.5	N	N	N	99	95	N	N
2. Sex		-	ID	N	N	95	97.5	ID	N	N	N
3. Spouse			-	ID	N	N	N	ID	N	N	N
4. Total Migrants				-	N	N	N	99	99.5	99.5	N
5. Caste					-	99	97.5	N	N	97.5	95
6. Occupation Origin						-	99.5	N	N	N	99
7. Occupation Village B							-	95	N	N	97.5
8. Mode of Migration								-	99.5	N	N
9. Location of Origin									-	99.5	N
10. Size of Origin										-	97.5
11. Time											-

1 Using Chi^2 Distribution. Level of Significance, as a percentage for 95% and above. N indicates Level of Significance falls below 95%. ID indicates Intrinsic Dependence between Variables resulting from classification method.

Chapter 8

Relationships between Agriculture and Class

8.1 Introduction

This chapter will attempt to examine the factors controlling the changing relationship between agricultural process and social relationships within the village, through an examination of the relationship between production patterns and demand for labour for various landuse types, and two indices of social relationships, the distribution of landownership and operation, and the organisation of agricultural labour.

Because of fundamental differences between types of agricultural production and labour organisation which preclude the mere discussion of total agricultural production or labour demand, reference has been made in earlier chapters to the relationship between agriculture and social relationships. Therefore because Chapter 4 showed that the spatial and seasonal variation in the availability of water for irrigation and the utilisation of irrigation technology produced three distinct landuse types characterised by essentially unique cropping patterns, productivity and labour demand, in Chapter 5 ownership patterns were described with reference to landuse type. And, because of the essential difference between male and female patterns of labour organisation and payment, in Chapter 4, labour demand was described with reference to this division.

This chapter will first attempt to examine the relationship between agricultural productivity and ownership and operation distributions. This is attempted through a discussion of patterns of mobility of ownership for the different landuse types, through an analysis of the relationship between ownership of different landuse types, through an examination of the nature of the relationship with the labour demand of the production process, and the extent of ownership and operation, and through an examination of the relationship between land productivity and tenancy arrangements. Secondly, the chapter will examine the nature of the relationship between labour demand and labour organisation.

8.2 Agricultural productivity and the distribution of land ownership and operation

8.2.1 Mobility of ownership within landuse types

Although local land values tend to vary inversely with the spatial extent of a particular landuse type, the value of a landuse type will vary directly with its productivity and hence profitability. In an open market, increases in land value result in direct decreases in the accessibility of the general population to land. Thus the degree of inequality of ownership will vary with the distribution of land value in the village, both between and within the various landuse types[1]. The degree of inequality of ownership will vary, too, with the distribution of wealth in any society. As wealth, in an agricultural society, is a facet of the ownership of land itself, the ability to accumulate land through buying on the open market and thus the degree of inequality of landownership will be accentuated by differences in productivity.

The analysis of the relationship between landuse type and the distribution of ownership and operation at the time of the survey showed that the ranking of landuse type according to productivity and value (first wetland, then gardenland, then dryland), was directly correlated with the degree of inequality

1 No quantification of the extent of variation of values within landuse types themselves was possible. Dryland values varys with the distance from the village site, and fertility, two factors interrelated by the physical characteristics of village land (see Section 4.2.1), gardenland values varied largely with the reliability of well water, and those of wetland with the distance from the threshing floor.

of ownership for all households, the amount of land leased, and the proportion of households leasing in land. This ranking also shows a positive correlation with the proportions of landowning households and the degree of inequality of ownership for all households, for periods of available data[1] for sample families of both villages. The one exception to this general rule, the distribution of ownership among sample families of Village B from 1926 to 1944 (Fig 5.9), where there is a similar degree of inequality for both gardenland and dryland, may be explained by two factors; first, sample families are increasingly unrepresentative of total ownership with receding time, their higher initial total area of gardenland ownership (and thus smaller degree of inequality), allowing greater chances of survival through non-migration for selection for time-series analysis, and secondly the increasing assumed productivity[2] of gardenland would have increased its comparative value, and thus reinforced the processes relating value to inequality.

Differences in the distribution of ownership of the various landuse types over time may to some extent be explained by patterns of land transfer, particularly those to do with transfer through Sales. For periods of relatively stable areal extent of ownership among resident households of the village or sample families, with relatively little change through the mode of mobility of <u>Physical change</u>, the patterns

1 For Village A 1947 to 1978, for Village B 1926 to 1978.

2 Although there is no direct evidence to suggest that productivity was increasing during this period, the assumed gradual deepening of the water table in Village B would have reflected increasing intensity of cultivation and hence productivity.

of change shown by the transfer of land from different classes of ownership through the mode of mobility of financial transactions, assuming an equal distribution of transfers through the mode of mobility of the Inheritance system, would tend to reflect the trends towards equality or inequality of onwership for any landuse type. Therefore differences in patterns of mobility through Sales between landuse types would tend to illustrate the capacity or tendency of different classes of ownership among the different landuse types to accumulate or lose land. While it is important in this context to examine both total and relative change from any ownership class over a period of time in terms of area and numbers of households, the distribution of change (otherwise the relationship between area and household change) from classes is also important as mobility from classes is not uniform in direction. The relationship between mobility of area and household numbers for the Inheritance system and for Physical change show close, though not directly linear, relationships[1]. Over a period of time, the extent to which household number and area changes are related through Sales, therefore, is important to trends in the distribution of total ownership.

The patterns of mobility through Sales is similar for both villages for dryland ownership, showing comparative upward mobility from central classes, and downward mobility from outer classes (Outer-class downward). Gardenland

1 Except for Village A gardenland for lower classes for Stage C through physical change, where dynamical expansion of area occurred among a few owners.

patterns of mobility for both villages, however, show dissimilar patterns: in Village A a Cyclical pattern in Stage A eventually changing to an Anticyclical pattern by Stage C, and in Village B an Anticyclical pattern holding for the first three stages, changing to an Outer-class downward pattern by Stage D. Thus while for dryland its Outer-class downward pattern of mobility for Sales would not result in any systematic change in the equality of ownership, the dominant Anticyclical pattern for gardenland for Village B, characterised by net losses from lower classes of ownership, and net gains from higher classes, would have resulted in increasing total inequality of ownership, and similarly the developing Anticyclical pattern for Village A gardenland would result in increases in inequality coincident with the expansion of the gardenland system during Stage C.

The distribution of change from various classes[1] through Sales for all landuse types shows generally a positive skew for lower classes, and a negative skew for higher classes of ownership. Fig 8.1 illustrates in idealised form the differences between the distributions of change from higher and lower classes of ownership. Such a difference would seem to suggest that although the distribution of change from lower classes is dominated by downward moving households, the accumulation of land through Sales from lower classes where it takes place is at first fast then slow. Conversely the distribution of change from higher classes is dominated by upward moving households, and the loss of land from higher classes, where it takes place is similarly fast then slow.

1 It should be emphasised that ownership classes are relative concepts, changing through time according to the distribution of ownership.

The distribution of ownership of dryland through time is relatively stable for both owners alone and for total households. (The trends for the ownership of sample households and of total households are similar for gardenland, indicating the reliability of dryland sample family data). Trends in the distribution of gardenland ownership, however, are dissimilar for both villages. The distribution of total gardenland ownership in Village A (Fig 5.10), from 1947 to 1978, while in Village B, (Fig 5.10), total inequality increases steadily from 1926 to 1978. Paradoxically, while inequality among owners in Village A increases over the period of data availability, that among owners in Village B remains remarkably steady. This difference may partly be explained in the context of changes in the total area of gardenland and the proportions of households owning gardenland. The spectacular increase in gardenland area in Village A from 1964 to 1972 resulted in an initial increase in the proportion of households owning gardenland, while the proportion of owning households in Village B has declined steadily in spite of the increase in area from 1926 to 1963. The degree of inequality of total ownership in Village A has therefore remained steady in spite of the increases in both total area and the proportion of owners (because of the increase in inequality among owners), whereas the inequality among gardenland owners in Village B has remained steady while the proportional decrease in total ownership has meant an increase in total inequality.

Changes in the Physical Change mode of mobility reflect the changing differences of area under gardenland between the villages.

However the distribution of change from different classes of ownership indicates no pattern of mobility for dryland of both villages, and for gardenland in Village B. For gardenland of Village A, proportional increases have been most pronounced from the outer classes, but have been highly skewed from the lower classes. Thus while in Village B, the falling water table did not selectively effect any class and therefore had no effect on ownership distribution, in Village A gardenland was acquired in significant proportion by previous non-owners, as well as being developed by the higher ownership classes.

The trends in equality of ownership of different landuse types for the whole village may be further explained in the context of mobility of land ownership between owners and non-owners. The rate of entry and exit from different landuse types[1] (Table 5.10) show that for each village, the rate of entry into ownership for almost all stages is greater for dryland than for gardenland, and the rate of exit is for all stages greater for gardenland than for dryland. This means that of there is no change through Physical Change, the proportion of households in the villages owning gardenland would decrease in comparison to the proportion owning dryland, if the rate of sub-division through the Inheritance System is assumed to be similar for both villages. This is in fact true of Village B, where the proportion

1 Insufficient data were available for wetland, though the comparatively small proportion of owning households in Village A, and small mean area of holdings would seem to suggest that, like gardenland, the rate of exit from ownership is greater than the rate of entry into ownership.

of sample family households owning dryland remains steady at about 50%, while the proportion of gardenland owning households decreases steadily (Fig 5.7). In Village A, where there has been an increase in the area of gardenland which is larger than the rate of population increase, the proportion of landowning households among sample families increased from 1947 to 1968, but decreased thereafter despite further increases in total area. The proportion of sample family households owning dryland remained relatively high, fluctuating between 57% and 77%.

8.2.2 Ownership and operation of different landuse types

Three basic determinants of the relationships between the ownership of different landuse types by the same household may be identified: first the profitability of "dominant" landuse types, secondly, the demand for different types of production by the farming household, and third the compatibility of the production processes of different landuse types.

8.2.2a Profitability of dominant landuse types

As the ability to produce net profits increases with the extent of ownership or operation of land, and will do so according the the productivity of the land, the capacity of the farm management unit to save money, and thus the wealth of the household and ability to accumulate land is increased. Thus the ownership of less productive, and therefore, less valuable landuse types will be "dominated" by the ownership of more productive landuse types.

Section 5.5 illustrated the strong relationship between the ownership or operation of different landuse types by individual households in both villages. While in Village B, because of the relative absence of wetland and because leasing is less important, a straightforward pattern emerges: the majority of gardenland owners (90.1%) also own dryland (Table 5.4), there is a high correlation (r=0.6723) between the extent of gardenland and dryland ownership (Table 5.5a), and the extent of dryland ownership is correlated more strongly (r=0.5247) with the extent of gardenland ownership among gardenland owners than is the extent of gardenland ownership with the extent of dryland ownership (r=0.4109) among dryland owners (Table 5.5b). Clearly gardenland is the dominant landuse type, determining to a great extent the ownership and operation of dryland. Although the majority of households (72.7%) which own wetland also own the other two landuse types (Table 5.4), they represent only a small proportion of households. There is little doubt that the limited accumulation of wetland from about 1970 in Village B was made possible because of profits from gardenland cultivation (and especially banana cultivation).

As for Village A, there is also a pattern where it is unusual to own or operate either wetland or gardenland alone, whereas a high proportion of households either owning or operating dryland do so without wetland or gardenland (Table 5.4). Wetland ownership appears to dominate wetland operation in that a higher proportion (45.2%) of wetland owners <u>own</u> gardenland and dryland, than the proportion of wetland operators who <u>operate</u> gardenland and dryland (35.4%). There is also a higher correlation between wetland ownership and gardenland ownership (r=0.7087) than between wetland operation and gardenland ownership (r=0.6023), and a higher degree of correlation between wetland ownership and dryland ownership (r=0.5896) than between wetland operation and dryland ownership (r=0.5831). However there appears to be a slightly paradoxical relationship between the ownership of wetland, and that of gardenland and the ownership of dryland. Whereas wetland ownership appears to dominate gardenland ownership in that there is a lower proportion (42.9%) of wetland owners who own dryland alone than for gardenland owners (60.3%) (Table 5.4), and there is a higher degree of correlation between wetland and dryland ownership (r=0.5896) than between gardenland and dryland ownership (r=0.5567), the relationship between the extent of wetland ownership and dryland ownership among gardenland owners is stronger (r=0.5228 and r=0.5510 respectively) than the relationship between the extent of gardenland ownership and dryland ownership among wetland owners (r=0.3128 and r=0.2818 respectively).

This phenomenon may be explained in the light of the recent development of gardenland as a major landuse type in Village A. The present pattern of dominance of gardenland over wetland in Village B was probably similar to the dominance of wetland over dryland before the increase in gardenland area in Village A. That there is a strong relationship between the extent of wetland ownership and dryland ownership among gardenland owners reflects the probable relationship between initial development of gardenland and the ownership of wetland.

Because of the relationship between land value and mobility, and between the ownership of various landuse types, the extent of and proportions of profitable landuse types will determine the degree of inequality of ownership (and thus wealth within the agricultural sector) for the village. Thus for Village A the extent of ownership and operation of the most productive landuse types has increased the inequality of total ownership as seen in the greater degree of inequality for both the Index of Agricultural Land Assets and the Index of Agricultural Profitability for Village A than for Village B. However, while in Village B the relative absence of leasing meant that profitability, saving, and subsequent accumulation of land was effectively limited to land owners, in Village A the leasing of wetland means that there is the possibility of more relative mobility from non-owners though at a slower rate.

