

Monitoring Changing Agriculture on a Local Scale in South India: Potential and Problems in the Use of Statistical Data

Junji NAGATA*

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I Introduction

Agriculture in South India has been transformed dramatically since the 1960s under agricultural modernization policies, which center round the promotion of the green revolution. On the macro level it is pointed out that the land productivity has been raised considerably mainly due to the introduction of high-yielding varieties of rice. Furthermore in the rural areas of South India in the 1980s and 1990s, along with agricultural modernization policies, the rapid urbanization and industrialization of the society is considered to have had a tremendous impact on the dynamics of agriculture. In these circumstances it can be an important theme to explain how the agriculture of South India has changed in the 1980s and 1990s, and at the same time to clarify the meaning of this change for South Indian society today.

For this purpose, first, it is necessary to monitor the changing agriculture under an appropriate time – space framework with accuracy. Generally speaking, if we analyze time series data without paying full attention to the observation period and interval, we tend to misread long-term trends and fail to catch short-term fluctuations that are not negligible. And in case the phenomena involves marked spatial biases it is often no use analyzing the data added up by a larger spatial unit. We should be conscious that the changes of agriculture in South India have probably both long-term trends and short-term trends, and

* Department of Human Geography, The University of Tokyo

spatial biases that cannot be overlooked both on a wider regional scale and on a local scale. The consideration that makes light of these points often leads to the misunderstanding of the phenomena. And what is worse, it results in mistaking the boundaries of the problem and prescribing for the problems posed wrongly.

This paper examines the potential of monitoring changing agriculture on a local scale in South India using statistical data and the accompanying problems. By 'on a local scale' I mean here that the monitoring is done based on detailed spatial data, at the largest, village-wise data. Until now it has not been clearly shown how meaningful the monitoring of agriculture on a local scale is in South India and what practical problems there are in such an attempt. In this paper I take up Ponneri area in the state of Tamil Nadu as a case. Ponneri area here is the territory which covers two taluks under Tiruvallur district, that is, Ponneri taluk and Gummidipundi taluk. The area lies to the north of Chennai (Madras), the largest city of Tamil Nadu (Figure 1).

II Statistical data on agriculture in Tamil Nadu

The statistical data can be an important source for monitoring changing agriculture systematically. The most comprehensive and important statistical yearbook on agriculture in Tamil Nadu is "Season and Crop Report of Tamil Nadu (yearly)" (it is hereafter abbreviated as SCR). This yearbook is published for every agricultural year (written as "1998/1999") and provides much useful information about agriculture including weather conditions, land use, irrigation facilities, acreage and output of each crop, and marketing prices. And it is also an important advantage of these statistics that we can get the annual time series data for a rather long period since the colonial era, although there is a serious problem of delay in publishing. For example, the newest volume that was available in the distribution center of government publications in Chennai as of September 1999 was for the year of 1994/1995, and the newest I could see in the Department of Agriculture, the State of Tamil Nadu was for the year 1996/1997.

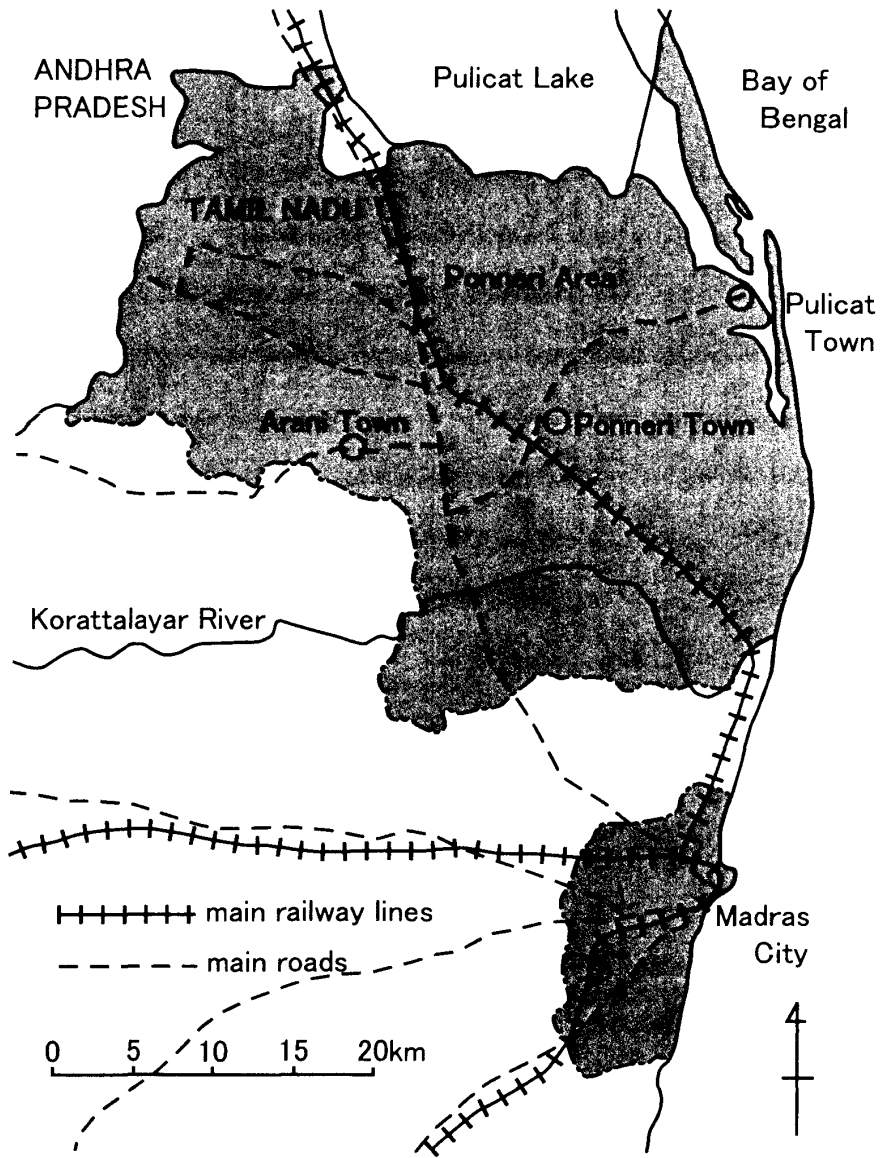


Figure 1. Location of Ponneri area.

Another serious problem of this statistical yearbook is that it contains district-wise data, but not more detailed spatial data such as taluk-wise data and village-wise data. “Taluk” is an administrative unit set up under the district. If we attempt to grasp the outlines of agriculture of each district in Tamil Nadu, the district-wise data will be usable in its own way. But for the purpose of discussing the dynamics of agriculture associated with the reality of the living of the people, district-wise data will be too rough to use.

Then, is it possible to get the more detailed spatial data of SCR than the district-wise data? Among the data of SCR the main data on land use, irrigation facilities and crops are based on the information in the “Village Accounts,” which is prepared by the village administrative officer (VAO) of each village. In order to get village-wise data of SCR in a certain area, one way is certainly to call on all the VAO in the area one by one. But we can consider another way, that is, gaining access to the statistical inspector who directs VAO to submit information on the village and compile it. In case of Ponneri area, one statistical inspector is assigned to each block set up under the taluk. Ponneri taluk is divided into two blocks; Minjur block on the northeastern side and Sholavaram block on the southwestern side. Gummidipundi taluk corresponds to Gummidipundi block as a whole (Figure 2). Thus, if we attempt to collect complete village-wise data of Ponneri area, we need to gain access to the three statistical inspectors who are in charge of one of these blocks.

