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Instructions for use

FELDA Jengka Settlers Preferences For Living Environment by Mental Map Presentation

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Abstract

Different types of localities, landscapes and other natural environments, personal feelings towards a way of life, affection of relatives, friends and neighbourhoods and familiarity of the surroundings are some of the pull factors to whether one choses to live 'here' or 'there' (Gould, P. and R. White, 11–13). It implies that the families settled in Jengka area as a result of land development and settlement program have their own preferences for living environment.

The Jengka settlers perceptions and preferences for places to live and towns and cities to obtain home consumption items can be represented on a geographical map known as mental map.

In this analysis it was found out that settlers who have migrated from other states under the land development and settlement program were very much affected by their new surroundings and indicated that they were well-adaped to the new living and working environment. However there are tendencies that they might migrate to the cities such as Kuala Lumpur and Petaling Jaya or other neighbouring towns.

Such mental map analysis can be extended to other dimensions of settlers and their families perception and preferences, for example, towards education, working places, shopping, information and learning, regional images and future plans.

Key words: Regional development planning, Living environment, Felda-Model, Spatial preferences, Mental map, Factor anlysis.

1. Introduction

It is very important to know whether people are satisfied with the present living environment for future expansion or development of facilities related to their living requirements. People's perception on the physical and man-made environments from their mental images will never escape reality of their feelings and affections of those environments.

Information on preferences for places of residence, for activities in towns and cities, for choice of states or districts, in the case of the settlers in Jengka Triangle illustrates their migration habits.   It also suggests that such location decisions were made within the context of those which were known to them, as the settlers of the respective locations and these decisions are important bases for consideration in regional development planning.   The study on spatial preference of settlers in Jengka, which reflects their preferences for living environment was an attempt to determine the migration decisions and the perceived environment of the inhabitants in various localities.

2. FELDA-Model

From the environmental studies point of view, FELDA-Model of land development and settlement is a totally new and unique living environment which might not have been in the mental images of the settlers themselves before settling, unless one has been living in the environment.   FELDA settlement scheme environment is planned and man-made which is the result of a highly supervised and an integrated approach program development.   It involves a total change of environment from the clearing of virgin jungles, land preparation, planting of the main crops (rubber, oil palm, cocoa, sugar cane and coffee), building of new infrastructure and facilities (settler houses, roads, schools, medical, water supply, electricity supply and other social or community facilities) and also providing services, such as, administration and management, processing and marketing and other advisory and extension services.

The whole process of land development and settlement undergoes four main stages, namely :   (1) Initial or development stage (2) Maintenance stage (3) Repayment stage and (4) Ownership stage (Bahrin and Perera, 26-37).

  (1) Initial or development stage
    (a) Consultation with the State Government and allocation of land for development by the State concerned.
    (b) Logging activities by the State Government contractors.
    (c) Clearing the jungle by FELDA contractors.
    (d) Planting of the main crops by FELDA contractors.
    (e) Building temporary village roads and houses by FELDA contractors.
    (f) Public Works Department constructs approach roads, school, clinic, water
      supply, and improved village roads.
    (g) Building other community facilities such as, mosque, shop houses, kindergraten, community hall by FELDA contractors.
    (h) FELDA staff supervise all the development or major works.
    (i) Settler entry after $2\frac{1}{2}-3$ years of initial development.
  (2) Maintenance stage
    (a) Settlers carry out weeding, manuring, pest and disease control.
    (b) FELDA staff train settlers in maintenance jobs and supervise work.

(c)   FELDA provides daily wages of $8.00 to each settler until production of crop or break-even point.

(d)   FELDA provides credit facilities for fertilizers, chemicals and other sub-sistence items.

(3)   Repayment stage

(a)   Settler commences repayment of loan (after 5 years of planting oil palm or after 7 years of planting rubber).

(b)   FELDA provides processing, transportation and marketing facilities for the produce.

(c)   FELDA continues to provide credit facilities for fertilizers, chemicals and other subsistence items.

(d)   Settler begins to involve and participate in administration and management of the scheme.

(4)   Ownership stage

(a)   Settler obtains group title or individual ownership after completion of loan repayment (normally about 15 years after commencement of loan repayment).

(b)   Settler fully participates and involves in administration and management of scheme.