8.2.2b Demand for different types of production

While profitability increases the capacity to accumulate, the need for production for both commercial and subsistence purposes (both in the context of the household and of the village) means that demand for land may be diversified to different types of land. Although both villages are characterised by landuse types of differential production, agricultural production in either village developed from a system dominated in 1915 by production for subsistence consumption to one dominated by the time of the survey by production for commercial marketing. This development was not a smooth process, punctuated as it was by developments in technology. Though farmers of productive land would have attempted to maximise the proportion of crops which could be sold, a process which varied with landuse type[1], they have generally planned to retain a proportion for consumption by the household. For farmers of dryland only, dryland production has represented a purely supplementary source of income or subsistence, because of the generally smaller amounts of dryland owned and its inadequate and seasonal production[2]. For gardenland and wetland farmers dryland represents an alternative means of production for subsistence, and thus the existence of dryland must be seen as an encouragement for the total commercialisation of the more productive landuse types. Although this factor may be less important to the larger wetland owners, especially with their decreasing tendency to consume millets, the ownership of dryland still represents a source of security[3]. and dryland production may be sold in the village if not consumed by the household.

1 Either a proportion of total production, as for wetland, or a proportion of area and time given over to the production of commercial crops.

2 The same is probably true for pre-green revolution gardenland in Village A.

3 It may also be seen as a desirable diversification of production.

8.2.2c Compatibility of the production processes of different landuse types

The differences in seasonal variations in the demand for male and female labour for the different landuse types allows and perhaps encourages the cultivation of different landuse types. The production processes of both dryland and wetland are characterised by peaked demands for labour inputs which are wholly compatible (Figs 4.20 and 4.25). Although demand for labour for gardenland production is spread more evenly throughout the year, and thus "clashes" occur with demand for both dryland and wetland cultivation, the general greater flexibility of gardenland cultivation practices allows the co-production of all three types by one household.

Moreover, the ownership of agricultural implements and draft animals, inspite of differences in the production methods of various landuse types, has encouraged the maximisation of their use, especially before the introduction of "green revolution" technology. Bullocks were used for ploughing for all three landuse types, for the threshing of millets and paddy, for the transport of harvested crops from the fields to the village, and from the village to the market, for the transport of manure (partly produced by bullocks themselves) to all three landuse types, and to operate the kamalai. Straw from the stalks of harvested dryland and gardenland millets could be used for fodder. Wooden ploughs could be used for all three landuse types, and (perhaps less importantly) other agricultural implements, the mammutty, sickle etc., were not specific to any particular landuse type.

More recently, the tractor has seen different uses according to the landuse type, but may be used on all three.

8.2.3 The relationship between the physical limitations of the production process and land ownership

The physical demands of the production process may be seen to limit the cultivation of different landuse types in two major ways: first the method of irrigation imposes limits on the extent of cultivation, and second the necessary regularity and volume of the use of labour may impose limits on the possible extent of cultivation by any household of any landuse type.

8.2.3a Irrigation method

Differences in the methods of irrigation tend to determine possible limits to the extent of individual household ownership of different landuse types. Whereas the extent of cultivable dryland is not limited at all by the spatial availability of irrigation water, (because it uses none), and that of cultivable wetland is limited only by the reliability of a single, independently controlled source of irrigation water, the canal, a factor of production which acts in a consistent manner to all farmers, gardenland cultivation is to some extent limited by the control of a source of limited irrigation capacity, the well. (It is also limited by the boundaries of the garden which are imposed by the boundaries of contiguous gardens, a factor which is not relevant, either, for dryland or wetland). While there is no limit in an open market to the number of wells which may be controlled, or to the extent to which a garden or the rights to well water may be divided, the demands of irrigation management tend to mean that gardens are ideally cultivated as single units. Therefore the degree of equality of garden size for the village will tend to influence the equality of ownership among gardenland owners (and indirectly the whole village).

Fig 8.2 shows the co-distribution of the variables of inequality (as shown by the Gini co-efficient) for garden size and gardenland ownership for both villages for the years of available data[1]. Whereas for Village A there is a relatively strong linear relationship between these two variables (r=0.84220), reflecting the increasing inequality of ownership with the increasing inequality of garden size through time (Figs 5.10 and 4.10b respectively), for Village B the low degree of correlation between the two variables is to some extent the result of the lack of variation in either variable from 1926 to 1978 (Figs 5.10 and 4.11b)[2]. Because the decline in gardenland area in Village B did not affect systematically different "classes" of garden size, there was no systematic effect on the variables of ownership. Moreover the recovery of the gardenland system in Village B despite the limited but increasing use of piping systems did not affect the equality of garden size until perhaps 1976

1 1947 to 1978 in Village A, 1926 to 1978 in Village B.

2 Both regression lines indicate a positive linear relationship between the inequality of garden size and gardenland ownership.

(the Gini Coefficient for garden size increased from 22% in 1974 to 27% in 1978). This actually represents a very small figure, perhaps inevitable where there is continued competition for a resource of limited availability, and there has been no effect on the distribution of gardenland ownership. The further development of piping systems in both villages could, especially in Village A tend to lead to increasing inequality of garden size, because of the almost unlimited potential for its development, and the high costs of development.

8.2.3b Labour Use[1]

Four characteristics of labour use may be seen to limit the potential extent of the cultivation of any landuse type by the household: volume of labour demand, the seasonality of demand, the division of labour between males and females, and whether labour is performed by household members or hired from outside the household. The volume of demand for labour may impose limits of time and cost. This is also true for seasonal labour, the demand for which may exceed the availability of labour for rigidly scheduled operations, such as the paddy harvest. The traditional divisions of labour between males and females would tend to emphasise such limitations, while the

1 Chapter 4 has illustrated the traditional and changing patterns of total, seasonal, and male and female demand for labour, while Chapter 5 has outlined different types of labour organisation. The relationship between labour demand and the organisation of labour is discussed at a later stage in this chapter. However reference is necessarily made in this section to that relationship.

costs of hiring labour from outside the family may be greater to the household than the drudgery undertaken by members of the household performing it[1].

It may be generally assumed that there is a greater tendency to use family labour for non-intensive operations which are flexible in timing and which are seasonally diversified rather than concentrated.

Wetland and dryland cultivation practices tended traditionally to be characterised by operations which were seasonally concentrated and inflexible in timing, therefore demanding larger proportions of hired rather than household labour. Gardenland traditional cultivation practices, however, tended to be characterised by operations which were more flexible and seasonally diversified, therefore demanding smaller proportions of hired labour. (The introduction of new agricultural technology has tended to increase the peaked demand for operations in all landuse types which have traditionally required female labour.)

Traditionally, the greater total and peaked labour demand for wetland, and the lesser though peaked labour demand for dryland cultivation would therefore potentially limit the extent of cultivation by households, and thus increase the equality of ownership among <u>owners</u> of either wetland or dryland. Labour demand for gardenland, on the other hand, although characterised by greater total labour

1 The idealised picture of a peasant household working on the land for most of the time, and hiring labour only when seasonal and total demand requires is not in fact true for most of the richer landowning households. Although an individual may consider himself or herself an "agriculturalist", this title may signify a widely ranging involvement in the process of agricultural production, from mild interest to hard physical labour.

demand than for dryland, had potentially less capacity to limit the extent of cultivation.

However, because of the general tendency for operations of peaked demand (e.g. weeding, planting, harvesting) to be performed by women rather than men, because of the smaller cost of female labour, and because the demand for female labour under traditional cultivation practices was smaller than those of post-"green revolution" technology, these potential limitations were overcome relatively easily by land operators. On the other hand, two important gardenland operations, land preparation and irrigation[1] demanded traditionally the intensive input of male labour at greater frequencies than for other landuse types. Because of the flexibility of gardenland cultivation practices, ploughing was carried out at different times of the year, and could be spread over a period of about one month before the time of cultivation. The irrigation of gardenland demands two men to operate the kamalai and to direct the flow of water at frequencies which varied from 3.7 times per month (for white cholam) to 6.6 times per month (for chillis). Because of this flexibility, however, labour tended to be performed by family members (or by attached labourers or <u>pangu</u> labourers). Thus traditional gardenland cultivation was characterised by a greater proportional input of male and

1 The operation of irrigation of wetland was effectively removed from the hands of individual farmers by the creation of the office of water controller, the man who had the responsibility to regulate the flow of water in a predefined area, in return for which he received a fixed amount of the crop. Although land preparation traditionally demanded a great input of male labour (with the operations of transport and mixing of manure, ploughing, levelling, and cutting and straightening of ridges) it was limited to a strict schedule and therefore demanded the use of hired labour.

household labour. These two operations also demanded the use of bullocks, and thus the potential for the extent of gardenland cultivation was further limited by the ownership of draft animals.

Thus the low degrees of inequality of ownership of gardenland among owners before the introduction of new technology may be seen to be the result of the limitations to cultivation imposed by the high demand for seasonally diversified male household labour. The introduction of new technology has greatly influenced traditional patterns of cultivation especially for gardenland. While tractors have been introduced into dryland and gardenland cultivation, their use has been limited in wetland cultivation, while the electrification of the village has affected gardenland irrigation practices alone, generally resulting in a falling male labour demand for gardenland. While other factors are important, this effective easing of the labour drudgery of male demand for gardenland may have allowed the increase in inequality of gardenland area in Village A from the time of the introduction of powersets. (The largest area of gardenland cultivated by one household in Village A is 18.08 acres, compared to 6.91 acres in Village B).

8.2.4 Productivity and Tenancy

Section 5.4 ("Forms of tenancy") illustrated the strong relationship betwe'n land productivity and tenancy. The terms of tenancy will increasingly favour the landlord, both in terms of decreasing expenses, and increasing, and increasingly assured, rent with increasing land productivity. This is because the increased attractiveness of the more productive landuse types allows the marginal increase in favourable terms for the landlord. Thus wetland is characterised by a high incidence of fixed rent tenancy with no inputs required by the landlord, gardenland by a lower proportion of _pangu_ (share) tenancy with input and product shared by landlord and tenant, and dryland by almost no tenancy at all.

Overall, two forms of tenancy may be identified: first that tenancy which provides the tenant with a significant proportion of the harvest, entered into where a proportion of the costs of the materials are provided by the tenant, and secondly that tenancy which provides the tenant with a very small fixed or proportional return, the costs being effectively borne by the landlord.

Whereas the first form varies in terms according to land productivity, the second has occurred in both wetland and gardenland, though its occurrence is the result of different circumstances and is favoured by different classes of ownership. For wetland _management_ in Village A, the "tenant" undertakes merely supervisory duties for the landlord in return for a small fixed payment. The landlord pays all costs and receives most of the harvest. Thus it is a more attractive form of tenancy for owners because it allows greater marginal profits. However, it is only undertaken by resident cultivators who already have a sufficient income from other owned or leased-in land[1], and only on behalf of non-resident landlords. The pàngu tenancy in Village B which provided the tenant with either one sixth or one ninth of the

1 It may be leased from the landowner of managed land.

produce according to the number of kamalais in a garden was entered into by resident garden landlords as a means of extending the effective labour of the household. The consistent, and intensive required inputs of labour for land preparation may well have limited the possible extent of gardenland cultivation during the use of traditional technology (Section 8.2.3b). However the comparatively greater extent of cultivation[1] could be accounted for by the greater incidence of this type of pangu tenancy. The declining labour demand for gardenland with the introduction of new technology may well have signalled the end of this type of tenancy, it being replaced by the occupation of attached labourer, a person available to the now diversified Village B farmer (with his wetland ownership) for any operation rather than having the responsibility for an individual garden.

The comparative demand for agricultural land from the village, which is reflected in the expansion or contraction of the village ownership zone (Chapter 6) becomes less important with the more productive landuse types, and although land may be developed into a productive landuse type through the mechanism of poramboke encroachment, a mechanism which is initially independent of the open market, the advantages of proximity to the village site (access to labour, time saving, local agricultural knowledge etc.) become less important to potential owners as productivity increases. Paradoxically, perhaps, even poramboke land is subject, as

1 Maximum extent of household ownership declined from 1930 in Village B, when over 40% of households owned gardenland.

soon as it is encroached, to the same processes as transfer, leasing and inheritance, as legally owned land. Thus the tendency of wetland within the Village A ownership zone to be owned to a large extent by non-residents who lease land either to residents of Village A or to residents of the dynamically expanding[1] adjacent village to the north may be presumed to be part of an historical trend since the inception of the Periyar Scheme towards the increasing ownership of village land by the rich non-farming residents of large villages or towns in the region. The existence of a class of landowners who have no connection with the village other than that of rent collection may be explained only to a limited degree by the out-migration of landowning village residents; the castes of non-resident landowners who lease land to village residents are, according to the chitta, generally different from those of Village A residents. A more plausible explanation, perhaps, is that the original purchasers from Village A residents, and from residents of other villages in the wetland zone of the Kambam Valley, raised capital through profits made from cardamom estates from the late 19th century onwards, purchasing wetland to be a stable source of income. The residences of most non-resident landowners are found in large villages to the west of Village A between the Cardamom Hills and the Suruli River, the area in which most of the cardamom estate owners in the Cardamom Hills reside, a fact which is reflected in the conspicuous development of "pukka" architecture in these villages.

1 Both in terms of its population and the village ownership zone.

8.3 Labour demand and labour organisation

8.3.1 Characteristics of labour demand and labour organisation

The changing demand for total and seasonal labour for the three landuse types in both villages has already been described (Section 4.6), and methods of organisation of labour described (Section 5.9), though without systematic reference to the characteristics of demand or organisation. This section will define three characteristics of labour demand and four of labour organisation, the relationships between which will be investigated in subsequent sections.

Labour demand characteristics

1. Total demand.

2. Arduousness of labour.

3. Skill/specialist nature of labour.

Labour organisation characteristics

1. Division of labour between males and females.

2. Method of organisation and payment.

3. Amount of payment.

4. Length of engagement.

Labour demand has been quantified in terms of mandays or manhours per operation, totalled per month or per incidence of cultivation. Although the arduousness of any operation will vary seasonally with the effort and strength required to perform it, as well as the length of time it takes to accomplish it and the time within which it must be completed, arduousness is itself a subjective concept, the definition of which, and the extent to which it applies to different operations will vary between individuals. A general overview of the arduousness of different operations, whether or not it truly reflects actual performance, if it is held by both land operators and labourers, affects methods of labour organisation. Skill, similarly, is a subjective concept. Basic agricultural skills such as weeding and harvesting are acquired through practice, and a general miniumum level of skill is expected by land operators; a "coolie" is one who does general agricultural labour and is therefore available for almost all operations. Where a special skill is practised, it is usually performed by the person possessing the appropriate technology for the operation. Thus it is possible to identify specialised agricultural operations which are outside the normal capacity of agricultural labourers to perform, both by virtue of the possession of the appropriate technology, and the acquired skill associated with the practice of the operation. Where the technology for a specialised operation is supplied by the land operator for the labourer, the skill required for the operation may only partially affect methods of payment etc.