After all, the village-wise data of Ponneri area which I was able to collect, whether in the form of a bundle of separate sheets or in the form of table, is for three agricultural years, that is, 1996/1997, 1997/1998, and 1998/1999. But as to 1996/1997 and 1998/1999 there is much deficiency in the data, so I was able to make an analysis based on the village-wise data only for the agricultural year 1997/1998. As for the block-wise data, I was able to collect them for the period from 1991/1992 to 1997/1998.

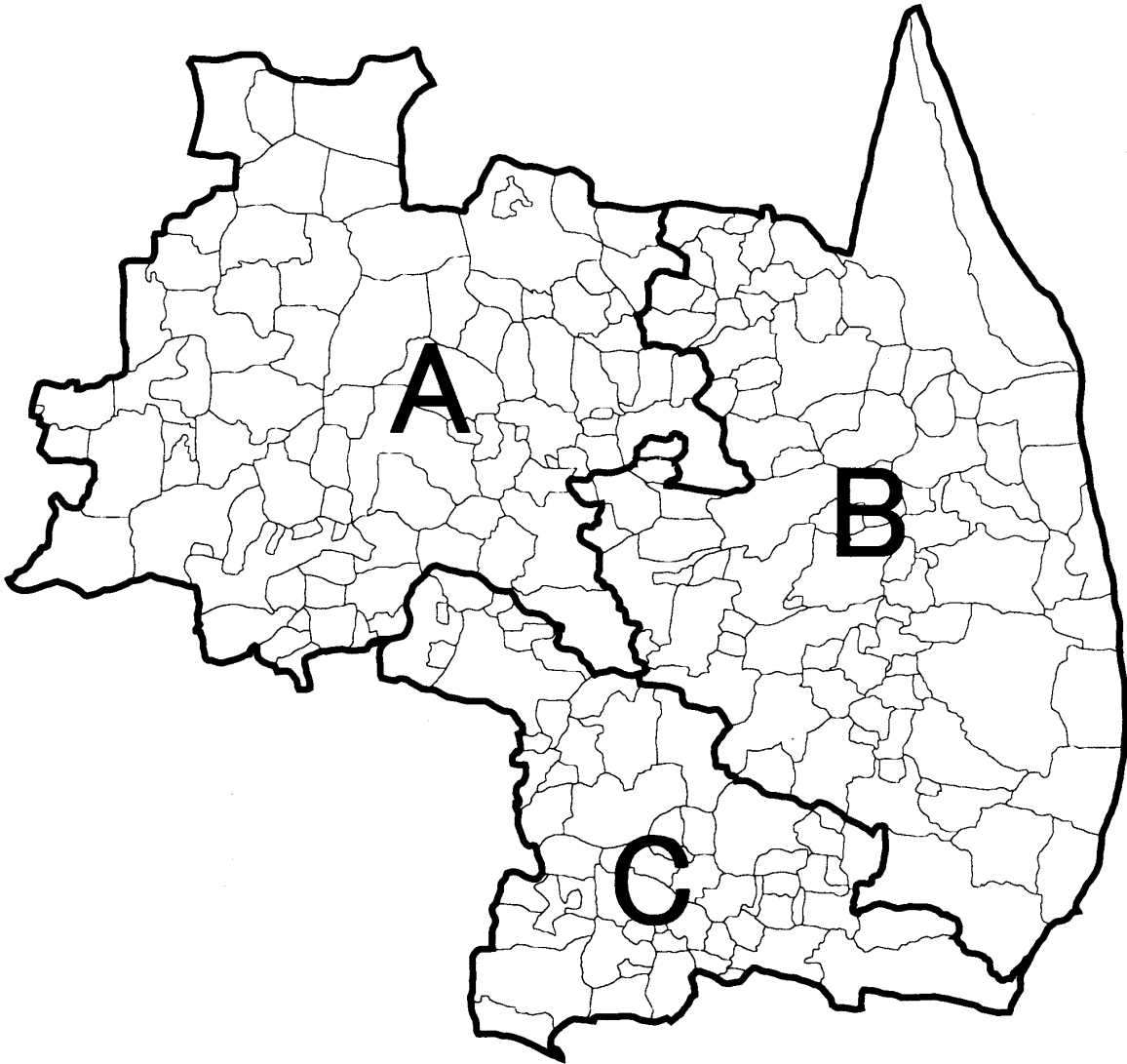


Figure 2. Taluks and blocks in Ponneri area.

A: Gummidipundi block = Gummidipundi taluk.

B: Minjur block. C: Sholavaram block.

B+C: Ponneri taluk.

III A case study of Ponneri area

1 Analysis based on the block-wise data

If we attempt to monitor changing agriculture on a local scale, we should use the village-wise data desirably. But as mentioned above I was able to get the complete village-wise data of Ponneri area only for the year 1997/1998. On the other hand I was able to get the block-wise data for seven successive years from 1991/1992 to 1997/1998. In this chapter I will examine to what extent we could understand the dynamics of agriculture in Ponneri area both in time and spatial dimensions through the analysis based on the block-wise data.

(1) Dry land / wet land and cultivated land / non- cultivated land

Before I proceed to consideration of the block-wise data of SCR, I will observe such basic data as the percentage of dry land or wet land to the total agricultural land, and the percentage of cultivated land or non-cultivated land to the total agricultural land in three blocks that constitute Ponneri area (Table 1). The former is a basic index of physical land conditions of the area and the latter is an important figure relating to the trend of agricultural activities in the area. The data can be taken from "*Register No.12 – Abstract of the settlement,*" which contains the basic information on land taxation and is available in the taluk office.

Firstly as for the percentage of dry land we can see distinct differences among the blocks. In Gummidipundi block, which is located in the interior side and is uplifted slightly, the percentage is the highest among three blocks, reaching 65%. In Minjur block, which occupies the coastal plain along the Bay of Bengal and Pulicut Lake, the percentage is the lowest, only 36%. In Sholavaram block, which mainly covers the lowland area excluding the coastal area, the figure is in the middle of the other two blocks, 57%.

Secondly as for the percentage of cultivated land it is particularly noticeable that in Gummidipundi block, which is considered to be under the most severe physical land

Table 1. Dry land / Wet land and Cultivated land / Non-cultivated Land in Ponneri Area

Block	Fasli	Year	Total		Dry		Wet		Actual cultivation charged		Dry		Wet		
			(ha)	Total	Total	Total	Total	Total	Actual cultivation charged	Waste charged	Actual cultivation charged	Waste charged			
Minjur	1406	1996/1997	24107	8748	15359	17567	6547	5579	3169	11988	3378	5579	3169	11988	3378
	1407	1997/1998	24107	8748	15359	17231	6876	5450	3298	11781	3578	5450	3298	11781	3578
	1408	1998/1999	24104	8742	15362	17141	6948	5340	3396	11801	3552	5340	3396	11801	3552
Sholavaram	1406	1996/1997	12803	7350	5453	9211	3592	4588	2762	4623	829	4588	2762	4623	829
	1407	1997/1998	12814	7361	5453	9081	3741	4531	2832	4550	908	4531	2832	4550	908
	1408	1998/1999	12814	7359	5455	8804	4010	4200	3158	4603	852	4200	3158	4603	852
Gummidipundi	1406	1996/1997	26774	17434	9340	20844	5930	12301	5133	8544	797	12301	5133	8544	797
	1407	1997/1998	26776	17436	9340	20777	5959	12346	5050	8431	909	12346	5050	8431	909
	1408	1998/1999	26794	17454	9340	20964	6119	12528	4920	8542	791	12528	4920	8542	791