(c)   FELDA staff reduced in number and generally acts as advisors.

(d)   Replanting of crop or crops.

A typical FELDA scheme is normally visualized during stages 2 and 3, where by all facilities and public amenities planned are expected to be completed and settlers are conveniently settled.   Usually a scheme consists of an area between 4,000 to 5,000 acres which is broken down into:

    village area=300 to 400 acres
    main crop area=4,000 acres
    unuseable areas=600 to 700 acres (10 to 15 per cent)

Approximately 400 settler families are settled in a scheme.   The scheme will be managed by the following staff members:

    1 Manager
    1 Assistant Manager
    3 Senior Supervisors
    8 Supervisors
    2 Settler Development Assistants
    2 Clerks
    1 Typist
    1 Driver
    1 Office Boy

Total 20

FELDA settlers come from all walks of rural and poor living conditions, in various employment categories, such as, padi or rice cultivators, fishermen, rubber smallholders, estate workers, odd-job workers, ex-servicemen and even ex-govern-

ment workers. "The FELDA type of scheme provides the settler with a widened base for occupational mobility — a base which is a marked contrast to what he had in his previous life home village and one in which, in a relatively immobile society such as Malaysia, the FELDA settler is given the opportunity to expand his interest and those of his family" (Mac Andrews, 1977, 75).

The new FELDA environment to the settlers and their families means living in an outstandingly new feature of spatial reorganization and thus raising expectations of their future. They have now built up their new mental topography and perception of the new living environment.

Figure 1.   FELDA-Model: Process of Development

Stage 1: Initial development	Stage 2: Maintenance	Stage 3: Repayment	Stage 4: Ownership
Year 0 to 2	3 to 5 (oil palm) 3 to 7 (rubber)	6 to 20 (oil palm) 8 to 20 (rubber)	after 20
1. Consultation with State Government 2. Logging activities 3. Clearing the jungles 4. Planting main crops 5. Building village roads and houses 6. Building other public facilities 7. Settler entry	8. Maintenance work by the settlers 9. FELDA providing processing, transportation and marketing services 10. Settler involvement and participation in management of scheme 11. Maintenance of public facilities and amenities	12. Settler commences loan repayment	13. Settler receives title 14. Replanting

3. Mental Map

3. 1 *On mental map presentation*

In this study the perception of the inhabitants is translated on to a geographical map presentation known as mental map. The significance of mental map from the regional planning point of view is in terms of:

    i.   The relationship between mental map and mobility.

    ii.   The relationship between mental map and spatial preference.

    iii.   The extensive application of mental map and explanatory variables.

    iv.   The density degree of mental map and its implication on spatial preference.

       density degree of M. M. high means, spatial preference strong

       means, movable potentiality high

thus, the most-favoured place for respondents

Table 1.   The Distribution of Settlers in the FELDA Jengka
Triangle according to scheme

Name of Scheme	Year of Development	Total Acreage	Planted Acreage	Settler Families	Crops (Grown)
Jengka 1	1967	5901	5538	543	Oil Palm
Jengka 2	1967/68	4922	4568	436	Oil Palm
●Jengka 3	1968	5187	4482	409	Oil Plam
Jeugka 4	1967/68	4565	4536	340	Oil Palm
Jengka 5	1969	4564	3299	324	Oil Palm
Jengka 6	1968/69	4508	4017	367	Oil Palm
Jengka 7	1969	4963	4078	332	Rubber
●Jengka 8	1969	5366	4543	350	Rubber
Jengka 9	1970	3893	3401	335	Oil Palm
Jengka 10	1970	4800	4215	415	Oil Palm
Jengka 11	1970	6273	5355	501	Oil Palm
Jengka 12	1971	4966	4244	404	Rubber
Jengka 13	1972	4478	4048	370	Oil Palm
Jengka 14	1971	4994	5797	465	Rubber
Jengka 15	1972	4354	3898	385	Oil Palm
Jengka 16	1972	5008	4219	522	Rubber
Jengka 17	1973	5165	4103	404	Oil Palm
Jengka 18	1973	5784	4715	456	Oil Palm
●Jengka 19	1974	7508	6106	583	Oil Palm
Jengka 20	1974	5640	5639	482	Rubber
●Jengka 21	1974/75	4590	5488	413	Rubber
Jengka 22	1975	3765	3764	301	Rubber
Jengka 23	1974	5630	4557	434	Oil Palm
	77/78/79	3758	3093	45	Coffee
Jengka 24		1437			Oil Palm
Jengka 52	78/79	3328	2916	N.A.	Oil Plam
Sg. Tekam	62/63	4562	3631	355	Rubber/
●Ulu Jempol	63/64/65/68	6500	5824	569	Oil Palm
Bt. Tajau	64/67/72	4624	3515	339	Rubber