The characteristics of labour organisation are fundamental and simple concepts. Chapter 4 has already described the traditional division between male and female operations, which is important in terms of most operations in the amount of payment. The method of organisation and payment shows a primary division between family-performed and hired labour, the first being "paid" through profits derived from the total business of the family, the second by direct payment. Within hired labour a division may be made between those paid on time basis, and those paid on a contractual basis. As well as variations in the value of payment, the difference between cash and kind payment is also important.

8.3.2 Relationships between labour demand and labour organisation

1. Total demand for all landuse types tends to show a higher female than male demand, being composed of large proportions of labour which is seasonally peaked. Although the demand for male labour is also peaked (especially in Village A), the volume of demand for female by far exceeds that for male labour for most months of the year for both villages. Therefore the greater use of comparatively poorly paid female labour results in a smaller outlay for the farmer.

2. Both because of the greater peaks of demand for female labour and because of the greater cost of male labour, there tends to be a greater total and proportional use of hired labour for female-performed operations rather than male-

performed operations (although the proportion of hired male labour also varies with the extent to which the relevant agricultural technologies are controlled by the land operating households). Table 8.1 shows the proportions of total labour demand met by hired labour for various groups of operations and for total demand for dryland, wetland and gardenland (3-month crops, chillis, cotton, and banana) as derived from the survey of sample households. For most groups of comparable operations (thus excluding irrigation) the proportions of hired labour is greater for females than for males. The greater proportional use of male labour for land preparation and planting for dryland is perhaps the result of the lesser proportional use, especially in Village B, of the technology of land preparation by dryland farmers, than farmers of other landuse types.

3. Where labour demand is so peaked as to necessitate the use of both male and female labour, the proportion of hired male labour rises. This is the case with dryland and wetland harvesting (as well as with the harvesting of three-month millet and groundnut crops). The proportion of hired male labour varies, too, with the specific operations required for different gardenland crops; a high proportion of male labour is required for banana cultivation because of the need to perform the intensive operations of both squaring and planting, and weeding and resquaring as single operations. Irrigation of gardenland is assumed to be performed by household labour. Irrigation of wetland is performed by hired

labour (through the "jajmani" system) because the operation is most efficiently performed for multiple land operators by single water controllers.

4. Greater peaked demand trends to be associated with greater payment and greater proportional payment in kind, and with the more consistent payment between males and females. Thus wetland harvesting tends to be paid at a higher rate than other comparative operations (the demand for harvest payment will vary according to the urgency of the harvest), and in kind, a form of payment which represents an insurance against inflation, while dryland harvesting will be paid in kind either at equal rates for men and women or in proportions of 5 and 4 measures respectively. The relatively long period over which cotton and chillis are harvested encourages the use of daily wage labour paid in cash.

5. The length of the engagement tends to vary with the seasonal consistency of demand for labour. Thus attached labourers are hired on a monthly basis for "In-cultivation" operations by large land-owning households to more efficiently extend the effective labour power of the household. Water controllers are selected on a more permanent basis by the largest landowners in any madai (channel area) and paid in kind at each harvest.

6. The real or recognised greater arduousness of some operations may have encouraged the dominance of male labour; for ploughing and other land preparation, for transportation

and for irrigation. Generally wages are higher for such operations, whether performed by males or females, and because of this and the nature of the operations, short-term contracts are preferred by farmers.

7. Similarly, specialised agricultural operations, such as spraying, ploughing by tractor, and even ploughing by bullock are more highly paid and therefore subject to short-term contractual arrangements.

8.3.3 Determinants of the changing relationship between labour demand and labour organisation

The changing patterns of labour organisation (division of labour, the amount and method of payment, and length of engagement) may be seen as attempts to minimise costs where demand exceeds or is increasing in relation to supply. Agricultural processes necessarily limit operations to strict schedules on individual crops and on the timing of cultivation practices generally, and lead therefore to the concentration of demand for specific operations for individual farmers as well as to the seasonal concentration of labour demand.

The greater comparative use of female and of hired female labour, reducing costs with the lesser valuation of female labour, may have resulted initially either from the choice of females for operations for greater or peaked demand because their labour was traditionally less valued through a set of cultural norms, or from the lesser valuation of female labour in order to reduce total labour costs for female-performed operations of peaked demand. As the agricultural labour demand patterns of the village developed within any "sere" of technology, each process would tend to reinforce the other and the imbalance of female over male labour utilisation would develop until a point beyond which the greater demand for female labour would tend to increase its comparative value[1]. (Because of the greater valuation of male labour, the adoption of technologies, and the introduction of new crops may have been made to selectively reduce male labour costs, while allowing an increase in female labour demand.)

Although an important factor in the initial division of labour may have been the real or recognised physical demands of different operations, the importance of this factor is lessened where demand increases, and both males and females are used for the same operations, such as harvesting. A tangible reason for the division of labour and the greater comparative payment of males may be seen in the operation of agricultural technology. Operations associated with the control of bullocks (ploughing, transportation, kamalai irrigation, and threshing), as well as other specialised agricultural technology are performed by males exclusively. However, not all male-performed operations require the use of bullocks or other technology, and of course it is physically possible, though culturally abnormal, for females to operate livestock. The division of

1 The greater utilisation of female labour within the new technological sere associated with the "green revolution" has been possible in a situation of increasing population and therefore greater supply of female labour.

labour must therefore be viewed as a means of controlling labour costs.

Variations in the demand for and supply of labour are matched by variations in the amount and method of payment and the length of engagement, though these characteristics are strongly interrelated in ways which tend to attract labour but minimise costs. Thus lower paid operations tend to be paid in cash on a daily wage basis, while higher paid operations tend to be paid in kind on a contract basis.

The kottukarin, used for operations of peaked and concentrated demand for labour, tends similarly to minimise labour costs. While the kottukarin negotiates for the maximum possible wage, the contractual arrangement made with the farmer, as well as his greater share of the contract, makes it in his interests to see to it that the work is completed quickly, as therefore that his workforce is efficient. The kottukarin builds up relationships with his clients which it is in his interests to maintain, and therefore, although he bargains for extra payment for greater distances over which the crop must be carried to the threshing floor, and for quicker work, his rates must be competitive[1]. While it is true that average harvesting rates have risen since the introduction of high yielding varieties, they changed little before this, indicating that the kottukarin does not act as an agent for the improvement of workers' conditions in the situation most favourable for such change; where demand exceeds supply and the time factor is very important, and where large numbers of labourers are

1 Ponram, of Village B, in order to maintain his clientele "negotiates" the rate after completion of the harvest.

united in a common cause. The lack of contact between kottukarins, and their general unawareness of the potential political or even economic power of their institution is further evidence that the kottukarin exists to more efficiently organise labour for land operators both from inside and outside the village.

Outside the responses of individual farmers to the changing demand and supply of labour, there is little attempt among farmers to unite to determine labour organisation; the only instance of this is in Village A, where a somewhat ineffectual attempt is made to determine the wage rate per unit area harvested on the eve of the paddy harvest by a group of the largest land operators (Section 5.9.2). However, because of the overall relationship between demand and supply, as seen in the estimates of seasonal agricultural employment (Section 6.3.2), the farmer is increasingly likely to exploit the patron-client relationship in order to reduce labour costs. Caste, too, may be used to minimise wage levels either by the selection as a form of patronage of same-caste labourers for work or the deliberate overworking or underpayment of lower-caste labourers. Although the importance of such relationships is difficult to quantify, the dominant factor influencing labour organisation is the farmers' response to the relationship between the demand and supply of labour.

8.4 Summary

It has been demonstrated in earlier chapters that production processes largely determine labour demand patterns (Chapter 4) and that landownership distribution primarily determines the occupational pattern of the village and thus roles within the labour organisational process (Chapter 5). This chapter has sought to explain the overall interdependence of agriculture and social relationships through two relationships: that between land productivity and the distribution of ownership and operation, and that between labour demand and labour organisation.

However, it has been demonstrated that, despite these strong relationships, landownership patterns may not be fully explained in terms of the potential economic profitability of the farm management unit, nor can labour organisation be explained purely in terms of the labour demand for the production process. This is largely because of ecological factors which mean that land productivity is not directly related to the characteristics of the production process.

Many Indian rural studies have emphasised the relationship between the nature of agricultural production and social relationships both at regional (e.g. K. Bardhan (1973) and Alexander (1975) and village (e.g. Epstein (1962), Dasgupta (1975), and Abelman and Dalton (1971)) levels. The latter two studies have emphasised the relationship between the village's agricultural development and concentration of landownership, and the proportion of agricultural labourers in the population. The influence of resource variation within the village itself on social relationships within the village itself is often underplayed or ignored.

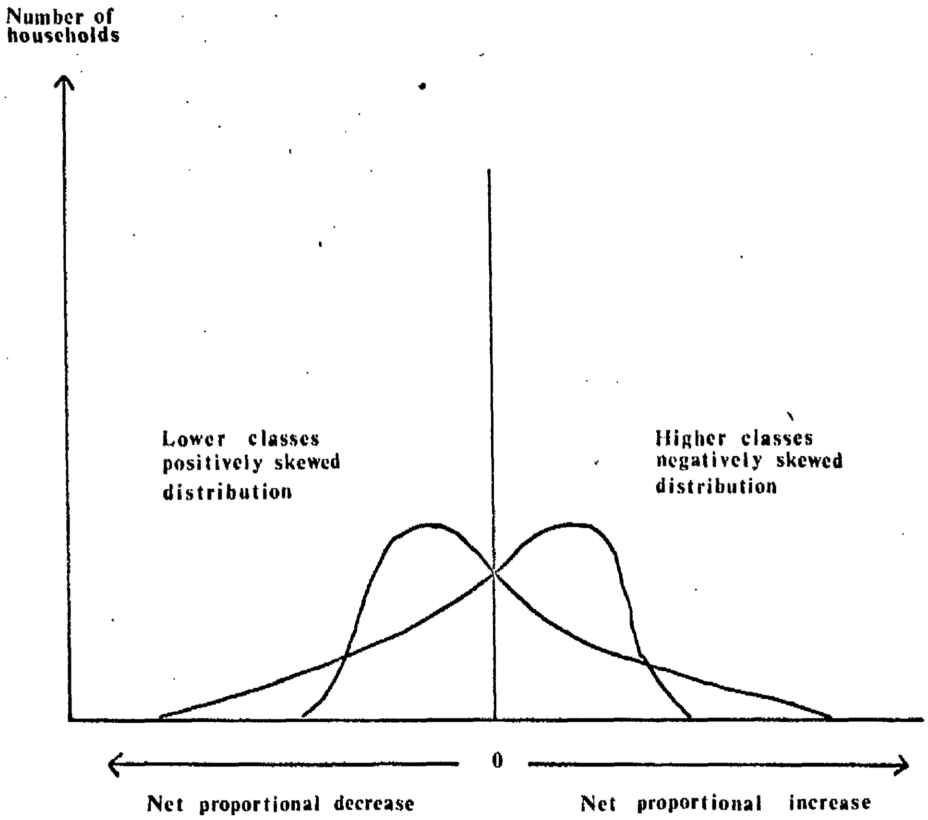


Fig. 8.1

Typical Distributions of Change in Landownership through Sales MM

Fig. 8·2 Co-distribution of Gini Co-efficient of Inequolity of Gardenland Ownership (for owners) and Garden Size
(Village A 1947-78, Village B 1926-78)

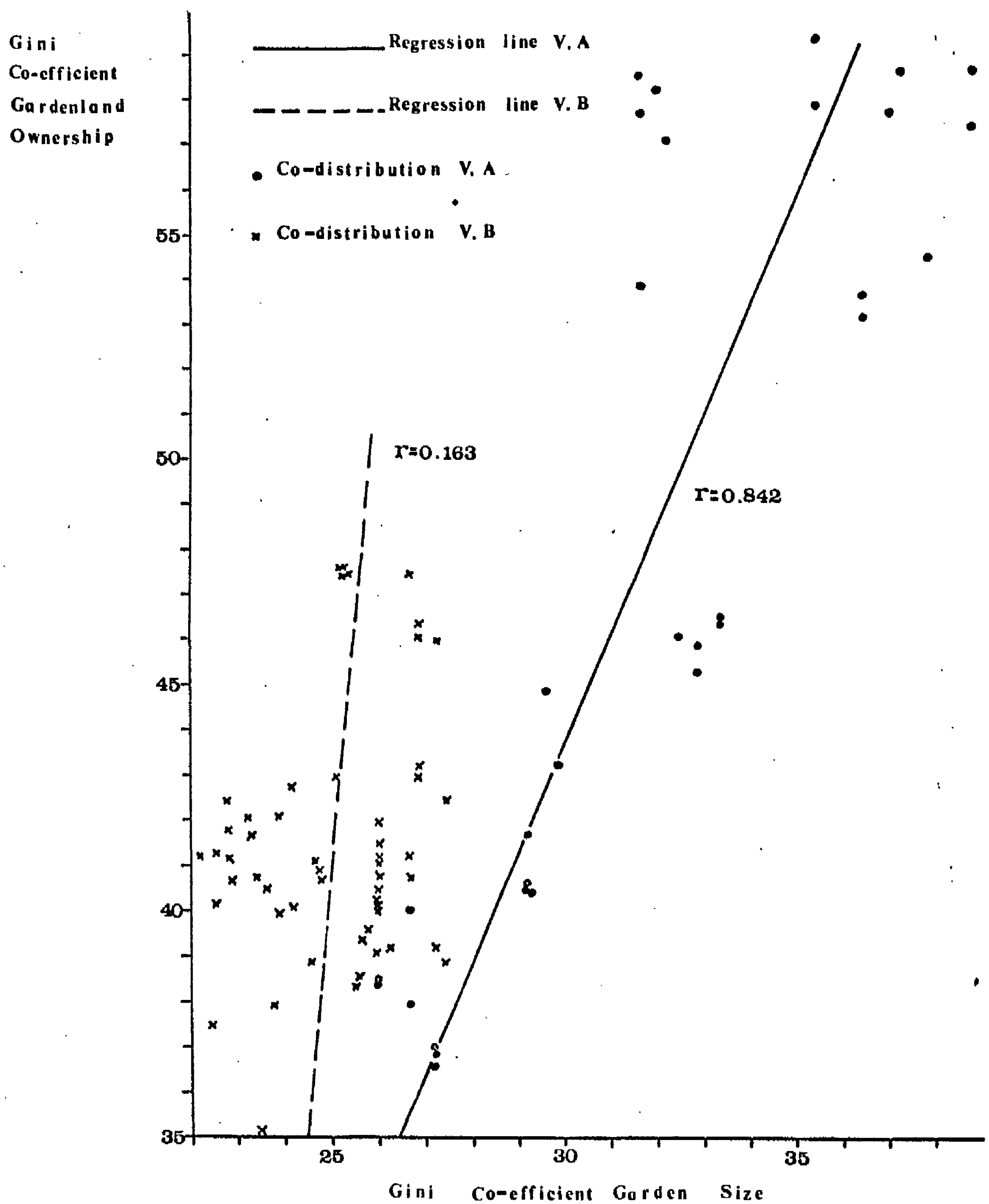


Table 8.1 Proportion of Total Labour Demand met by Hired Labour (shown as a percentage)