Block	Fasli	Year	Total		Dry		Wet		Actual cultivation charged		Dry		Wet		
			(%)	Total	Total	Total	Total	Total	Actual cultivation charged	Waste charged	Actual cultivation charged	Waste charged			
Minjur	1406	1996/1997	100.0	36.3	63.7	72.9	27.2	63.8	36.2	78.0	22.0	63.8	36.2	78.0	22.0
	1407	1997/1998	100.0	36.3	63.7	71.5	28.5	62.3	37.7	76.7	23.3	62.3	37.7	76.7	23.3
	1408	1998/1999	100.0	36.3	63.7	71.1	28.8	61.1	38.8	76.8	23.1	61.1	38.8	76.8	23.1
Sholavaram	1406	1996/1997	100.0	57.4	42.6	71.9	28.1	62.4	37.6	84.8	15.2	62.4	37.6	84.8	15.2
	1407	1997/1998	100.0	57.4	42.6	70.9	29.2	61.6	38.5	83.5	16.7	61.6	38.5	83.5	16.7
	1408	1998/1999	100.0	57.4	42.6	68.7	31.3	57.1	42.9	84.4	15.6	57.1	42.9	84.4	15.6
Gummidipundi	1406	1996/1997	100.0	65.1	34.9	77.9	22.1	70.6	29.4	91.5	8.5	70.6	29.4	91.5	8.5
	1407	1997/1998	100.0	65.1	34.9	77.6	22.3	70.8	29.0	90.3	9.7	70.8	29.0	90.3	9.7
	1408	1998/1999	100.0	65.1	34.9	78.2	22.8	71.8	28.2	91.5	8.5	71.8	28.2	91.5	8.5

Source: Register No.12 - Abstract of the settlement (Ponneri taluk and Gummidipundi taluk) (each year).

conditions, the figure is the highest among three blocks, reaching 78%, while in Minjur and Sholavaram blocks the figure is around 70%. If we take a look at dry land only, the percentage is the highest in Gummidipundi taluk, reaching around 71%, although in Minjur and Sholavaram blocks it is only around 60%. In wet land that is well – irrigated, the percentage of cultivated land is generally higher than in dry land. If we take a look at wet land only, the percentage is the highest also in Gummidipundi taluk, reaching around 91%, although in Minjur and Sholavaram blocks it is around 77% and 84% respectively. It is noteworthy that in the area, which is considered to be under more favorable physical conditions for agriculture, the percentage of cultivated land has become lower.

(2) Net area sown and total cropped area

In the following I will examine the block-wise data of SCR (Table 2 and Table 3). Firstly as to the net area sown, there is no remarkable change in the 1990s in any blocks in Ponneri area (Table 2). Next if we give attention to the ratio of total cropped area to net area sown, which is an index of intensiveness of land use, the figure shows a tendency to rise a little in the 1990s in all blocks of Ponneri area (Table 2). But there is a difference in the absolute level among the blocks; in Minjur block the ratio has changed from around 1.3 to 1.4, and in Sholavaram block from around 1.4 to 1.5, while in Gummidipundi block from around 1.0 to 1.1, still remaining at a lower level. This means in Sholavaram block about 50% of the net area sown is double cropped, but in Gummidipundi block only 10%. The more unfavorable physical conditions for agriculture in Gummidipundi block could be the main reason for this difference. However we should pay attention to the fact that in Minjur block the ratio is lower than in Sholavaram block, although in Minjur block the percentage of wet land is higher and therefore the physical conditions for agriculture are considered to be more favorable than in Sholavaram block.

(3) Irrigation

As for the ratio of net area irrigated to net area sown, in Minjur block it has gone up from

Table 2-a. Net Area Sown, Total Cropped Area and Cropped Area with Some Important Crops (Minjur Block)

Fasli Year	Net area sown (ha)	Total geographical area (ha)	Net area sown / Total geographical area (%)	Total cropped area (ha)	Total cropped area / Net area sown	Paddy Samba (ha)	Paddy Nawarai (ha)	Paddy Sornavari (ha)	Paddy Samba / Net area sown (%)	Paddy Nawarai / Paddy Samba (%)	Paddy Sornavari / Paddy Samba (%)	Groundnut Total (ha)	Groundnut Total / Net area sown (%)
1401 1991/1992	18968	47869	39.6	24736	1.30	12708	2328	4194	67.0	18.3	33.0	2176	11.5
1402 1992/1993	17004	47869	35.5	21070	1.24	11710	1268	3308	68.9	10.8	28.2	1604	9.4
1403 1993/1994	17602	47869	36.8	22594	1.28	9430	2002	5754	53.6	21.2	61.0	1570	8.9
1404 1994/1995	17752	47769	37.2	24385	1.37	10139	2120	5958	57.1	20.9	58.8	1860	10.5
1405 1995/1996	17790	47869	37.2	24792	1.39	10245	2320	6218	57.6	22.6	60.7	1813	10.2
1406 1996/1997	17847	47869	37.3	25191	1.41	9250	3735	6120	51.8	40.4	66.2	1902	10.7
1407 1997/1998	17877	46385	38.5	25200	1.41	9250	3738	6121	51.7	40.4	66.2	1896	10.6

Fasli Year	Pulse Total (ha)	Pulse Total / Net area sown (%)	Mango (ha)	Mango / Net area sown (%)	Banana (ha)	Banana / Net area sown (%)	Eucalyptus (ha)	Eucalyptus / Net area sown (%)	Casuarina (ha)	Casuarina / Net area sown (%)
1401 1991/1992	1398	7.4	20	0.1	212	1.1	175	0.9	452	2.4
1402 1992/1993	1610	9.5	20	0.1	291	1.7	130	0.8	453	2.7
1403 1993/1994	2563	14.6	0	0.0	38	0.2	39	0.2	649	3.7
1404 1994/1995	3341	18.8	5	0.0	40	0.2	36	0.2	365	2.1
1405 1995/1996	3134	17.6	5	0.0	46	0.3	47	0.3	489	2.7
1406 1996/1997	3049	17.1	5	0.0	49	0.3	56	0.3	621	3.5
1407 1997/1998	3058	17.1	5	0.0	50	0.3	58	0.3	620	3.5

Source: Block-wise data of Season and Crop Report.

Table 2-b. Net Area Sown, Total Cropped Area and Cropped Area with Some Important Crops (Sholavaram Block)

Fasli Year	Net area sown (ha)	Total geographic area (ha)	Net area sown / Total geographic area (%)	Total cropped area (ha)	Total cropped area / Net area sown	Paddy Samba (ha)	Paddy Nawarai (ha)	Paddy Sornavari (ha)	Paddy Samba (%)	Paddy Nawarai / Paddy Samba (%)	Groundnut Total (ha)	Groundnut Total / Net area sown (%)
1401 1991/1992	18968	47869	39.6	24736	1.30	12708	2328	4194	67.0	18.3	2176	11.5
1402 1992/1993	17004	47869	35.5	21070	1.24	11710	1268	3308	68.9	10.8	1604	9.4
1403 1993/1994	17602	47869	36.8	22594	1.28	9430	2002	5754	53.6	21.2	1570	8.9
1404 1994/1995	17752	47769	37.2	24385	1.37	10139	2120	5958	57.1	20.9	1860	10.5
1405 1995/1996	17790	47869	37.2	24792	1.39	10245	2320	6218	57.6	22.6	1813	10.2
1406 1996/1997	17847	47869	37.3	25191	1.41	9250	3735	6120	51.8	40.4	1902	10.7
1407 1997/1998	17877	46385	38.5	25200	1.41	9250	3738	6121	51.7	40.4	1896	10.6

Fasli Year	Pulse Total (ha)	Pulse Total / Net area sown (%)	Mango Total (ha)	Mango / Net area sown (%)	Banana (ha)	Banana / Net area sown (%)	Eucalyptus (ha)	Eucalyptus / Net area sown (%)	Casuarina (ha)	Casuarina / Net area sown (%)
1401 1991/1992	1398	7.4	20	0.1	212	1.1	175	0.9	452	2.4
1402 1992/1993	1610	9.5	20	0.1	291	1.7	130	0.8	453	2.7
1403 1993/1994	2563	14.6	0	0.0	38	0.2	39	0.2	649	3.7
1404 1994/1995	3341	18.8	5	0.0	40	0.2	36	0.2	365	2.1
1405 1995/1996	3134	17.6	5	0.0	46	0.3	47	0.3	489	2.7
1406 1996/1997	3049	17.1	5	0.0	49	0.3	56	0.3	621	3.5
1407 1997/1998	3058	17.1	5	0.0	50	0.3	58	0.3	620	3.5

Source: Block-wise data of Season and Crop Report.