Note: ● :   *study area.*
source: HJ. Mohd. Nawawi, HJ. Arshad, "Effects of Land Development on Socioeconomic
Growth of The Region".

Table 2.   Jengka settlers by state of origin–January 1983

State of Origin Scheme	Pahang	Kela-ntan	Melaka	Negeri Sembi-lan	Kedah	Selan-gor	Perlls	Pulau Pinang	Tereng-ganu	Johore	Perak	Total
Jengka 1	140	42	43	13	75	16	16	12	17	87	75	536
Jengka 2	101	71	139	38	15	7	17	25	7	6	10	436
●Jengka 3	136	73	3	5	67	20	6	6	3	2	38	359
Jengka 4	167	28	5	3	51	16	5	16	10	8	31	340
Jengka 5	72	67	—	1	47	38	8	9	43	25	14	324
Jengka 6	77	99	6	1	65	22	2	3	53	22	17	367
Jengka 7	70	36	6	2	36	30	4	25	34	42	27	332
●Jengka 8	93	47	4	—	95	9	1	6	4	28	63	350
Jengka 9	36	16	4	—	95	76	—	3	56	4	45	335
Jengka 10	54	38	4	2	98	126	3	7	50	9	24	415
Jengka 11	118	18	—	—	42	205	53	—	55	—	10	501
Jengka 12	310	32	3	2	16	16	2	3	5	7	8	404
Jengka 13	162	20	1	2	17	89	11	5	6	11	46	370
Jengka 14	389	25	1	1	19	11	—	—	5	2	12	465
Jengka 15	36	2	—	—	5	26	—	55	114	2	145	385
Jengka 16	137	—	—	—	87	51	—	10	7	—	130	422
Jengka 17	99	1	1	1	125	82	2	6	1	11	75	401
Jengka 18	246	71	8	3	74	73	6	4	13	8	50	456
●Jengka 19	289	37	4	2	61	98	3	5	9	8	67	583
Jengka 20	378	1	15	—	15	20	—	—	—	—	53	482
●Jengka 21	413	—	—	—	—	—	—	—	—	—	—	413
Jengka 22	301	—	—	—	—	—	—	—	—	—	—	301
Jengka 23	108	42	10	3	99	41	17	26	6	11	70	433
Jengka 24	19	8	—	2	8	3	2	1	—	1	1	45
Bkt. Tajau	100	99	4	2	34	8	3	50	11	7	21	339
●Ulu Jempol	252	85	5	9	40	41	5	79	8	4	41	569
Sg. Tekam	150	13	3	10	50	21	2	63	1	6	36	355
	4353	991	269	102	1336	1145	168	419	518	311	1103	10721

Note: ● :   Study area.

source :   HJ. Mohd. Nawawi, HJ. Arshad, "Effects of Land Development on Socioeconomic Growth of TheRegion", 1983.

The manageable or controlled variables and unmanageable or uncontrolled variables are determinants of the best place for the respondents, from the administrative and political point of view. Examples of manageable variables are public facilities and amenities, buildings and infrastructure. While the unmanageable variables are age, sex, birth place and other biological characteristics of the respondents.

3. 2 *Procedure for constructing mental map*

Suppose six fairly large groups of perhaps $n(=20)$ settlers have all recorded their rank preference for regions on a series of maps, Jengka Triangle, Pahang state and Peninsular Malaysia.

Twenty settlers in each scheme were asked about their geographical preferences, as if they had a completely free chioce of serving in any district. So, we can take this information from the individual maps and record it as a data matrix with regional rows and 20 settlers as in Table 3. Each settler, represented by a column of preferences in the matrix, will agree to a greater or lesser extent with all the others in the group, and thus, we can measure their agreement by calculating the correlation coefficients between all possible pairs of settlers. These coefficients can be shown as a aquare 20×20 correlation matrix (Table 4).