Male

	Dryland	Gardenland				Wetland
		3-month Crops+	Chillis	Cotton	Banana Mixed*	
Land Preparation & Planting	77.5	69.3	59.9	66.4	85.4	66.7
In-Cultivation	0.0	0.0	0.0	34.2	92.1	10.9
Irrigation	-	0.0[2]	0.0[2]	0.0[2]	0.0[2]	100.0[1]
Harvesting	63.8	63.0	-	0.0	-	100.0
Total	78.3	51.1	36.5	43.0	57.3	72.26

Female

	Dryland	Gardenland				Wetland
		3-month Crops	Chillis	Cotton	Banana Mixed	
Land Preparation & Planting	44.0	93.7	87.6	82.2	99.4	99.0
In-Cultivation	89.6	99.8	98.5	90.7	98.9	95.6
Harvesting	77.9	99.8	98.0	90.0	100.0[3]	100.0
Total	81.6	99.8	97.8	89.9	99.3	97.7

+ Averaged total demand for Ragi, Onions, White Cholam & Groundnut
* Bananas cultivated with Onions and Chillis
1 Presumed - performed by water controllers
2 Presumed - performed by garden operators or their attached labourers
3 of Mixed crop only

Chapter 9

Conclusion

9.1 The need for a general model of village change

The thesis has attempted to identify and examine the interrelationships between three major variable groups of population, production and distribution, through time for the sample villages. The analysis has been made without a rigid separation of causal and derivative variables, though two externally operating factors, population increase and technological change, have been identified.

Although two villages with different resources have been taken as contrasting examples, processes involved in village change may not be explained primarily in the light of resources. Rather, it has been the intention to analyse the effect that resources have had on potentially universal processes. The similar population histories and man-land ratios of the villages, and their similar settlement history and access to urban areas made this comparison meaningful.

Inferences of changing class and social relationships of the whole village have been drawn from data on the agricultural economy of the villages, and specifically the agricultural economy of land cultivation. Therefore, the analysis of relationships within the village have been limited to the "agricultural village", as defined in Chapter 4. The definition of the agricultural village is appropriate to the analytical structure of the thesis as it is defined by the set of physical objects of the agricultural system which are operated by or which directly affect village residents, as well as the vast majority of village residents who owe a proportion of their living to agriculture. That this set of physical objects, principally land, can be identified as a largely spatially concentrated and contiguous unit, and that the production process of the village is characterised by the inter-dependence of resident members of the village, strengthens the relevance of analysis of individual village change.

Within the flexible structure of analysis of change, there is a need to identify important relationships within and between the factors of population, production and distribution. Although no single variable may be regarded as rigidly causal, any general analysis of change must take into account population growth and technological change acting as external factors. The remainder of this chapter will first attempt a general theory of change as it occurred in the sample villages, secondly examine the weaknesses of this theory, and lastly, assess the relevance to and compatability of the theory with other views of change, and specifically village change, in the context of formation of poverty.

9.2 A general model of change

A general model of change for the two sample villages, involving relationships between the three major factors is outlined below. (Succeeding arguments will be numbered in order to facilitate reference.)

1.A

Population increase has led to the intensification of agricultural production, and more importantly the differential intensification of agricultural production, where it is able to exert an influence on landuse.

1.B

The effect of intensification has been, almost automatically, to lead to polarisation, increasing the inequality of total ownership, and the numerical strength of the resident agricultural labour sector. This is seen through:

a. The positive relationship between land productivity and land value. (This relationship is accelerated partly by the process of commercialisation of more productive land, although commercialisation may be affected by the extent of leasing, which is positively related to land value - see 1.B.c.).

b. The positive relationship between the inequality of total ownership and land value (despite smaller average holding sizes for higher land value landuse types). (This phenomenon may be illustrated in the process of transfer through the Financial Transfer Mode of Mobility, which shows different patterns for gardenland and dryland, those of gardenland tending to concentrate ownership to a greater degree than those of dryland, which show some tendencies towards more prominent "cyclical" patterns. For wetland there is no direct evidence as to the nature of this process, though as the inequality of total ownership over time is consistently high, we may assume a similar but more pronounced pattern than that of gardenland, tending to accentuate accumulation by higher ownership classes. Processes leading to a polarisation of ownership are especially strong during periods of intensification, or expansion of more intensive agricultural landuse types.)

c. The positive, though less important (than 1.B.b), relationship between the extent of leasing out, non-resident ownership of land operated by village residents, and land value.

d. The positive relationship, especially within the period of use of traditional technology, between total demand for labour (and to some extent seasonal intensity of labour demand) and land productivity. (This meant that not only could the more productive landuse types support a greater population through a paid labour force, but that, in the absence of a system of exchange labour, a labour force comprised of non-owners, whether resident or not in the village, was necessary for the production process to continue.

Indeed the relationship between demand for labour and productivity has led to the development of different forms of organisation of agricultural labour.)

2.

However, polarisation, or differentiation, is slowed by two demographic factors inherent in the process of population growth:

A. The greater relative downward mobility from higher ownership classes through the inheritance system, a process which is accentuated for the more productive landuse types. (Again there is no direct evidence for wetland.)

B. The greater proportional out-migration (or non-survival) of households of landless labourers, a process which is accelerated by the demographically determined balance of landownership and occupational structure.

which mean that there is a tendency towards the stability of ownership distribution, thus slowing down the process of polarisation of landownership initiated by population increase. This is seen in the general "downward" mobility from all landuse types, and in the relative stability of coefficients of inequality of ownership. Further evidence is seen in the nature of landownership change among sample family trees; the process sampling lineages for analysis tended to be biased to choose lineages typified by higher proportions of surviving households and higher initial ownership than average. However, this slowing down process tends generally to be weaker than that leading to polarisation through intensification. Thus, with increasing population, intensification generally results in a slow process of polarisation.

3.A

While the relationship outlined above (Steps 1 and 2) between population increase and class formation (via the agricultural production process) may be seen to operate within different periods of use of agricultural technology, the introduction of any new technology[1] enforces a readjustment of:

a. The relationship between population increase and intensification, through the alteration of the ecologically imposed limitations on expansion or intensification of the agricultural system.

b. The relationships of the production process with the formation of agricultural classes, through the relationships between productivity and land value, between inequality of ownership and land value, between productivity and leasing, and between productivity and labour demand.

3.B

The readjustments of these relationships is multidirectional

1 Although population increase may provide the stimulus for the introduction of new technology through demand for consumption or income from agricultural production, and provide the means of introduction through labour, the availability of technology is, like falling mortality, village-independent.

and complex. For example, identical technology (powersets) has had quite different effects on the total agricultural systems of the two sample villages, Moroever, it cannot be assumed that technology is labour enhancing or labour substituting. However, two main determinants of the direction of readjustment may be identifed:

a. The relationship of technological adoption with ecological limits imposed by the resource base of the village.

There have been two techno-ecological brakes on the ability of the villages' population to exert an influence on landuse (1.A). First, in Village A, the canal system has been unable to expand effectively because of the physio graphical nature of its original course. Water can irrigate land only on its eastern side, as water drains back from the channel to the river. The only effective measure that residents of Village A could have taken to increase the area of canal-irrigated wetland would have been to build an anicut starting higher in the valley so that it would run parallel to the present position of the channel but at a greater distance from the river. Such an anicut exists, but it irrigates the land of the adjacent village to the south. The extension of Village A wetland has been limited to marginal encroachment along the banks of the river, to the encroachment of the Karuvelan Tank, and to the irrigation of small sections of excavated[1] paddy land

1 Land must be lowered to receive irrigation water from the lower irrigation channel.

to the west of the channel. However this activity has managed to increase the area of canal-irrigated wetland in the revenue village by only 10.2% from 1915 to 1978.

Secondly, for both villages, limits have been imposed on the potential extension of gardenland by the efficiency of extracting groundwater through different technological systems. Expansion of gardenland in Village B, the main form of intensification, was proceeding at a steady rate from 1915 (and presumably was before this date) until about 1953 (Fig 4.11a), when limits to expansion were reached, because of the increasing depths from which water had to be extracted on the outer edges of the gardenland area. Intensification thereafter was only possible through marginally increasing the depths of wells, thus extending the length of the agricultural season. The resulting competition for water through digging, whether it started because of a falling water table resulting from maximum expansion of gardenland area, or whether it was itself the cause of falling water tables, led to a limited decline in gardenland area from 1953 to 1968. However, this decline, if there had been no subsequent introduction of powersets, would probably have halted at a point where it was no longer economic, given the limited efficiency of the kamalai, to increase depth further. Assuming a stable rainfall, an equilibrium would have been reached between the rate of recharge, the rate of outflow of groundwater, the rate of water withdrawal, and the depth of the water table[1]. This equilibrium would have been reflected in a

1 See Bharvan (1975) for a discussion of these interrelationships, with especial reference to the pumpset revolution.

steady area under gardenland, and stability in the number of operating wells.

In Village A, the same factor operated to limit expansion, which proceeded slowly until the introduction of powersets. Again we may presume that in the absence of powersets an equilibrium or plateau of gardenland cultivation would have been reached.

Thus the effect of the contrasting resource bases at the introduction of new technology served to remove limits to expansion in Village A, and to tighten them in Village B (while allowing intensification within surviving gardenland). Other potential techno-ecological brakes on expansion may be identified; for example the overutilisation of HYVs rendering them subject to crop disease[1] would lead to their elimination from cultivation, or the overintense use of land (as a result of technological introduction) leading to erosion[2].

b. The positive relationship between the adoption of technology and enhanced productivity.

The extent to which new technology is utilised will depend on its capacity to enhance farm productivity. Therefore new agricultural technology will have the general effect of increasing land values, and the relationships which accentuate polarisation of ownership (see 1.B.a and 1.B.b). It has had this direct effect in Village A

1 For the IR20 crop in Village A, insect attacks before harvest have necessitated increased expenses for pesticides.

2 There is no direct evidence for this trend in either village.

gardenland from 1965 to 1978 (see Fig 5.10). The new agricultural technology of canal irrigation can be assumed to have had a similar effect. Certainly present ownership distributions reflect this. The trend towards non-resident ownership of Village A operated lands may be seen as part of a trend towards increasing inequality, for although the existence of tenanted wetland within the village reduces the index of inequality of operated as compared with owned wetland for Village A residents, the appropriation of rent from leased lands reduces the effective value of wetland for the operators.

The increase in polarity will result in increased proportional out-migration of lower ownership classes and non-owning classes. The extent to which this happens is regulated by the increased demand for labour for the increasingly productive production process.

Leasing, however, while being associated with the greater productivity of wetlands, is not associated with increased productivity through the introduction of technology (especially HYVs, gardenland technology etc.). Instead a process of change from outside ownership and leasing-in by village residents[1] to an unequal system of ownership within the village takes place, a situation dominated by owner cultivation. This trend may be seen in the increased proportion of resident ownership both for Village A and the adjacent village to the north (Fig 5.12).

1 This may be regarded as a form of inequality or a form of redistribution of landownership, depending upon the boundaries for the definition of inequality.

As for the effect of technology on labour demand and hence labour organisation,again the relationship between land productivity and technology is crucial. Technology will be adopted where it enhances profitability, the material embodiment of productivity for the farmer. Within an unchanging period of use of new technology, intensification will result in greater inputs of labour (hence the relationship between the size of the labour class and productivity). However, the effects of the adoption of <u>new</u> technology on traditional labour demand and organisational patterns appear to be haphazard. For example the effect of the introduction of well irrigation technology was generally to lead to a decline in the demand for contract male labour, and an increase in the demand for casual female labour. For wetland, however, labour demand probably increased for both males and females after the introduction of HYVs. However, this apparent paradox may be explained by the fact that in Village B the ownership of bullocks was closely related to their use for operating the kamalai. With the almost total substitution of the kamalai, there was a decline in the bullock population which encouraged the use of tractors for ploughing. No such substitution occurred for Village A wetland farmers, who continue in the main to use bullocks or to hire bullock operating labour.

The general effects of changed technology, however, tend to be directed towards the increased polarisation of ownership of land (and thus of income), though this increased polarity is in turn subjected to demographic factors tending to diminish it (2.A and 2.B).

9.3 Possible weaknesses of the general model

Four major arguments, which are sometimes interrelated, may be forwarded which question the relevance of the general theory outlined above. These rest upon assumption of weaknesses of the relationships cited, the incompleteness of these relationships in explaining change, and the irrelevance of a theory of change based upon interrelationships at the village level.

9.3.1 That the agricultural sector does not necessarily determine relationships for the village as a whole

The strength of the non-agricultural sector in the village may be assessed both in terms of its importance in providing employment and thus income for the village population, and in terms of its potential to survive aside from the agricultural system.