Table 2-c. Net Area Sown, Total Cropped Area and Cropped Area with Some Important Crops (Gummidipundi Block)

Fasli Year	Net area sown (ha)	Total geographic area (ha)	Net area sown / Total geographic area (%)	Total cropped area (ha)	Total cropped area / Net area sown	Paddy Samba (ha)	Paddy Nawarai (ha)	Paddy Sornavari (ha)	Paddy Samba / Net area sown (%)	Paddy Nawarai / Paddy Samba (%)	Paddy Sornavari / Paddy Samba (%)	Groundnut Total (ha)	Groundnut Total / Net area sown (%)
1401 1991/1992	21871	42051	52.0	22503	1.03	14303	438	0	65.4	3.1	0.0	2729	12.5
1402 1992/1993	22034	42051	52.4	23162	1.05	13992	454	490	63.5	3.2	3.5	2628	11.9
1403 1993/1994	22323	42051	53.1	24113	1.08	14044	533	514	62.9	3.8	3.7	2769	12.4
1404 1994/1995	22203	42051	52.8	24467	1.10	14371	544	614	64.7	3.8	4.3	2818	12.7
1405 1995/1996	22252	42051	52.9	24523	1.10	14480	555	700	65.1	3.8	4.8	2825	12.7
1406 1996/1997	22447	42051	53.4	24703	1.10	14450	610	710	64.4	4.2	4.9	2925	13.0
1407 1997/1998	22400	42051	53.3	24835	1.11	14480	600	800	64.6	4.1	5.5	2873	12.8

Fasli Year	Pulse Total (ha)	Pulse Total / Net area sown (%)	Mango (ha)	Mango / Net area sown (%)	Banana (ha)	Banana / Net area sown (%)	Eucalyptus (ha)	Eucalyptus / Net area sown (%)	Casuarina (ha)	Casuarina / Net area sown (%)
1401 1991/1992	68	0.3	806	3.7	51	0.2	518	2.4	1788	8.2
1402 1992/1993	62	0.3	1127	5.1	36	0.2	852	3.9	1795	8.1
1403 1993/1994	117	0.5	1324	5.9	66	0.3	915	4.1	1729	7.7
1404 1994/1995	128	0.6	1543	6.9	129	0.6	1027	4.6	1024	4.6
1405 1995/1996	135	0.6	1743	7.8	130	0.6	1029	4.6	1030	4.6
1406 1996/1997	150	0.7	1750	7.8	120	0.5	1000	4.5	990	4.4
1407 1997/1998	120	0.5	1850	8.3	110	0.5	1030	4.6	960	4.3

Source: Block-wise data of Season and Crop Report.

around 87% to 95% and in Gummidipundi block from around 74% to 78%. Although I have some doubt about the figures of Sholavaram block, the ratio has risen probably from around 90% to almost 100% (Table 3). It is certain there is a conspicuous difference in the absolute level, but we can see the rise in the ratio of irrigated area in the 1990s all over Ponneri area. As to the irrigation facilities, we can observe a substantial decrease in the number of tube wells both in Minjur and Sholavaram blocks and an increase in the number of tube wells and tanks in Gummidipundi block. But I have some doubt about these data also and their relationships to the rise in the ratio of irrigated area are not obvious.

In this connection, if we look at the sources of water supply, there is a striking contrast among the blocks. In Minjur block about 50% of the net area irrigated is watered by tube well, 40% by tank, and 10% by canal. In Sholavaram block about 75% is watered by tube well, 15% by tank, and 10% by canal. In contrast to these, in Gummidipundi block, about 55% is watered by tank, 40% by ordinary wells, and 5% by tube well and others.

(4) Rice farming

The main crop in Ponneri area is rice (paddy), which is, needless to say, the most important crop in South India. However, as to the block-wise data on rice farming, I was able to obtain only figures about the acreage. In Ponneri area, normally, three cropping seasons are distinguished; Sornawari (April – July), Samba (August – November) and Navarai (December – March). Among these the main crop season is Samba, and the most severe season for water conditions is Sornawari.

If we observe the changes in rice cropped area in the 1990s according to the three crop seasons, that is, Sornawari, Samba and Navarai, we can recognize a significant difference of trends among the blocks (Table 2). First, in Minjur block, the percentage of rice cropped area in Samba to net area sown has decreased from around 70% to 50%. Conversely, rice cropped areas both in Navarai and Sornawari have increased substantially. The ratio of rice cropped area in Navarai to that in Samba has risen from around 20% to 40%, and in case of Sornawari, from around 30% to 60%. On the other hand in Sholavaram block, rice

Table 3-a. Irrigation (Minjur Block)

Fasli Year	Area Irrigated (ha)				Tube Wells				Ordinary wells (Sole irrigation)				Other sources				Total				Ordinary wells (Supplement)							
	Canals		Tanks		Gross		Net		Gross		Net		Gross		Net		Gross		Net		Gross		Net		Gross		Net	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net
1401 1991/1992	2355	2193	7080	6560	10283	7908	0	0	60	52	19778	16713	4390	4182														
1402 1992/1993	1504	1469	5916	5639	8484	7561	0	0	55	47	15959	14716	4364	3800														
1403 1993/1994	2250	2146	6660	6012	9499	8206	0	0	55	47	18464	16411	4496	3894														
1404 1994/1995	2300	2240	6640	6018	9499	8206	0	0	55	47	18494	16511	4410	3815														
1405 1995/1996	2220	2100	6740	6218	10975	8010	0	0	55	47	19990	16375	4610	3945														
1406 1996/1997	2187	2118	7115	6340	11023	8155	0	0	55	47	20380	16660	4755	4020														
1407 1997/1998	2281	2166	7372	6484	11428	8281	0	0	55	47	21136	16978	5016	4070														

Fasli Year	Area Irrigated (%)				Tube Wells				Ordinary wells (Sole irrigation)				Other sources				Total							
	Canals		Tanks		Gross		Net		Gross		Net		Gross		Net		Gross		Net		Gross		Net	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net		
1401 1991/1992	11.9	13.1	35.8	39.3	52.0	47.3	0.0	0.0	0.3	0.3	100.0	100.0	0.0	0.0										
1402 1992/1993	9.4	10.0	37.1	38.3	53.2	51.4	0.0	0.0	0.3	0.3	100.0	100.0	0.0	0.0										
1403 1993/1994	12.2	13.1	36.1	36.6	51.4	50.0	0.0	0.0	0.3	0.3	100.0	100.0	0.0	0.0										
1404 1994/1995	12.4	13.6	35.9	36.4	51.4	49.7	0.0	0.0	0.3	0.3	100.0	100.0	0.0	0.0										
1405 1995/1996	11.1	12.8	33.7	38.0	54.9	48.9	0.0	0.0	0.3	0.3	100.0	100.0	0.0	0.0										
1406 1996/1997	10.7	12.7	34.9	38.1	54.1	48.9	0.0	0.0	0.3	0.3	100.0	100.0	0.0	0.0										
1407 1997/1998	10.8	12.8	34.9	38.2	54.1	48.8	0.0	0.0	0.3	0.3	100.0	100.0	0.0	0.0										