At the time of the survey, the non-agricultural sector employed only 10% of the working population in Village A (18% of working males) and 12% in Village B (21% for males) either in full- or part-time employment. Of these 22% in either village were also employed in the agricultural sector. Only 6.6 % of households in Village A and 10.1% of households in Village B did not derive any proportion of their income from the agricultural sector.

If the nature of employment within the non-agricultural sector is examined (see Table 3.4), it will be seen that a significant proportion of the non-agricultural sector employment is directly related to the agricultural system of the village or the region, while the majority of other occupations are directly concerned with providing services for the village population (the majority of whom derive their income from agriculture). The extent of the working population employed by independently operating industries or services is restricted to 14 stone masons[1] in Village A, some of whom are also engaged in agriculture, employing 10 labourers (who are also agricultural labourers), one timber merchant in either village, 2 cement pot makers in Village B (who are also agricultural labourers), and a handful of individuals in full time employment working outside the village (many of whom own agricultural land).

There is no reason to suspect that the non-agricultural sector of the village economy has, at any time in the past been proportionately stronger, or more independent of the village, in spite of the assumed decline of caste as an occupational determinant[2]. Rather, it is likely that it has increased with the increased proportions of households which do not own productive land. It is important to distinguish between two types of diversification from the agricultural sector; first diversification through the investment of capital derived from agriculture, and secondly diversification through the creation of an

1 The majority of their business is outside the village.

2 E.g. the traditional occupation of the Martharis, leather working, has virtually died out. This was, however, directly linked with the agricultural system, using the hides of bullocks for material, and having as one of their main products the leather pouches of the kamalai. The supply of raw materials and market was, therefore, destroyed by the introduction of powersets. Most Martharis are absorbed into the agricultural sector as labourers.

"informal rural sector"[1] brought about by lack of opportunities in the agricultural sector. The first type has been shown to be associated with more intensive agricultural villages (Dasgupta's Type A villages). Little such new investment through accretion of agricultural profits has occurred in either village, although the existence of some entrepreneurial families in Village A may point to this future trend[2]. However Village A is able to support, through its larger agricultural economy a higher number of people engaged in general services.

The second, Dalena-like[3], type of diversification may be identified in Village B, where of the 31 people[4] employed in "Agriculture-related Occupations" (Table 3.4) many are employed as merchants outside the village (especially the Specie Merchants), and where there is a relatively high population of professional employees, which is perhaps boosted by the generally more complete educational system in that village.

9.3.2 That the essentially economic arguments of the general model cannot fully explain social relationships in the village

Four major factors may be identifed which may be seen to determine relationships in the village to a

1 As pointed out by Dasgupta (1975).

2 E.g. the family of Velu Theva (ranked No. 4 in the Index of Agricultural Land Assets) opened a rice mill in 1979.

3 Epstein's unirrigated village (Epstein, 1962).

4 In Village A there are only 9.

greater extent than the economic factors as outlined in the general theory: demographic, cultural, political, and ecological.

a) Demographic factors

It may be argued that demand for production and labour availability, either as organised into households or acting in larger groups determine social relationships through their effect on the production process. Kessinger's thesis for Vilyatpur, is that the "cycle" of household evolution is the dominant factor explaining changes in wealth[1] through such activities as migration, leasing, sale or purchase of land, and hiring of labour (Kessinger, 1974).

However, it has been shown (in Chapter 7) that while demographic forces of population increase determine processes leading to redistribution (the Inheritance System and migration), only for Village B does the cycle of household evolution have an effect on the extent of land operation, and that this relationship is only true for the grouped co-distribution of area and stage of household development (and may not explain skewness of distribution). Moreover this influence may be seen to be stronger for the least important type, dryland.

However, it must be conceded that the cycle, because of the continuous demand for male labour (especially operating bullocks) within the traditional dryland and gardenland economies, and the subsistence nature of

1 Also Perlin's (1975) interpretation.

production, may to some extent explain the less unequal ownership distributions of dryland and gardenland in Village B. This relationship would have been especially strong during the period of use of traditional technology, and increasingly so with receding time, before intensification of agricultural production had increased land value and led to the increasing production of commercial crops. It may therefore be true to say that the economic relationships outlined in 1.B may have increasing strength through time.

One fundamental criticism of the life cycle theory remains difficult to refute: Chayanov's suggestion that income is maintained through higher participation and more intense work during peak dependency periods is an option which is not available to the landless labourer (Rodgers 1976).

It has also been shown that the system of labour organisation and revenue distribution may be adjusted to individual household size (within the patrilineage) for the farm management unit (Sections 5.2 and 7.4). However, this may be viewed as an adjustment of the household organisational system to prevailing economic conditions[1], rather than demographic forces exerting a deterministic influence on landownership distributions.

On the one occasion where demographic forces of demand for land for production and availability of labour acted at the village level independently of formal economic relationships, that of the encroachment of the tank in Village A in 1969, the formal economic relationships based

1 A process seen in the organisation of extended family units for Village A wetland owners.

on landownership (assumed through encroachment) were immediately resumed after encroachment.

b) Cultural factors

The formalist argument that economic relationships receive their outward expression in the patterns of cultural values, has its mirror in the (substantivist) argument that cultural values determine (the social expression of) economic processes[1]. The contention of this thesis is that while the former argument provides a more logical and complete base for analysis of social relationships and of general change, traditional cultural values are important both because they may serve to reinforce social relationships in the village, and because they may to some extent determine the course of change where they are not wholly incompatible with the demands of changing economic relationships.

Attempts to explain social relationships and change in the light of traditional values may be

1 This study is firmly rooted in the formalist (rather than substantivist) tradition of (economic anthropological) village studies. However, it perhaps escapes from the trap of formalism identified by Djürfeldt and Lindberg (1975) that

> The formalists are wrong when making "economising " the subject matter of economics, since it is a specific formal type of action which is found in many spheres of reality not merely or exclusively the economic one.

as the general theory attempts to explain, as well as purely economic spheres, other spheres, specifically those of household organisation and labour organisation.

criticised as being incomplete, because they ignore the fact that

> other levels in a social formation have an economic aspect in so far as they carry with them the use of material goods
>
> (Djurfeldt and Lindberg, 1975).

Epstein's (1963) distinction between structure (economy, politics, tec.) and culture (values) as independently acting factors, has been criticised by Gough (1965). Commenting on Epstein's assertion that, over time, farming had not become less valued, Gough points out

> To say that people farm because they value farming begs the question, which is, why do they value farming enough to continue it under some circumstances and not under others?

Similarly, Alexander's (1975) assertion that paddy cultivation on the best (fertile and irrigated) land in Tamilnadu can be related to a set of traditional valuative norms which placed foodgrains in a hierarchy, with rice occupying the highest rank, above, for example, cholam, and that social relationships (such as the extent of tenancy, the proportions of scheduled caste labourers etc.) follow directly from this relationship, begs the question, which is, why is rice so highly valued?[1]

Two specific aspects of traditional values have been examined, caste and the division of male and female labour. Caste has been shown to have strong relationships

1 The answer being it is the most productive crop given the available inputs of assured irrigation, temperature, etc.

with occupational category. However, the relationship between the extent of landownership and occupational category is even stronger than this. Moreover, although average landownership varies with caste, there are high degrees of inequalities of ownership, and thus variations in occupational category within castes.

The relationship through time between caste and landownership would be difficult to explain for the sample villages in terms of the initial status of caste groups, for the dominant castes (both numerically and in terms of landownership) in either village hold no higher status than the other caste groups of the village outside the village (except for the "untouchable" Pallars in Village A and the Martharis in both villages). Indeed the Kalla Thevas have a very bad "press" in Madurai District generally. However, it must be observed that the relatonship between the extent of landownership of a caste and its status in the village is strong[1].

This relationship may perhaps be more fully

1 A good example of this point is seen in the contrasting fortunes of the Devanga Chettiars of both villages. In Village B, of 11 households, 10 own land totalling 20.41 acres of dryland, 12.38 acres of gardenland, and 0.80 acres of wetland. They live in well built houses. 28% of their population are farmers or farming labourers, 28% labourers, and 33% housedwellers. In Village A, of 9 households only one owns land, 0.58 acres of wetland. 7 of the 9 households live in one partitioned and repartitioned house. There are no farmers or farming labourers, 59% of their population are labourers, and 33% housedwellers. Both groups are characteristically outmigrating though for different reason. In Village B the Devanga Chettiar have strong links with the Cardamoms where 2 of the households of the village own land. In Village A outmigration is linked with coolie labour opportunities in the Cardamoms. Although the villages are located only five miles from each other, there appears to be no contact between the two groups.

'if we regard the historical acquisition of land by different parties as largely accidental (in the sense that land was not acquired because of status) explained in terms of the historical relationship between landownership and population. It has been shown that landownership is negatively associated with outmigration, and that (for the sample family lineages) a lineage's ability to survive in the village is dependent upon the extent of its initial ownership of land. The numerical and social dominance of the Kulla Thevas and Telungu Chettiars in either village may perhaps be explained by the largely accidental (in the sense that land was not acquired because of status) historical acquisition of land by different castes.

Moreover, it has been suggested (Section 6.3.3) that once numerical dominance is established, the process is reinforced in that caste may restrict the migration of other castes into the village, because of the necessary close links between families for rural to rural migration[1]. This is not to say that continuous social and economic discrimination have not had the effects of keeping the social status of particular groups low, or at least delaying upward status and landownership mobility[2]. However social discrimination within the village must be seen in terms of economic position.

All this would seem to support Mencher's opinion that caste (rather than class) as the unit of analysis can be overemphasised (Mencher, 1974). The

1 This process is perhaps less strong for service or labouring castes, whose presence may be useful to dominant farming castes.

2 However, as Moffat (1979) points out for the untouchable castes of Tamilnadu
"Although the land the Untouchables own is poorer and drier than that of the higher castes, and though the average size of an Untouchable family's holding is smaller than a higher caste family's holding, the Tamil Untouchables have done reasonably well in the last hundred years, considering the zero baseline from which they have started and the continuous economic discrimination to which they have been subjected".

emphasis, rather, should be laid upon

> the ways in which caste has been used by people in the system, as well as by outside obervers to mark class differences.
>
> (Mencher, op.cit.)

The manner in which this may happen is not detailed in this thesis. However, it may be pointed out that, given a situation of inequality of ownership within the different caste groups of the village, and especially within a socially and numerically dominant caste (a situation which exists for both sample villages), caste may be an ideal vehicle to exploit the more real (if less tangible) class differences.

The second main cultural value which has been discussed is the male/fenale division of labour. It has been shown (Section 8.3.2) that there have traditionally been strong relationships between labour demand and labour organisation. These resulted in the greater use of more cheaply paid hired female labour for operations of peaked demand "complemented" by (subjectively defined) skilled or more arduous, continuous (rather than peaked) family performed male labour ("skill" being associated with the ownership of bullocks, itself associated with landownership).

Since the introduction of new technology, especially for gardenland there has been a systematic increase in peaked (female performed) labour and a reduction in continuous (male performed) labour. It may well be that social beliefs, for example that transplantation must be performed by females for symbolic reasons of fertility, rather than economic necessity, govern the decision making process of the farmer regarding labour organisation. However, the economic advantage, or lack of economic disadvantage, in this form os social organisation probably reduces costs of inputs.

This overall relationship may be atypical of India in general. Bardhan (1977) quotes Census of India data (for 1961 and 1971) to show that for India as a whole the participation rate for women has decreased, although the proportion of women agricultural workers to women workers has increased at a faster rate (from 23% to 54%) than for males (15% to 25%). Similarly, Dasgupta (1975) shows that agriculturally advanced (Type A) villages have low participation rates for women, though the duration of female labour is high. Dasgupta's (1977) observation that almost all AERC studies show high adult male participation rates (for example, for Madras 92%) and lower adult female participation rates (Madras 55%), differs with those of the sample villages. For Village A the adult participation rate (OCs 1-3 as a proportion of the population for persons aged 13 and above) is 82% for males and 77% for females, and for Village B 74% for males and 77% for females. Moreover, when the ratio of female to male labour demand is considered (2.81 for Village A, and 3.69 for Village B) it is obvious that participation rates disguise extremely heavy under-employment for males. Dasgupta does note one exception to the general rule (the AERC study of Aralikottai village), which occurs in Tamilnadu. However his hypothesis that

In a dynamic setting with increased prosperity and a more skewed distribution of land and income (such as exists in Village A)[1], the participation of women decreases.

cannot be applied to the sample villages over time. The three reasons forwarded for this trend are, perhaps, questionable: that of status (women of richer households not being allowed to work), of labour substitution of higher class labour by subsistence-seeking lower class women, and, perhaps most questionably, that especially among the landless classes

in a village with a highly skewed land distribution pattern, women of families with little or no land do not find it easy to combine work with child care and other domestic duties.

The first two reasons are perhaps contradictory, for if labour is substituted within the same sex, there is no mobility of labour between the sexes. The third is perhaps irrelevant, and in any case there is no reason why it should be more true for women of families with no land than for women of landed families.

Generally Indian rural studies show a lack of quantitative analysis of trends in male and female labour demand (e.g. Byres, 1981), one exception to this rule

1 My parantheses.

being Harriss (1977b) for Randam Village, North Arcot District Tamilnadu, noting that with the pumpset revolution the demand for male labour is likely to decrease, and that women's labour has increased due to demand for intensive operations in paddy cultivation (transplanting, weeding, and harvesting) with increases in production associated with HYVs. However, he considers the "imbalance" not so much a matter of absolute disparities as of trends. This may well be true, as it is impossible to calculate accurately previous labour demand profiles. However, if the present demand for traditional operations and techniques are taken as a guide, (Section 4.6.5), it would seem likely that for the two sample villages, the imbalance existed before the introduction of recent new technology.

c) Political Factors

This aspect of village relationships, at least in the sense that power structure represents the deliberate organisation of class (which is strongly related to ownership), has been left largely unexplored. It is possible that power structures within the village determine to some extent the course of social relationships, but ultimately these relationships are influenced by roles within the production process, and thus landownership.