Fasli Year	Index				Sources of water supply (number)																					
	Total cropped area (ha)		Net area sown (ha)		Gross area irrigated / Total cropped area (%)		Net area irrigated / Net area sown (%)		Canals			Tanks			Tube Wells			Wells used for irrigation purposes only			Wells used for domestic purposes			Wells not in use		
	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Canals	Tanks (with ayacut of 40 hectares or more)	Tanks (with ayacut of less than 40 hectares)	Tanks (total)	Tube Wells for irrigation purposes only	Tube Wells for domestic purposes	Wells used for irrigation purposes only	Wells used for domestic purposes	Wells not in use									
1401 1991/1992	24736	18968	80.0	88.1	1.18	3	73	132	205	1474	520	1140	328													
1402 1992/1993	21070	17004	75.7	86.5	1.08	3	73	128	201	1619	511	1168	233													
1403 1993/1994	22594	17602	81.7	93.2	1.13	3	73	128	201	1828	564	1694	250													
1404 1994/1995	24385	17752	75.8	93.0	1.12	3	73	128	201	870	530	2984	472													
1405 1995/1996	24792	17790	80.6	92.0	1.22	3	73	128	201	882	546	3032	470													
1406 1996/1997	25191	17847	80.9	93.3	1.22	3	73	128	201	889	393	3071	141													
1407 1997/1998	25200	17877	83.9	95.0	1.24	3	73	128	201	889	393	3071	141													

Source: Block-wise data of Season and Crop Report.

Table 3-b. Irrigation (Sholavaram Block)

Fasli Year	Area Irrigated (ha)						Area Irrigated (%)							
	Canals		Tanks		Tube Wells		Ordinary wells (Sole irrigation)		Other sources		Total		Ordinary wells (Supplement)	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net
1401 1991/1992	1151	987	1505	1366	7426	6732	0	0	0	0	10082	9085	1720	1158
1402 1992/1993	1271	952	1352	1308	6585	6532	0	0	0	0	9208	8792	1376	1126
1403 1993/1994	1146	855	1822	1809	7515	6134	0	0	0	0	10483	8798	1494	1251
1404 1994/1995	906	858	1820	1785	8220	6858	0	0	0	0	10946	9501	1580	1400
1405 1995/1996	996	936	1507	1399	9111	7220	0	0	0	0	11614	9555	1876	1430
1406 1996/1997	1055	1037	1547	1476	10113	7385	0	0	0	0	12715	9898	1985	1486
1407 1997/1998	1123	1067	1618	1521	10548	7634	0	0	0	0	13289	10222	2049	

Fasli Year	Area Irrigated (%)						Area Irrigated (%)							
	Canals		Tanks		Tube Wells		Ordinary wells (Sole irrigation)		Other sources		Total		Ordinary wells (Supplement)	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net
1401 1991/1992	11.4	10.9	14.9	15.0	73.7	74.1	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
1402 1992/1993	13.8	10.8	14.7	14.9	71.5	74.3	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
1403 1993/1994	10.9	9.7	17.4	20.6	71.7	69.7	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
1404 1994/1995	8.3	9.0	16.6	18.8	75.1	72.2	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
1405 1995/1996	8.6	9.8	13.0	14.6	78.4	75.6	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
1406 1996/1997	8.3	10.5	12.2	14.9	79.5	74.6	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
1407 1997/1998	8.5	10.4	12.2	14.9	79.4	74.7	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0

Fasli Year	Sources of water supply (number)						Sources of water supply (number)							
	Canals		Tanks		Tube Wells		Ordinary wells (Sole irrigation)		Other sources		Total		Ordinary wells (Supplement)	
	Total cropped area (ha)	Net area sown (ha)	Gross irrigated / Total cropped area (%)	Net area irrigated / Net area sown (%)	Gross irrigated / Net area irrigated	Net area irrigated	Tanks (with ayacut of 40 hectares or more)	Tanks (with ayacut of less than 40 hectares)	Tanks (total)	Tube Wells for irrigation purposes only	Wells used for domestic purposes	Wells not in use	Gross	Net
1401 1991/1992	12246	9048	82.3	100.4	1.11	1	34	52	86	1113	517	1290	271	
1402 1992/1993	13127	9416	70.1	93.4	1.05									
1403 1993/1994	15018	9728	69.8	90.4	1.19	11	34	56	90	1324	380	2025	345	
1404 1994/1995	15158	9828	72.2	96.7	1.15	11	34	56	90	1340	370	2150	300	
1405 1995/1996	14843	9829	78.2	97.2	1.22	11	34	56	90	1340	370	2150	300	
1406 1996/1997	14771	9823	86.1	100.8	1.28	11	34	56	90	426	357	3672	465	
1407 1997/1998	14806	9840	89.8	103.9	1.30	1	34	56	90	429	255	3683	139	

Source: Block-wise data of Season and Crop Report.

Table 3-c. Irrigation (Gummidipundi Block)

Fasli Year	Area Irrigated (ha)		Tanks		Tube Wells		Ordinary wells (Sole irrigation)		Other sources		Total		Ordinary wells (Supplement)	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net
1401 1991/1992	175	175	9590	9590	360	360	5975	5975	210	210	16310	16310	1410	1410
1402 1992/1993	175	175	9590	9590	360	360	5975	5975	210	210	16310	16310	1524	1524
1403 1993/1994	195	175	10590	9590	577	385	7154	6025	210	210	18726	16385	1827	1554
1404 1994/1995	0	0	10624	9713	582	415	7790	6626	198	176	19194	16930	1860	1590
1405 1995/1996	0	0	10630	9715	584	418	7800	6630	200	180	19214	16943	1870	1595
1406 1996/1997	0	0	10930	9815	690	450	7290	7039	300	280	19210	17584	1872	1598
1407 1997/1998	0	0	11116	9815	700	455	7360	7045	300	280	19476	17595	1852	1598

Fasli Year	Area Irrigated (%)		Tanks		Tube Wells		Ordinary wells (Sole irrigation)		Other sources		Total		Ordinary wells (Supplement)	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net
1401 1991/1992	1.1	1.1	58.8	58.8	2.2	2.2	36.6	36.6	1.3	1.3	100.0	100.0	14.1	14.1
1402 1992/1993	1.1	1.1	58.8	58.8	2.2	2.2	36.6	36.6	1.3	1.3	100.0	100.0	15.2	15.2
1403 1993/1994	1.0	1.1	56.6	58.5	3.1	2.3	38.2	36.8	1.1	1.3	100.0	100.0	18.3	15.5
1404 1994/1995	0.0	0.0	55.4	57.4	3.0	2.5	40.6	39.1	1.0	1.0	100.0	100.0	18.6	15.9
1405 1995/1996	0.0	0.0	55.3	57.3	3.0	2.5	40.6	39.1	1.0	1.1	100.0	100.0	18.7	15.9
1406 1996/1997	0.0	0.0	56.9	55.8	3.6	2.6	37.9	40.0	1.6	1.6	100.0	100.0	18.7	15.9
1407 1997/1998	0.0	0.0	57.1	55.8	3.6	2.6	37.8	40.0	1.5	1.6	100.0	100.0	18.5	15.9

Fasli Year	Index		Sources of water supply (number)		Sources of water supply (number)		Sources of water supply (number)		Sources of water supply (number)	
	Total cropped area (ha)	Net area sown (ha)	Canals	Tanks (with ayacut of 40 hectares or more)	Tanks (with ayacut of less than 40 hectares)	Tanks (total)	Tube Wells for irrigation purposes only	Wells used for domestic purposes	Wells not in use	Wells used for domestic purposes
1401 1991/1992	22503	21871	11	57	93	150	360	3792	2552	943
1402 1992/1993	23162	22034	11	57	93	150	385	3802	2627	958
1403 1993/1994	24113	22323	11	57	93	150	395	3810	2635	960
1404 1994/1995	24467	22203	11	57	93	150	405	3850	2638	969
1405 1995/1996	24523	22252	11	57	93	150	410	3845	2650	958
1406 1996/1997	24703	22447	11	57	93	150	470	3845	2650	958
1407 1997/1998	24835	22400	4	89	93	182	470	1437	2850	128

Source: Block-wise data of Season and Crop Report.

cropped area in Samba does not show a tendency to rise, and that in Navarai shows a tendency to decrease. Rice cropped area only in Sornawari shows a tendency to rise, and the ratio of cropped area in Sornawari to that in Samba has risen from around 25% to 33%. In Gummidipundi block, rice cropped area in Samba has been almost stable. Rice cropped area in Navarai shows a tendency to rise and that in Sornawari has increased from almost nil. But their volume is not so much, and the ratios of rice cropped areas in Navarai and Sornawari to that in Samba have reached only around 5% respectively.