Perhaps it is more significant to point out that lack of overt political organisation[1] in the villages,

1 Excepting the activities of State and National Parties.

especially among labouring classes. In this role of caste as a divisive agent against the emergence of class consciousness has been cited above.

Both villages have had histories of caste rivalry, which have occasionally flared up into open conflict. For example in Village B a riot occurred in 1961 over the management of the Kurumba Gounda owned village school, which the Telungu Chettiars wanted to be run by the panchayat. Police occupation of the village resulted in the desertion of the village by the adult males of both castes (staying with same-caste relations in the surrounding villages), a situation which was resolved when the leaders of both castes agreed with the police to cooperate. Similarly a riot about 30 years before the survey between Pillais and Kulla Thevas ended in the murder of a Pillai and had to be resolved by arrests and convictions of several Kulla Thevas. Such events are widely remembered, and interpretations vary between castes.

Another factor restricting the formation of class consciousness is seen in the manner in which seasonally fluctuating demand for labour is organised. For most of the year agricultural labourers are continually in competition for available labour, yet for the two brief periods in the year when the demand for labour exceeds supply, at the paddy harvest, the kottukarin organisation of labour at once creates competition for available labour between working groups[1], and effectively separates the

1 Through the organisation of non-resident labour. The phased schedule of release of canal water in the valley spreads times of harvestin over an equivalent period, thus allowing a greater organisation of labour.

farmer from the labourer.

The formation of class organisation for large farmers does exist for this brief period[1] (though it is perhaps ineffectual in controlling wage rates), as well as for the organisation of the specialist water-controllers. However, the lack of general political organisation for the higher classes in either village may be interpreted as resulting from the lack of the need for it. As well as having for the majority of the year, the advantage of the demand-supply ratio for labour, the control of water for irrigation is not an important issue. While for Village B higher ownership classes are likely to have access to groundwater through power-operated wells, for Village A, there is assured water supply throughout the year. In villages where there is competition for available water from a single source of supply, such power structures may arise (see, for example, Wade, 1979).

d) Ecological Factors

The ecological and resource bases of the village have been shown to have had important effects on social relationships in the village. To a certain extent these relationships are incorporated into the theory, both where landuse type has a fundamental influence on the production process, and where ecological systems (e.g. groundwater availability) have determined the extent of cultivation.

1 See Section 5.9.2.

However, the nature of different resource bases, and therefore landuse types, exerts influences on the nature of production (and therefore, perhaps, social relationships), which may not be explained merely in terms of productivity and value (2.B.a, 2.B.b, and 2.Bd). This point may be illustrated in two main ways.

First, wetland, though by far the most productive landuse type, is ideal for paddy cultivation, a crop which may be used both for subsistence and commercial purposes[1]. However, the most productive use of gardenland, since the introduction of powersets, is for the long-term cash crops of cotton, chillis and bananas. The relationship between commercialisation and productivity is complicated by the extent of tenancy in wetland, which may have retarded the development of production for commercial rather than susistence purposes. However, the lack of any discernable relationship between the cycle of household evolution and the extent of wetland operation and ownership suggests either that subsistence production has not been important, or that if it has been important, it has exerted little effect on the distribution of landownership.

Secondly, although the production of rice necessitates for individual crops the inputs of intensive labour, the regime of water supply concentrates this input seasonally

1 Although for Village B, their newly acquired wetland produces marketable paddy, the attraction of wetland was enhanced by its potential function as a producer of rice for the family. Riceland is a form of stability, while gardenland remains the profit maker.

for the whole village, in a far more drastic way than with gardenland cultivation. Dryland cultivation, the least intensive, is more akin to wetland cultivation in the respect of seasonal concentration of labour demand. However, this factor does not outweigh the overall relationship between landproductivity and total labour demand, as reflected in labour organisation.

9.3.3 That other unrecognised factors acting externally may have changed the nature of interrelationships of the general model

Although two external factors have been identified as acting independently of the village, population growth and the introduction of new technology (see Chapter 1), other outside factors, most importantly government policy and the general capitalisation of the economy, may influence the village. The extent of their influence is difficult and perhaps impossible to quantify, both because they act in concert with the other main external forces, and because their influences are mediated through intra-village processes which may be seen as evolving indigenously.

Historically, government policy can be seen to have acted through three processes: revenue collection, agricultural extension and pricing policy and through the law relating to agricultural relations. It is possible that the process of revenue collection helped to create a greater degree of class formation than would have occurred otherwise, because of the necessary extra production of crops to pay kist[1]. This was perhaps especially true where land productivity and thus revenue rates were highest[2]. However, the relative value of rents, for leasing, and thus productivity, has fallen progressively during the 20th century with inflation (Haswell, 1967), and the continuing inequalities of ownership, and the differences in equality between the villages, may not be attributed to the revenue system.

Extension and pricing policies may also have accelerated the process of adoption of technology and intensification, and thus processes leading to polarity of ownership. It is difficult, however, in this respect, to separate government policy as an external force from availability of new technology. It is likely for example, that the technology of the green revolution would have been eventually imported by Indian farmers without government intervention. However, government influences on the agricultural systems may be seen in the accelerated adoption of powersets (especially in Village B) and of HYVs, mainly through an extensive loan

1 The ryotwari system was favoured by Munro, the Governor of Madras Presidency from 1820, because of its potential for agricultural and social change. Ryots would look upon land as permanent hereditary property, and taxation was to be for a moderate money assessment, providing an incentive for extra production. Early ryotwari settlements were, in fact, unnecessarily harsh, taking in the early 19th century up to 80% of the crop. By the end of the century, however, the principle that land revenue for a normal year should be worth half the value of the crop (33% for dryland), net of cultivation costs, was established in practice (Kumar, 1965).

2 Thus it would have had a greater effect on the production process of Village A.

system for the various levels of agricultural inputs, and in the selective adoption of certain HYVs through price fixing policies.

The tenancy and land ceiling legislation has had little effect on the villages, apart, perhaps, from the negative effect of discouraging long term tenancy agreement.

The gradual capitalisation of the regional and national economies is an even more nebulous, if more far-reaching, process than government policy. It is probable that here was a symbiosis of the development of the intra-village capitalisation of the agricultural system and capitalisation of the wider economy. The availability of outside markets would have encouraged the production of cash crops, while the intensification of village land would have made marketing possible. However, except where there may have been a sudden change in the regional economy, such speculation is perhaps irrelevant to the individual course of change for villages.

9.3.4 That the relationships outlined in the general model have varying strength through time, and thus the general model is incomplete

This criticism is a valid one, given that any change in the village must change the constituent institutions and relationships of the village.

The villages at the beginning of the 20th century were very different places from their counterparts in

1978. Perhaps their most striking feature was the closely knit interacting agricultural system, geared to the maximum use of available village resources within limitations ecologically imposed on a largely static primitive technological capability. Land, water, animal and human resources were geared to the independent reproduction of the village system from agricultural year to agricultural year, both through the production of crops for largely subsistence consumption, and the organisation of inputs, principally seeds and manure, for production.

By 1978 they had evolved into far more outwardly looking systems of agricultural production, whose prodcution and inputs relied on outside markets. The close dependence on animal resources had declined significantly, with the selective substitution of traditional methods of technology by methods offering more intensive production to the individual farmer.

While the apparent process of opening up of the village had been taking place, however, the interdependence of village members had not decreased. Because of the ability of the village to regulate its population, and the proportions of its population in different occupations, (seen recently, especially for Village B), and because of the increased demand for labour associated with more intensive forms of production, the process of polarisation associated with population increase (Steps 1 and 2 of the general model) perhaps <u>increased</u> the interdependence of village members through economic relationships. Therefore, in the absence of any process of true diversification, and the continuing strength of the agricultural sector in the village economy, the formal economic relationships outlined in the general model will continue to determine the course of changing social relationships for the sample villages.

9.4 The relevance of the general model; some final notes

While the previous section has made references to the overall context of the general model and the sample villages in the literature of village studies, the dominant theme of the thesis is one of change, and specifically change in the context of increasing poverty. There are several further points to be made.

There has been an emphasis in the thesis on the changing inequality of ownership of land, because of its potential to explain the distribution of resources and thus to some extent poverty within the village. There have been several studies which have sought to quantify the changing extent of inequality, both of income and of landownership. Kumar (1974), reviewing the literature on the inequality of income and expenditure from the mid-1950s until the late 1960s for all India, points out that Gini coefficients of income show either no change or a slight reduction in inequality, while Gini coefficients of consumption expenditure show a slightly more marked trend towards equality. This picture of general stability over time is upheld in Kumar's (1975) study of inequality of landownership[1] in Madras Presidency from the mid-19th to the mid-20th centuries.

The general absence of a marked trend towards inequality is also reflected in Bardhan's (1974) study of income inequality in four districts during the "green revolution" period. The

1 This is among landowners (revenue payers) only, not the total population.

application of Gini coefficients to village studies is rare, understandably, because of the difficulties of procuring accurate past ownership data. Instead the direction of change is often assumed. For example Djurfeldt and Lindberg's assumption that

> In an agrarian structure based on the private ownership of land and market transferences of ownership rights, we can .... expect a tendency towards concentration of landownership in the hands of a decreasing number of rich farmers and big landlords.
>
> (Djurfeldt and Lindberg, 1975)[1]

In some cases, the data are available, though left unused; for example in Kessinger's Vilyatpur, data on the distribution of farms (operated land) among property groups, seems actually to indicate increasing polarity over the period of study, 1848 to 1968, a datum which would be hard to explain in terms of Kessinger's central thesis, that of adjustment of farm size to changing family composition with the "cycle" (Kessinger, 1974, p.116).

Dantwala and Rao (1974) have warned against the use of the concentration ratio on its own, without a presentation of the processes of change,

> such as the movement of farmers up and down the "agricultural ladder".

Two studies which have applied Gini coefficients to the village (combined with an analysis of ownership mobility)

1 They do admit that there has been a certain amount of mobility within this system, both upward and downward.

have been made by Rao and Attwood.

Rao's (1972) single time point data for 36 villages in Maharastra, showing different degrees of inequality of landownership lead him to the questionable conclusion that they represent different stages in a temporal process of increasing inequality. This conclusion is drawn in spite of subsequent data on ownership mobility showing proportional gains from lower ownership classes, and corresponding losses from higher classes; the paradox is left largely unresolved.

Attwood (1979) has shown that for a village in Maharashtra, the relatively unchanging inequality of landownership is related to a cyclical pattern of ownership mobility, characterised by the relatively higher upward mobility for lower ownership classes through the balance of purchases over sales (in spite of a higher rate of loss through partitioning[1]), and corresponding downward mobility

1 Attwood links the greater proportional loss of land through partitioning for lower ownership classes to the influence of the Chayanovian cycle. These data, of course, conflict with my own which show a "cyclical" pattern of mobility (i.e. higher proportional loss from the higher ownership classes) for the Inheritance System MM (mainly partitioning), which balances changes through the other modes of mobility (usually not "cyclical") to give a total "downward" pattern of mobility (i.e. proportionately similar losses from all ownership classes), a trend which is reflected in the relatively stable Ginis over time for the ownership of different landuse types. The stability of Attwood's coefficients of inequality is maintained through a cycle of gains and losses reflecting a high degree of mobility. That there is a high degree of ownership mobility in the sample villages is not denied (patterns of mobility for the Financial Transfer MM are composed of the balance of sales and purchases). However, the overall direction of change for partitioning (my Inheritance system) is different. This difference may to some extent be explained by differences of data processing (see below).

from higher ownership classes (an imbalance of purchases over sales, combined with loss through partitioning).

Attwood's analysis of mobility is indeed a valuable addition to the literature on the mobility of ownership, but the fact that his data contain no distinction between land values or recognition of the possibility of changing relative value within the village perhaps weakens the general analysis. Attwood had probably allowed trends within the (probably) less productive but over represented[1] landuse types to override trends in the more productive landuse types. Moreover, the use of a large time span (50 years) does not allow the adjustment of relative classes of ownership (in fractiles) to be made, as is permitted through the smaller stages of this thesis. Thus where change occurs towards the end of the time span, it probably takes place from relatively higher fractiles[2].

Any analysis of changing inequality cannot be made without reference to related factors: population, land resources, technology, the production process, production use and labour organisation. The general conclusion is that with increasing population, inequality will increase slowly, but that as the related factors are themselves subject to change, this cannot be assumed to be a smooth process. Poverty, as much as being a function of inequality is a function

1 Because the "rogue" total area owned is used.

2 During the initial data processing for Village B, taking the overall 52 year period, I produced very similar figures to Attwood's for the areally dominant dryland, showing "anticyclical" mobility for the Inheritance System, and a "cyclical" pattern for the Financial Transfer MM, and the overall "cyclical" patterns characterised by Attwood's data. When, however, the data were separated into 13 year "Stages", the pattern of the inheritance system was "cyclical".

of the relationship between total production and population.

Bardhan (1977) has noted that the stability of equality of ownership of land may mask a process of proletarianisation, as the decreasing size of holdings means that small farmers are gradually forced to derive more and more of their income from agricultural labour. Similarly, Kumar (1975) admits that even in the absence of change in equality of ownership

> it is possible that various factors making for the inequality of wealth and income ... operate: commercialisation, the growth of money lenders and so forth.

It is possible, too, that the stability of equality of landownership may mask the process of increasing diversification of the richer peasantry into trade, banking and industry (Washbrook, 1973).

However, for the sample villages, in the absence of definitive temporal data on income, the relationship between landownership and occupation seems to indicate that while for Village B, there is increasing inequality of income because of the concentration of ownership of the more productive landuse types over time, in Village A we may assume a similar process based on increasing inequality of ownership of wetland (combined with increasing non-resident ownership until 1965) and the recent expansion of total income (associated with the expansion of the gardenland area) leading to increased inequality of income. The greater total inequality of Village A ownership of land, and the assumed increased inequality of income, is a reflection of its resource base.

Analysis of the relationship between aggregafe population and resources seems to support Boserup's (1965) thesis that intensification does take place with increasing population. Other village studies (e.g. Kessinger, 1974, Etienne, 1975 and Dube, 1969) seem to support this view, though it is questioned by others (including Thorner and Thorner, 1962, and Haswell, 1967). The processes and consequences of indigenously generated intensification, however, are little explored in Indian village studies. The process of differential intensification outlined in this thesis took place within the physiographical, land fertility and water resource spatial variation within the village. It would probably occur, too, in other villages because of two factors. First, differences in land fertility and water availability tend to be reflected in the location of the village at the most favourable site for the use of more productive land. Secondly, the village geography of resource allocation, except where influenced by variations in the availability of resources (especially water resources), tends to be influenced by movement-minimisation criteria, showing concentric cropping zones (Blaikie, 1971). Therefore intensification, where it takes place would normally be concentrated at the core.

The reciprocal controlling effect of resources on population through migration is also illustrated in the literature of village studies (e.g. as seen in the concept of "saturation" advanced by Chambers and Harriss, 1977).

Thus if population pressure is seen to be developing, it must be viewed in the context of distribution as well as population and production variables.

The general theme of this study is one of change. Whether change is seen as a result of external or internal processes it must be viewed as a multivariate process. The analysis of aggregate village data has been carried out within this theme (e.g. Dasgupta 1975, and Abelman and Dalton 1971). Kessinger (1974) is surely correct when he states

> Although the ultimate source of economic change is external to the village ... it does not follow that rural society is passive (having) an internal system of ideas and institutions that together with an internal process of cyclical change influences the form that external development takes within the community.

Appendix 1 Changing Areas under Landuse Types, 1885-1978

Village A

	Revenue Village			Village Ownership Zone					
	A	B	C	A	A_1	A_2	A_3	B	C
1885	781.72	563.85	147.79	714.93	572.68	-[1]	142.25	366.10	133.63
1915	1151.33	176.75	168.41[2]	944.46	732.06	37.83	174.57	118.06	155.27[2]
20	1150.11	175.63	170.75	943.24	724.45	40.93	177.86	116.94	157.61
25	1163.63	162.50	170.75	956.65	731.76	46.25	178.64	103.92	157.61
30	1176.84	149.29	170.75	969.86	730.97	60.25	178.64	90.71	157.61
35	1178.22	147.91	170.75	971.24	728.76	63.64	178.84	89.33	157.61
40	1186.04	140.09	170.75	979.06	730.03	70.19	178.84	81.51	157.61
45	1186.04	140.09	170.75	979.06	730.03	70.19	178.84	81.51	157.61
50	1224.77	104.01	168.10	998.77	736.42	80.86	181.49	64.45	154.96
55	1224.77	104.01	168.10	998.77	722.30	94.98	181.49	64.45	154.96
60	1230.39	98.39	168.10	1004.39	726.09	96.81	181.49	58.83	154.96
65	1231.19	97.59	168.10	1005.19	720.78	102.92	181.49	58.03	152.36
70	1251.56	94.47	149.85	1026.56	681.58	153.49	191.49	54.91	136.71
75	1262.50	84.33	149.85	1036.50	680.89	164.06	191.75	44.77	136.71
78	1263.54	83.49	149.85	1037.54	675.26	169.94	192.34	43.93	136.71

Village B

	Revenue Village			Village Ownership Zone					
	A	B	C	A	A_1	A_2	A_3	B	C
1885	708.54	369.35	139.11	506.55	?	?	-	236.37	83.28
1915	816.71	258.05	142.63[2]	576.22	443.91	132.31	-	163.67	86.79[2]
20	841.68	233.08		601.19	465.43	135.76	-	138.70	
25	940.98	133.78		669.94	522.57	147.37	-	69.95	
30	1002.92	71.84		695.51	532.37	163.14	-	44.38	
35	1009.51	65.25		696.30	531.18	165.12	-	43.59	
40	994.63	80.13		698.74	503.61	195.13	-	41.15	
45	994.10	80.66		698.21	503.08	195.13	-	41.68	
50	996.18	78.58		698.21	504.45	193.76	-	41.68	
55	993.52	81.24		698.21	496.54	201.67	-	41.68	
60	998.71	76.05		703.40	504.17	199.23	-	36.49	
65	1012.32	62.44		708.93	513.48	195.45	-	30.96	
70	1012.32	62.44		708.93	597.50	111.43	-	30.96	
75	1014.98	59.78		708.93	567.13	141.80	-	33.82	
78	1015.42	59.34		708.93	539.91	169.02	-	33.88	

A - Agricultural Land cultivated
A_1 - Cultivated Dryland
A_2 - Cultivated Gardenland
A_3 - Cultivated Wetland
B - Agricultural Land Uncultivated
C - Non-agricultural Land

1 1885 Register states that there are two wells in the village, but their location and extent of irrigation are unknown.

2 Increase due to re-survey of government lands.

Appendix 2 Depths of Operating Wells in 1885* and 1960-78

	Village A+									Village B++								
	Kamalai			Powerset			Total			Kamalai			Powerset			Total		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1885*	2	?	?	0	-	-	2	?	?	68	23.53	3.63	0	-	-	68	23.53	3.63
1960	32	23.19	8.95	0	-	-	32	23.19	8.95	79	34.58	6.43	0	-	-	79	34.58	6.43
1961	32	23.19	8.95	0	-	-	32	23.19	8.95	79	34.58	6.43	0	-	-	79	34.58	6.43
62	32	23.19	8.95	0	-	-	32	23.19	8.95	78	34.63	6.68	0	-	-	78	34.63	6.68
63	32	23.59	9.60	0	-	-	32	23.59	9.60	77	34.76	6.68	1	24	0	78	34.68	6.65
64	32	23.94	9.52	0	-	-	32	23.94	9.52	75	35.33	6.84	1	33	0	76	35.30	6.80
65	33	23.73	9.40	0	-	-	33	23.73	9.40	74	35.79	7.02	1	33	0	75	35.76	6.98
66	35	23.68	9.00	0	-	-	35	23.68	9.00	73	36.23	7.20	1	33	0	74	36.19	7.16
67	34	25.41	10.19	3	21.33	4.99	37	25.08	9.94	71	36.32	6.78	1	33	0	72	36.28	6.94
68	30	25.87	9.70	10	26.40	10.37	40	26.00	9.88	35	36.54	6.50	34	39.44	8.49	69	37.97	7.68
69	25	24.92	10.02	16	29.62	11.72	41	26.76	10.96	10	40.30	5.92	37	41.43	8.51	47	40.91	7.37
70	23	25.09	10.94	19	30.10	10.63	42	27.36	11.09	4	42.00	4.69	38	45.39	8.41	42	45.07	8.19
71	21	25.00	11.71	20	31.30	9.59	41	28.07	11.82	2	44.00	6	40	47.15	8.59	42	47.00	8.51
72	20	23.60	10.92	24	32.00	9.00	44	28.18	10.76	2	44.00	6	38	50.71	7.87	40	50.37	7.92
73	18	23.33	10.33	26	31.96	9.73	44	28.43	10.84	2	44.00	6	40	51.40	9.06	42	51.05	9.07
74	15	24.07	10.97	28	31.75	9.91	43	29.07	10.93	2	44.00	3	42	52.62	11.29	44	52.36	11.09
75	15	25.73	11.36	28	32.96	9.27	43	30.44	10.62	0	-	-	43	54.44	10.52	43	54.44	10.52
76	14	25.64	10.75	29	33.52	9.34	43	31.33	10.02	0	-	-	43	56.46	11.64	43	56.46	11.64
77	12	26.58	10.59	31	33.81	9.64	43	31.80	10.43	0	-	-	43	57.98	12.03	43	57.98	12.03
78	9	25.44	10.78	32	34.44	9.10	41	32.46	10.44	0	-	-	48	58.69	12.65	48	58.69	12.65

A No. of operating wells

B Average depth of operating wells

C Standard deviation of average depth of operating wells.

* Information for Village B taken from 1885 Settlement Register, though exact date of Karnam's survey of wells is unknown.

\+ For 48 of 51 wells operating during this period.

++ For 79 of 83 wells operating during this period.

Appendix 3 Gardenland Crop Areas according to Village Records (Adangal) 1960-78

Year*	Onion	Groundnut	White Cholam	Tomatoes	Ragi	Rice	Others[1]	Chillis	Cotton	Banana	Cholam	Others[2]
	3-Month Crops							6-Month Crops		12-Month Crop	5-Month Dry Crops	
Village A												
1960	-	2.27	-	0.75	5.30	16.04	5.03	17.70	7.00	0.09	37.03	2.50
1961	0.81	8.82	2.40	2.20	15.98	14.80	20.10	12.80	7.57	0.10	14.56	1.30
1962	0.90	25.43	7.41	1.84	10.69	11.02	16.71	6.40	12.95	0.11	34.32	3.19
1967	-	-	47.60	-	54.92	4.57	5.03	25.50	-	-	-	3.08
1968	4.46	32.77	56.74	37.16	26.07	-	43.25	10.54	0.80	3.06	15.69	1.96
1969	0.27	1.70	32.65	26.48	7.51	-	7.56	19.36	2.00	5.69	33.71	-
1970	2.24	40.92	29.39	25.13	8.12	-	32.76	24.25	40.92	6.96	30.74	7.18
1971	0.99	5.00	6.71	7.39	1.21	-	18.60	20.32	73.88	0.25	18.14	5.12
1972	-	40.75	3.46	26.12	1.00	-	36.40	15.88	37.41	2.60	11.98	5.73
1973	-	9.10	10.62	20.77	-	-	15.18	4.47	83.03	9.17	14.50	0.92
1974	-	2.16	88.64	6.20	0.62	-	8.30	19.57	114.98	3.40	12.69	0.96
1975	-	-	45.44	7.34	-	-	34.31	28.22	43.48	1.20	22.05	0.66
1976	1.45	-	0.45	6.14	-	-	10.75	48.11	112.20	5.08	14.59	1.34
1977	-	3.23	6.48	15.59	-	0.63	14.64	30.39	50.21	7.80	11.90	0.99
1978	-	4.36	18.55	9.90	-	-	19.95	22.96	46.95	22.15	5.65	0.43
Village B												
1966	18.04	0.65	14.79	16.15	46.75	-	5.33	37.48	2.64	5.16	38.61	49.22
1968	15.25	7.97	1.60	27.26	72.17	1.30	1.60	18.73	0.60	4.89	80.48	3.35
1969	4.54	-	45.05	8.25	12.23	-	13.86	10.63	-	18.66	14.86	3.19
1971	3.95	3.66	0.75	6.65	20.97	-	1.02	21.90	54.99	36.27	30.30	6.86
1972	20.49	3.89	22.62	20.64	1.59	0.58	10.79	18.25	37.75	36.59	4.79	5.10
1973	10.37	3.50	11.85	11.29	2.24	-	1.34	4.59	49.57	65.70	17.79	3.39
1974	12.21	-	28.04	11.92	9.77	-	2.04	4.57	77.04	23.90	14.91	3.39
1975	18.61	-	6.76	13.93	14.60	-	7.76	20.43	43.04	10.87	29.78	12.37
1976	2.63	-	7.24	2.58	0.25	-	2.00	24.11	128.15	15.27	27.01	3.44
1977	9.39	7.70	5.24	5.69	3.58	0.35	2.18	6.67	47.11	37.32	4.47	23.49
1978	17.67	6.94	1.65	6.68	2.20	-	12.94	11.31	35.17	69.42	7.89	0.36

* Fasli

1 includes Blackgram, Ladysfinger, Cumbu, Cabbage, Sweet Potato

2 includes Tovare, Samai, Karnam, Varagu

Appendix 4. Estimated Monthly Dryland Labour Demand (man days)
Source : Sample Household Survey

Village A[1]

	Operation	Tamil Month 1	2	3	4	5	6	7	8	9	10	11	12
Males	Ploughing by bullock	7.1			7.1	7.1							
	Ploughing by tractor	411.4			411.4	411.4							
	Transport of Manure/Mud					204.7							
	Mixing of Manure/Mud					127.0							
	Weeding						58.1						
	Harvesting									1173.3			
	Total	418.2			418.2	749.9	58.1			1173.3			
Females	Mixing of Manure/Mud					33.0							
	Weeding						2658.3			3007.3			
	Harvesting												
	Total					33.0	2658.3			3007.3			

Village B[2]

	Operation	1	2	3	4	5	6	7	8	9	10	11	12
Males	Ploughing by bullock	16.6			16.6	16.6							
	Ploughing by tractor	280.7			280.7	280.7							
	Transport of Manure/Mud					68.2							
	Harvesting									348.6			
	Total	297.3			297.3	365.5				348.6			
Females	Transport of Manure/Mud					52.1							
	Mixing of Manure/Mud					169.0							
	Weeding						2799.8						
	Harvesting									4549.7			
	Total					221.1	2799.8			4549.7			

1 For 109.9 of 591.11 operated dryland acres.
2 For 105.80 of 530.10 operated dryland acres.

Appendix 5 Labour Demand for Operations (as defined in Section 4.6.2) for Main Gardenland Crops and Crop Combinations