The expansion of rice cropped area in the 1990s in Sornawari, the most severe season for water conditions, is a common phenomenon in all three blocks in Ponneri area, but it is noteworthy that there exists a considerable difference in its absolute level among the blocks. And a substantial decrease in rice cropped area in Samba, the most favorable season in the water conditions, which is observed only in Minjur block, also deserves our attention.

(5) Other crops

As for the main crops other than rice, we can see also the distinctive features of each block (Table 2). In Minjur block groundnut occupies around 10% of net area sown through the 1990s. Pulse expanded in the 1990s and the percentage of area cropped with pulse has increased from 7.4% in 1991/1992 to 17.1% in 1997/1998. In Sholavaram block groundnut occupies around 15% through the 1990s and pulse shows almost the same tendency as in Minjur block. Other than these, banana occupies 3 to 5%. Gummidipundi block shows a slightly different tendency compared with Minjur block and Sholavaram block. Groundnut occupies around 12%, but pulse and banana remain below 1%. On the other hand mango has increased from 3.4% in 1990/1991 to 8.3% in 1997/1998, while eucalyptus and casuarina occupying around 4% in 1997/1998 respectively.

In all three blocks groundnut is the most important crop next to rice and its acreage is rather stable. As for crops other than groundnut, there is a specific difference among the blocks. For instance, in Gummidipundi block, where the percentage of dry land is compara-

tively high, the percentage of tree crops has become higher.

2 Analysis based on the village-wise data

As I stated in Chapter II, it is incredibly difficult to collect complete village-wise data of SCR for more than one year. In addition, as I will mention in the final chapter, the data have quite a few problems as to reliability of the figures. Therefore analysis based on the village-wise data is said to be extremely limited in practice. After all in this study, the village-wise data of SCR which I consider usable are; net area sown, rice cropped area (first crop, second crop and third crop) and gross cropped area with groundnut for the year 1997/1998 only. Here I call each crop of rice farming 'first crop, second crop and third crop' in order of acreage in each village. I have taken this measure because I noticed there existed many errors of data entry and therefore it is not clear which figures actually correspond to the crops in Samba, Navarai and Sornawari respectively. Even if I have adopted such a measure it would be possible to understand in what part of Ponneri area double or triple cropping of rice farming is popular.

As I examined in the former section, through the analysis based on the block-wise data of SCR, we were able to know the existence of spatial bias, which is not negligible as to the agriculture in Ponneri area. But here, by mapping the village-wise data of SCR, a more distinct spatial pattern appears. Figure 3 – Figure 6 shows the distribution of acreage of net area sown, first crop of rice, second crop of rice and gross cropped area with groundnut respectively.

The acreage of net area sown in the area is rather evenly distributed (Figure 3). And in almost all the villages in Ponneri area rice is cropped at least once, although its area is smaller in the western part of the area (Figure 4). These facts are known, however, through the analysis based on the block-wise data of SCR. It is the distribution of the acreage of second crop of rice that we should pay attention to (Figure 5). The area where the double cropping of rice farming is popular is almost limited to the plain which stretches over Minjur block and Sholavaram block north and south. In the western part of Ponneri area,

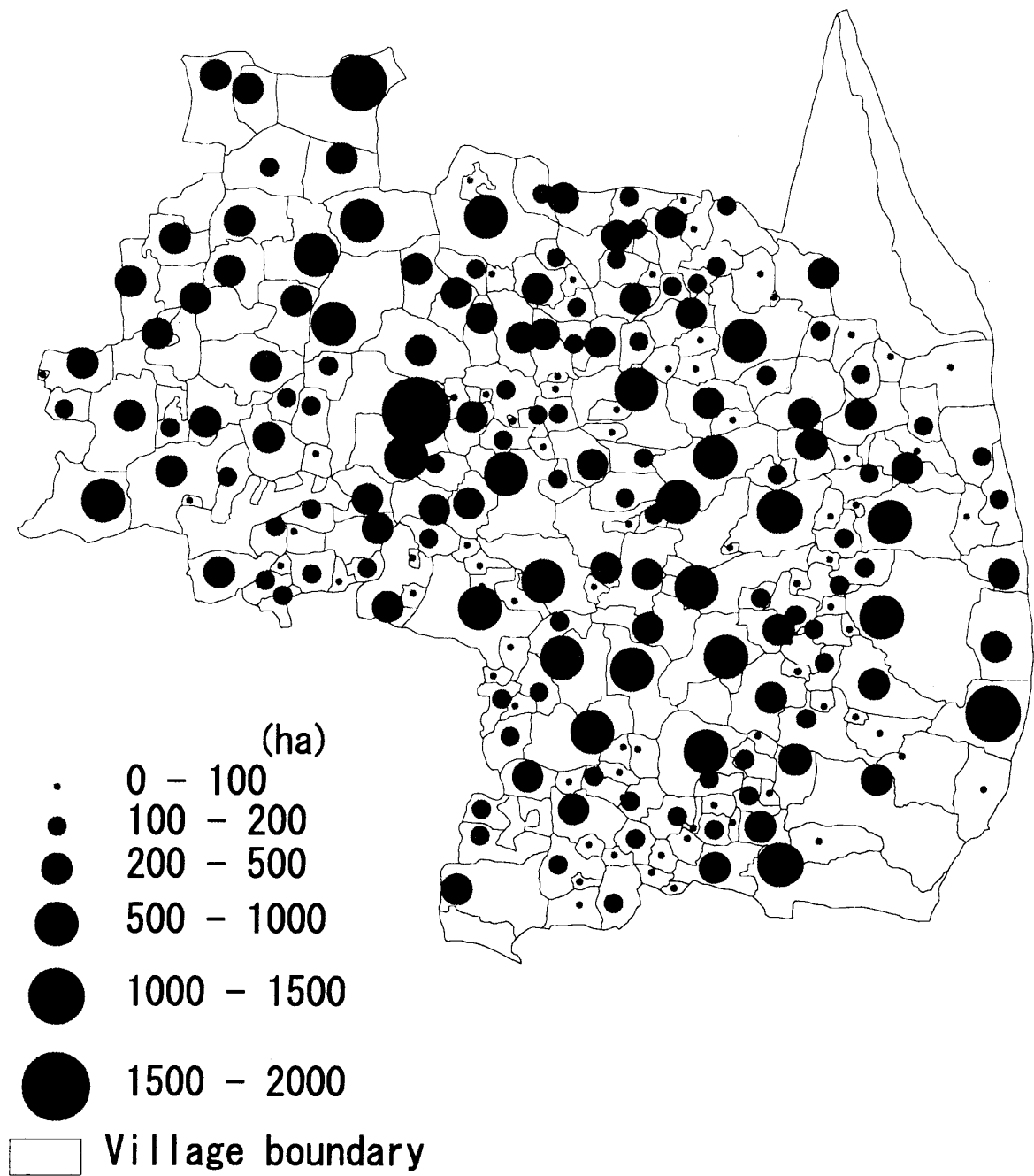


Figure 3. Distribution of acreage of net area sown in Ponneri area in 1997/1998.
Prepared based on the village-wise data of Season and Crop Report.