		Post-powerset								Pre-powerset							
		M		F						M		F					
Operations		H	Fa	H	Fa	M	F	T	f	H	Fa	H	Fa	M	F	T	f
ONION	(1)															-	
	(2)	5.63				5.63		5.63	4	2.70	6.27			8.97		8.97	
	(3)																
	(4)																
	(5)	2.81				2.81		2.81	1								
	(6)																
	(7)			13.07	0.16		13.23	13.23	1								
	(8)			34.95	0.23		35.18	35.18	3.37								
	(9)																
	(10)		1.66	0.79		1.66	0.79	2.46	2.49			-	-			-	
	(11)																
	(12)										26			26		26	13
	(13)		3.25			3.25		3.25	13							-	-
	(14)		0.54	33.97	0.18	0.54	34.15	34.69	1								
	Total	8.44	5.45	82.78	0.57	13.89	83.35	97.24		5.51	32.81	82.78	0.57	38.32	83.35	121.67	
WHITE CHOLAM	(1)	2.55h				2.55h		2.55h	0.93								
	(2)	2.38	1.70			4.42		4.42	6.37	2.70	6.27			8.97		8.97	
	(3)	0.17	1.19			1.36		1.36	1								
	(4)	1.02	0.34		0.34	1.36	0.34	1.70	1								
	(5)	4.42				4.42		4.42	1								
	(6)																
	(7)			7.82			7.82	7.82	1								
	(8)			16.33			16.33	16.33	2								
	(9)																
	(10)		1.02			1.02		1.02	1							-	
	(11)							?	3.54								
	(12)										22			22		22	11
	(13)		2.75			2.75		2.75	11							-	
	(14)	2.04		9.52		2.04	9.52	11.56	1								
	Total	10.35	7.00	33.67	0.34	17.35	34.01	51.36		10.35	29.80	33.67	0.30	40.15	33.97	74.12	
GROUNDNUT	(1)	2.02h				2.02h		2.02h	1.51							-	
	(2)		6.48			6.48		6.48	5.86	2.70	6.27			8.97		8.97	
	(3)																
	(4)																
	(5)	3.04				3.04		3.04	1								
	(6)																
	(7)			11.63			11.63	11.63	1								
	(8)			24.70			24.70	24.70	2.58								
	(9)																
	(10)		1.21			1.21		1.21	1.29							-	
	(11)							?	2.35								
	(12)										28.62			28.62		28.62	14.31
	(13)		3.58			3.58		3.58	14.31							-	
	(14)			30.36			30.36	30.36	1								
	Total	3.44	11.27	66.69	0	14.71	66.69	81.40		6.14	34.89	66.69	0	41.03	66.69	151.72	
CHILLIS	(1)		2.83h			2.83h		2.83h	1.49							-	
	(2)	3.58	3.88			7.46		7.46	2.73	2.70	6.27			8.97		9.97	
	(3)	0.60	1.49			2.09		2.09	1								
	(4)	0.89	0.60		0.60	1.49	0.60	2.09	1								
	(5)	4.18				4.18		4.18	1								
	(6)																
	(7)	0.67	0.33	4.95	0.16	1.01	5.11	6.12	1								
	(8)			72.00	1.01		73.01	73.01	5.73								
	(9)																
	(10)		0.62	4.19	0.16	0.62	4.36	5.41	2.90			-	-			-	
	(11)							?	6.07								
	(12)										79.7			79.7		79.7	39.85
	(13)		9.96			9.96		9.96	39.85							-	-
	(14)			72.25	1.51		73.76	73.76	10.32								
	Total	9.92	17.23	153.39	3.44	27.15	156.83	183.98		9.04	98.35	149.20	3.28	107.39	71.34	178.73	

Continued ...

Appendix 5 (cont)

COTTON	(1)	0.59h	0.32h			0.91h		0.91h	0.52							-	
	(2)	3.65	3.27			6.91		6.91	4.24	2.70	6.27			8.97		8.97	
	(3)	1.85	0.91		0.05	2.76	0.05	2.82	1								
	(4)	0.40	0.64	1.12	0.70	1.04	1.88	2.92	1								
	(5)	4.55	0.18			4.72		4.72	1								
	(6)																
	(7)	0.21	0.38	6.43	0.88	0.59	7.52	7.91	1								
	(8)	0.66	0.88	45.72	4.47	1.55	50.19	51.74	5.46								
	(9)																
	(10)		0.39	9.27	1.15	0.40	10.41	10.81	2.87			-	-			-	
	(11)							?	10.94								
	(12)										50.38			50.38		50.38	25.19
	(13)		6.29			6.29		6.29	25.19							-	-
	(14)		2.13	82.70	9.17	2.13	91.86	93.99	12.43								
	Total	11.39	15.11	145.24	16.42	26.50	161.66	188.16		10.37	62.16	135.97	15.27	72.53	151.24	223.77	
BANANA	(1)	1.39h	0.35h			1.75h		1.75h	0.80							-	
	(2)	3.71	1.47			5.19		5.19	4.69	2.70	6.27			8.97		8.97	
	(3)	2.21	3.08			5.29		5.29	1								
	(4)	1.48	0.08	2.66	0.08	1.56	2.74	4.30	1								
	(5)								1								
	(6)	8.58	0.08	1.01		8.66	1.01	9.67	1								
	(7)								1								
	(8)																
	(9)	18.41	0.02	62.38	0.91	18.43	63.29	82.10	6.92								
	(10)	0.99	1.94	9.36	0.25	2.93	9.62	12.55	5.48			-	-			-	
	(11)							?	0.75								
	(12)										351.52			351.52		351.52	87.88
	(13)		21.97			21.97		21.97	87.88							-	-
	(14)								-								
		35.55	28.68	75.41	1.24	64.23	76.65	140.88		33.37	383.02	66.05	0.99	416.39	67.04	483.43	
BANANAS	(1)	1.39h	0.35h			1.75h		1.75h	0.80							-	
and	(2)	3.71	1.47			5.19		5.19	4.69	2.70	6.27			8.97		8.97	
½ONION &	(3)	2.21	3.08			5.29		5.29	1								
½CHILLIS	(4)	1.48	0.08	2.66	0.08	1.56	2.74	4.30	1								
	(5)								1								
for banana	(6)	8.58	0.08	1.01		8.66	1.01	9.67	1								
	(7)			9.81			9.81	9.81	2								
	(8)																
	(9)	18.41	0.02	69.77	0.68	18.43	70.45	88.89	7.55								
	(10)	1.28	1.66	11.32	0.25	2.94	11.57	14.51	6.68			-	-			-	
	(11)							?	5.30								
	(12)										351.52			351.52		351.52	87.78
	(13)		21.97			21.97		21.97	87.78							-	-
	(14)		0.28			0.28	54.19	54.47	6.84								
	Total	35.84	28.68	148.76	1.01	64.52	149.77	214.29		33.38	383.02	137.44	0.76	416.39	138.20	554.59	
3-MONTH	(1)	1.15h	0.46h			1.61h		1.61h									-
CROP	(2)	3.55	2.87			6.42		6.42		2.70	6.27			8.97		8.97	
(RAGI,	(3)	0.39	0.90			1.29		1.29	1								
ONIONS,	(4)	0.26	0.08		0.58	0.34	0.58	0.92	1								
WHITE	(5)	3.43				3.43		3.43	1								
CHOLAM	(6)																
&	(7)	1.04		9.17	0.04	1.04	9.21	10.25	1								
GROUNDNUT)	(8)			26.97	0.05		27.03	27.03	?								
	(9)																
	(10)		0.96	0.71		0.96	0.71	1.68				-	-			-	
	(11)																
	(12)											30		30		30	15
	(13)		3.75			3.75		3.75	15							-	-
	(14)	0.51	0.30	21.41	0.04	0.81	21.45	22.26	1								
	Total	9.32	8.92	58.26	0.71	18.24	58.97	77.21		8.33	41.30	57.55	0.71	49.63	58.26	107.89	

H - Hired (Daily wage and Contract) Labour
Fa - Family (Family and Attached) Labour
M - Male
F - Female
T - Total
f - Frequency of operation

Figures given in labour days per acre, except (1), where given in hours (h) per acre.

Appendix 6a Estimated Monthly Gardenland Labour Demand (man-days)

Source: Sample Household Survey

Village A[1]

Grouped Operations	Tamil Months 1	2	3	4	5	6	7	8	9	10	11	12
Males												
Land Preparation (1-5)	329.2	123.0	400.3	373.0	331.7	0	163.5	272.9	152.7	150.9	272.9	96.9
Planting (6-7)	6.3	21.3	0	15.3	16.8	15.5	0	6.2	82.3	8.2	7.3	3.5
In-Cultivation Operations (8-10)	70.7	44.2	130.1	126.5	129.4	141.4	144.0	135.5	112.1	143.7	6.84	6.61
Irrigation (13)	172.2	163.3	167.8	195.5	178.8	179.2	169.1	145.0	167.5	181.2	158.8	150.6
Harvesting (14)	14.1	6.7	16.0	65.3	0	12.3	24.6	14.0	31.3	39.6	23.3	11.2
Total	592.3	358.5	714.4	775.6	656.7	348.4	501.1	573.5	545.9	523.6	504.9	303.3
Females												
Land Preparation (1-5)	12.6	6.1	6.8	36.1	36.2	0	20.3	30.7	10.5	2.6	33.3	3.7
Planting (6-7)	31.8	107.3	0	219.7	224.8	140.9	0	79.1	242.7	57.6	64.0	153.8
In-Cultivation Operations (8-10)	938.0	739.2	1123.1	873.0	1100.1	1106.0	1431.8	1166.6	1104.1	843.3	684.1	726.0
Irrigation (13)	0	0	0	0	0	0	0	0	0	0	0	0
Harvesting (14)	771.2	773.2	688.9	2122.1	504.4	1310.2	1362.7	642.6	1345.0	1706.1	1474.4	483.0
Total	1753.7	1625.8	1818.7	3250.8	1865.5	2557.1	2814.8	1919.0	2703.2	2609.5	2255.8	1366.5

1 For 183.10 Acres

Appendix 6b Estimated Monthly Gardenland Labour Demand (man-days)

Source: Sample Household Survey

Village B[1]

Grouped Operations	Tamil Months 1	2	3	4	5	6	7	8	9	10	11	12
Males												
Land Preparation (1-5)	700.5	36.1	302.5	194.8	252.1	392.7	45.0	13.4	0	197.0	22.2	124.5
Planting (6-7)	4.1	85.2	0	8.9	9.5	5.1	14.9	3.2	1.2	0	30.1	3.6
In-Cultivation Operations (8-10)	14.1	20.1	189.8	199.4	207.2	187.7	154.5	141.8	111.3	92.5	0.9	22.4
Irrigation (13)	139.1	177.4	142.7	165.9	169.9	183.6	122.6	192.0	191.0	190.5	170.5	152.1
Harvesting (14)	0.9	2.1	4.2	19.5	0.6	29.2	2.3	0	18.1	37.3	38.9	22.5
Total	858.7	321.0	639.1	588.5	639.3	798.3	339.3	350.3	321.6	517.4	262.5	309.8
Females												
Land Preparation (1-5)	42.2	1.4	18.6	19.9	28.1	48.8	1.8	0.6	0	17.6	0.3	5.1
Planting (6-7)	66.3	342.5	0	226.4	131.7	143.2	190.0	42.2	10.4	0	187.1	206.6
In-Cultivation Operations (8-10)	164.5	386.5	808.9	1061.0	1103.3	1026.1	1147.4	1416.1	1133.2	818.5	90.9	219.8
Irrigation (13)	0	0	0	0	0	0	0	0	0	0	0	0
Harvesting (14)	273.0	40.9	596.0	811.3	116.4	1163.9	528.6	0	779.3	1530.9	1661.2	972.2
Total	545.9	771.3	1423.5	2118.6	1379.6	2382.0	1867.7	1458.9	1922.9	2367.0	1939.5	1235.0

1 For 182.65 Acres

Appendix 7 Estimated Monthly Wetland Labour Demand for Village A[1] (man-days)

Source: Sample Household Survey

Operation	Tamil Months 1	2	3	4	5	6	7	8	9	10	11	12
Males												
Ploughing by Bullock	16.9*		33.9					33.9				
Ploughing by Tractor	781.7*		1563.4					1563.4				
Transport of Manure			691.7									
Mixing of Manure			376.1									
Levelling			159.4					159.4				
Transplantation				28.7					28.7			
Fertilizer Application					408.0					408.0		
Harvesting								1475.8				1475.8
Total	798.6		2824.5	28.7	408.0			3232.5	28.7	408.0		1475.8
Females												
Mixing of Manure			511.6					511.6				
Transplantation				2822.4					2822.4			
Fertilizer Application					4307.8					4307.8		
Harvesting								2145.1				2145.1
Total			511.6	2822.4	4307.8			2656.7	2822.4	4307.8		2145.1

* For Green Manure Crop

1 For 159.37 Acres

Appendix 8 Estimated Monthly and Total Labour Demand for All Landuse Types (man-days)

Source: Sample Household Survey

	Tamil Month												
	1	2	3	4	5	6	7	8	9	10	11	12	Year
Village A													
Male													
Dryland	418.2			418.2	749.9	58.1			1173.3				2817.7
Gardenland	592.3	358.5	714.4	775.6	656.7	348.4	501.1	573.5	545.9	523.6	504.9	303.3	6398.2
Wetland	798.6		2824.5	28.7	408.0			3232.5	28.7	408.0		1475.8	9204.8
Total	1809.1	358.5	3538.9	1222.5	1814.6	406.5	501.1	3806.0	1747.9	931.6	504.9	1779.1	18420.7
Female													
Dryland					33.0	2658.3			3007.3				5698.6
Gardenland	1753.7	1625.8	1818.7	3250.8	1865.5	2557.1	2814.8	1919.0	2703.2	2609.5	2255.8	1366.5	26540.6
Wetland			511.6	2822.4	4307.8			2656.7	2822.4	4307.8		2145.1	19573.8
Total	1753.7	1625.8	2330.3	6073.2	6206.3	5215.4	2814.8	4575.7	8532.9	6917.3	2255.8	3511.6	51813.0
Village B													
Male													
Dryland	297.3			297.3	365.5				348.6				1308.7
Gardenland	853.7	321.0	639.1	588.5	639.3	798.3	339.3	350.3	321.6	517.4	262.5	309.8	5995.6
Wetland	69.4		245.4	2.5	35.3			280.9	2.5	35.5		128.3	799.9
Total	1220.4	321.0	884.5	888.3	1040.2	798.3	339.3	631.2	672.7	522.9	262.5	438.1	8054.2
Female													
Dryland					221.1	2799.8			4549.7				7570.6
Gardenland	545.9	771.3	1423.5	2118.6	1379.6	2382.0	1867.7	1458.9	1922.9	2367.0	1939.5	1235.0	20436.2
Wetland			44.5	245.2	374.4			230.9	245.3	374.4		186.4	1710.1
Total	545.9	771.3	1468.0	2363.8	1975.1	5181.8	1867.7	1689.8	6747.9	2741.4	1939.5	1421.4	29716.9

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