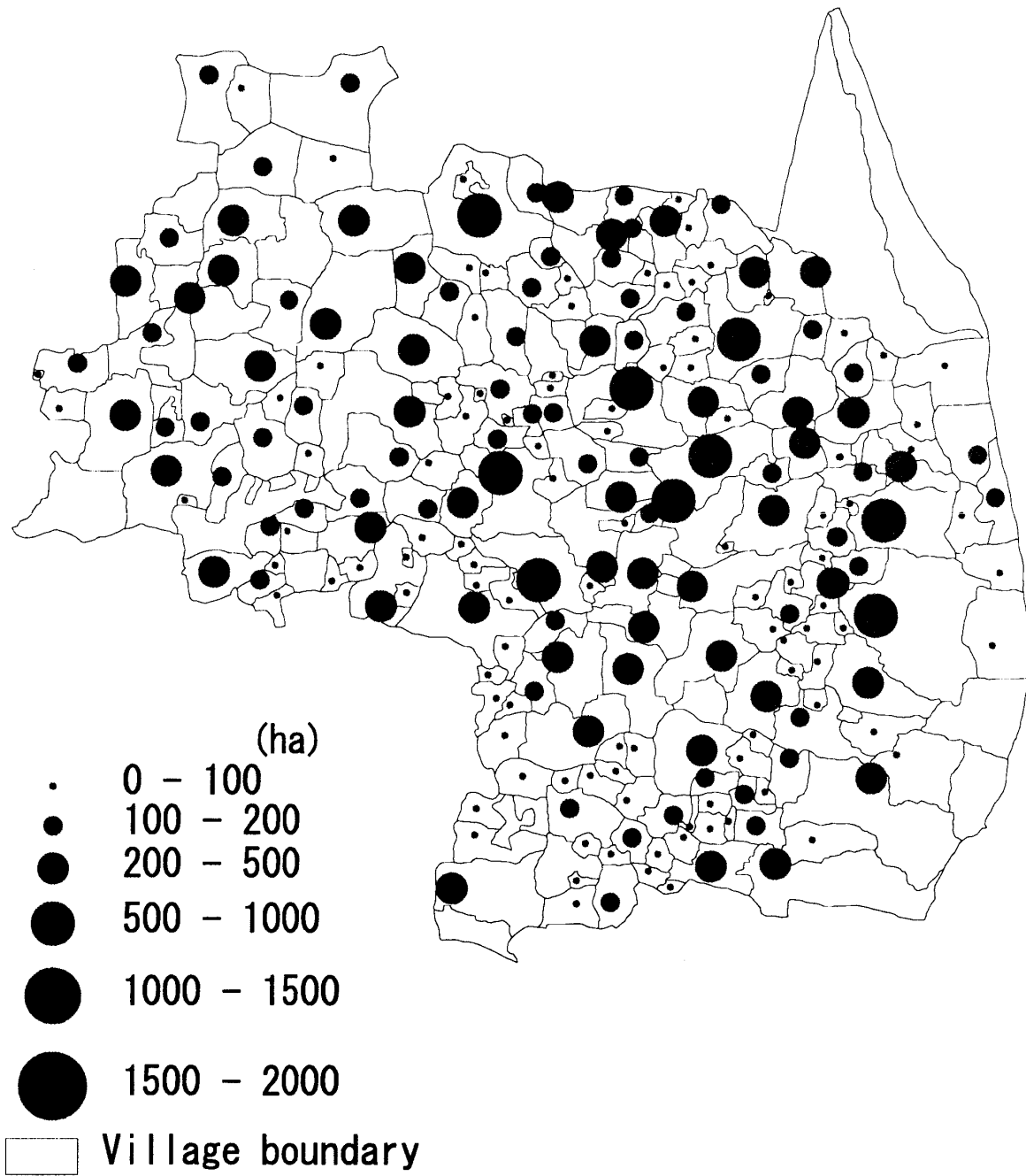


Figure 4. Distribution of acreage of first crop of rice in Ponneri area in 1997/1998.

Prepared based on the village-wise data of Season and Crop Report.

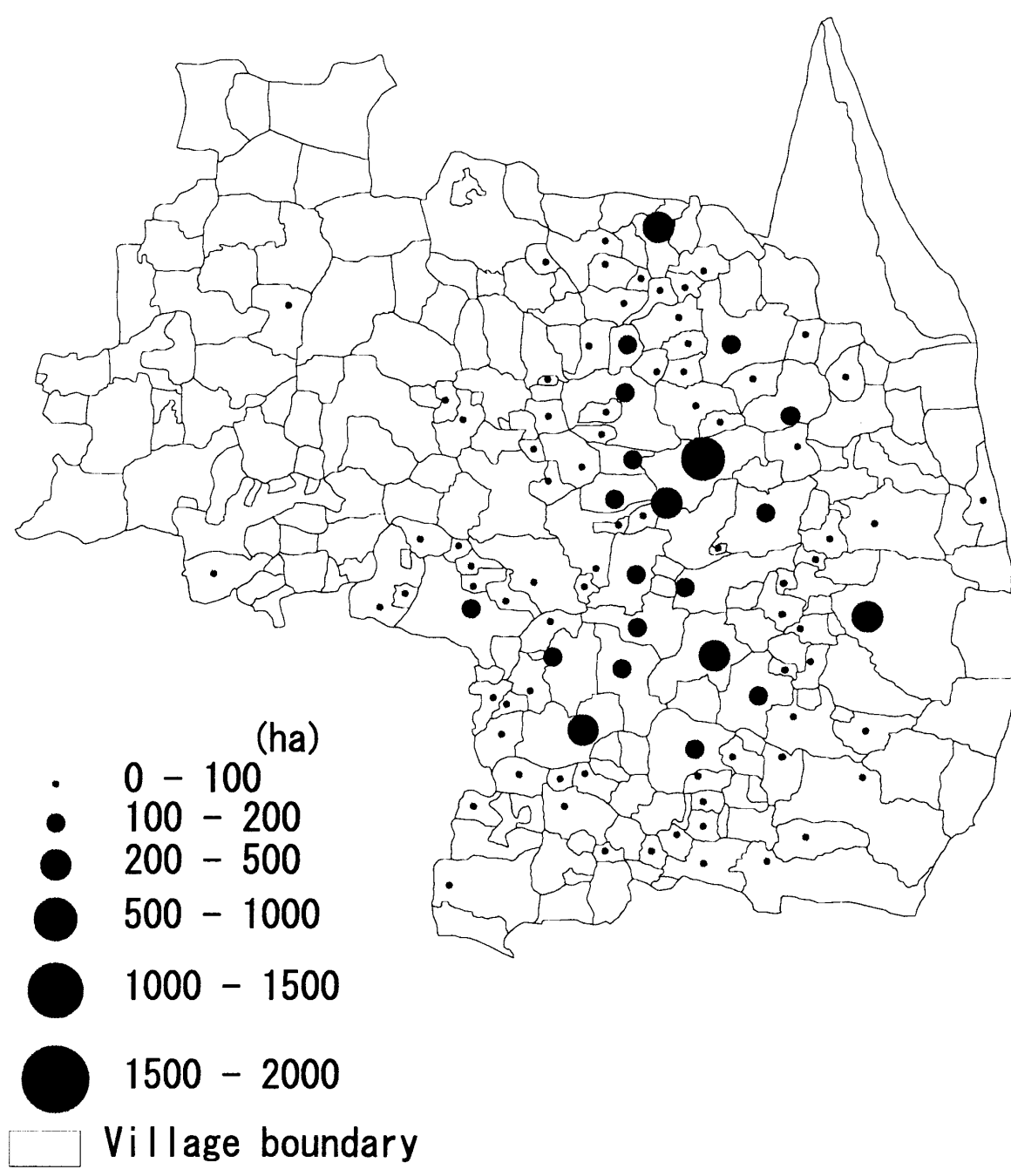


Figure 5. Distribution of acreage of second crop of rice in Ponneri area in 1997/1998.

Prepared based on the village-wise data of Season and Crop Report.

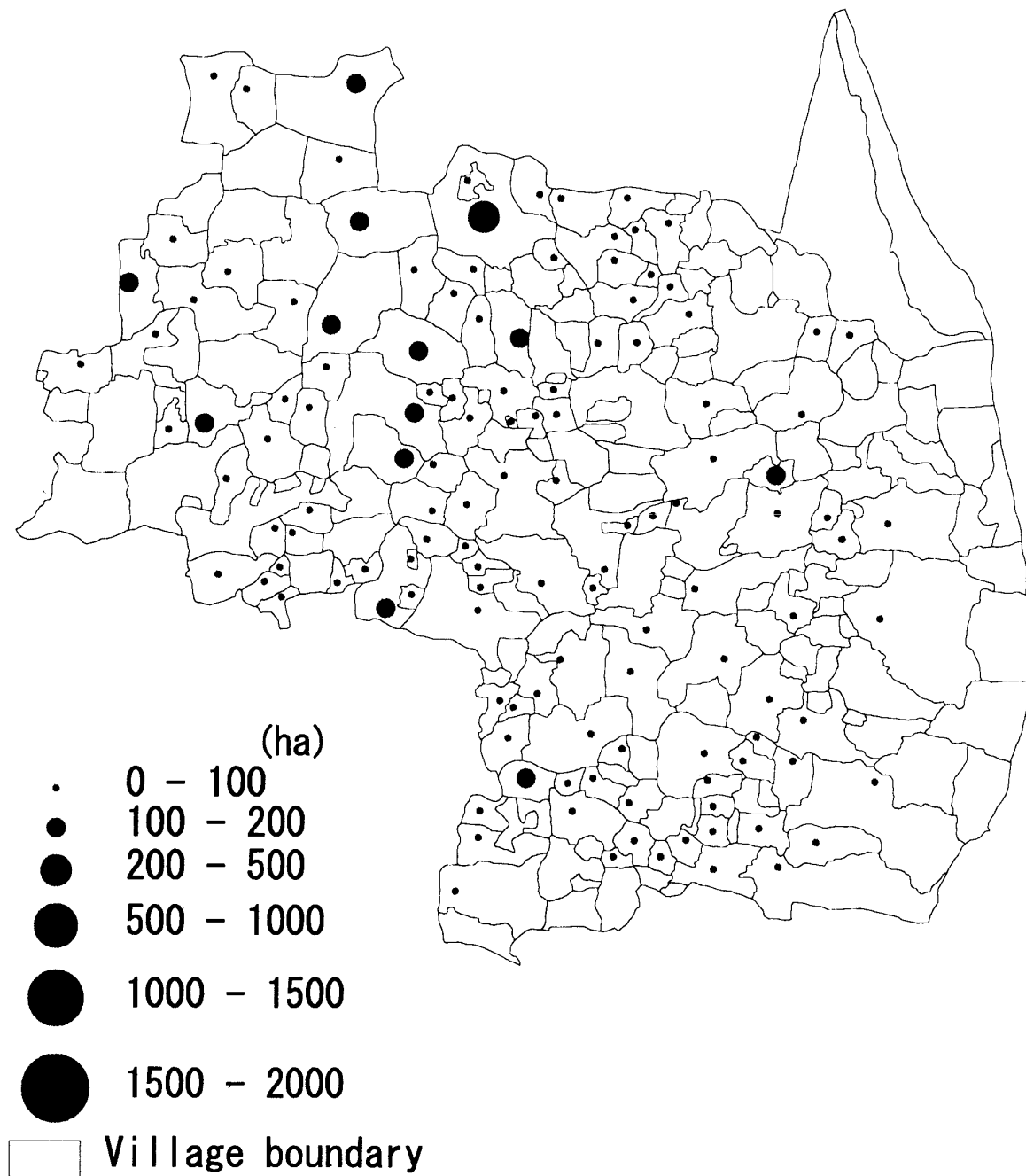


Figure 6. Distribution of acreage of gross cropped area with groundnut in Ponneri area in 1997/1998.

Prepared based on the village-wise data of Season and Crop Report.

which nearly corresponds to Gummidipundi block, the double cropping of rice farming is not basically done, as is also suggested from the block-wise data. The only other area where rice is cropped only once is the strip area which extends along Pulicut Lake and the Bay of Bengal. The existence of this latter single cropped rice farming area is not recognized through the analysis based on block-wise data.

The western part of Ponneri area is a rice single cropping area because of the unfavorable physical conditions for water supply. As for the strip area which extends along Pulicut Lake and the Bay of Bengal, according to the information which I obtained in the field, it is considered to be a single cropping area mainly due to the problem of underground water containing a high concentration of salt in the drier season. In the wet season the underground water in this area can be usable as irrigation source because the salt content becomes lower.

IV Concluding Remarks

In this paper, taking up Ponneri area as a case, I examined to what extent we can understand changing agriculture both in time and space dimensions based on the existing statistical data on agriculture. Since the most comprehensive and important statistical yearbook on agriculture in Tamil Nadu, SCR, does not include more detailed spatial data than district-wise data, I took the trouble to obtain the unpublished block-wise and village-wise data of SCR from the statistical inspectors.

I was able to get such block-wise data for seven successive years from 1991/1992 to 1997/1998. Through the analysis based on these data, we were able to know the existence of important spatial bias as to the agriculture in the area. I was able to use village-wise data only for the year 1997/1998. However, through the analysis based on the village-wise data it became possible to notice the existence of a spatial pattern that was not recognized through the block-wise data.

If we attempt to discuss the dynamics of agriculture associated with the reality of living

of the people, even the analysis based on the block-wise data will not be sufficient. We should be conscious of the probability there exists important spatial variation which is only revealed through analysis based on the more detailed spatial data, at least, village-wise data. But one of the big problems we will meet here is the difficulty in obtaining such spatial data. Judging from my experience, it is very laborious to collect the village-wise data even for a year and it is almost impossible to collect such data going back a few years. Another big problem is the credibility of the data. Through the process of checking the data I noticed that quite a few errors had gone into the data at almost all stages of statistical survey, that is, the data collection, the data entry and the data counting. I can say that certainly the village-wise data of SCR is usable to grasp the outlines of agriculture on a local scale, but its credibility is not such that we can discuss precisely the changes year by year and the spatial variation village by village.

If it is not so easy to raise the credibility of the existing agricultural statistics, it will be meaningful to develop a way of monitoring changing agriculture on a local scale using satellite image data, which is applicable to the rural area in South India. For this purpose, it is required to establish the keys for judging from the satellite image data the actual land use and cropping pattern. In order to establish the keys, firstly, we need to select some test fields where we can obtain field data on actual land use and cropping pattern, and then, carefully relate these field data to the satellite image data at several points of time in the year.

Under the strict limitation of the use of statistical data, it seems to be promising to monitor changing agriculture on a local scale using satellite image data and GIS (Geographic Information System). However, we should be aware that, in practice it is never an easy task. To establish the keys for interpreting satellite image data, a substantial field survey will be required. And even if the keys are established, such problems as the availability of the satellite image data at the proper timing in the year or the limits of the area in which a set of keys is applicable, will appear. To put the monitoring using satellite image data and GIS to practical use, on the assumption that we recognize the importance of

monitoring changing agriculture on a local scale, we have to be ready to organize a project to tackle this difficult task.

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