Obviously, we will notice two things : first, is that, the values along the diagonal are all 1.0 because someone's ordered preferences are obviously correlated perfectly with himself ; and, secondly, that the matrix is symmetrical — the relationship between settler-1 and settler-3 is obviously the same as between setter-3 and settler-1.

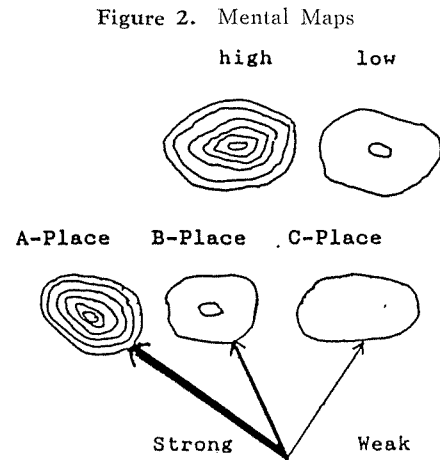After analysing the rank correlation coefficients matrix by using factor analysis

Figure 2. Mental Maps

Table 3. Rank evaluation for major cities and towns in Jengka Triangle

Cities and towns	respondants (settlers)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Temerloh	2	2	2	5	5	7	1	3	2	2	1	1	1	1	1	2	1	4	4	3
2. Jerantut	7	3	7	1	1	3	3	4	4	6	3	2	2	3	2	7	7	6	5	4
3. Mentakab	6	4	6	6	6	2	2	7	3	3	4	5	4	6	4	3	4	3	3	7
4. Maran	3	5	3	4	3	4	4	6	5	5	2	6	3	2	3	1	5	2	2	2
5. Bandar Pusat	1	1	1	4	4	5	5	2	6	4	5	7	5	4	5	6	2	5	6	5
6. Sungai Jerik	5	6	4	3	2	1	1	5	1	1	6	4	6	5	7	4	3	1	1	1
7. Kuala Kerau	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
8. Kampong Awah	4	7	5	7	7	6	6	1	7	7	7	3	7	7	6	5	6	7	7	6

Table 4. Rank correlation coefficient matrix of settlers for major cities and towns in Jengka Triangle (Ulu Jempol)

settlers	1	2	3	4	5	6	7	8	9	10
1	1.0000	0.7455	0.7091	0.2727	0.3455	0.6606	0.4424	−0.2242	0.9273	0.6364
2	0.7455	1.0000	0.7212	−0.1394	0.4667	0.4061	0.4303	−0.5273	0.6242	0.3576
3	0.7091	0.7212	1.0000	−0.1636	0.4182	0.6485	0.8545	0.1030	0.5879	0.7576
4	0.2727	−0.1394	−0.1636	1.0000	0.2242	0.2485	0.0545	0.0667	0.4788	0.3091
5	0.3455	0.4667	0.4182	0.2242	1.0000	0.3939	0.3697	0.0061	0.3818	0.4424
6	0.6606	0.4061	0.6485	0.2485	0.3939	1.0000	0.4667	0.2970	0.7818	0.8182
7	0.4424	0.4303	0.8545	0.0545	0.3697	0.4667	1.0000	0.3091	0.3697	0.7818
8	−0.2242	−0.5273	0.1030	0.0667	0.0061	0.2970	0.3091	1.0000	−0.1273	0.4303
9	0.9273	0.6242	0.5879	0.4788	0.3818	0.7818	0.3697	−0.1273	1.0000	0.6364
10	0.6364	0.3576	0.7576	0.3091	0.4424	0.8182	0.7818	0.4303	0.6364	1.0000
11	0.7576	0.6242	0.7939	−0.1273	−0.0182	0.3939	0.6121	−0.0545	0.5394	0.5515
12	0.5758	0.2485	0.7333	0.2602	0.3333	0.7697	0.7697	0.4182	0.6242	0.8667
13	0.7212	0.6606	0.7455	0.2364	0.6848	0.6970	0.5636	0.2970	0.6848	0.6606
14	0.8061	0.6242	0.6000	−0.0667	0.2485	0.5636	0.2485	−0.2848	0.6364	0.5273
15	0.4424	0.3212	0.8061	−0.1636	0.4061	0.7091	0.6970	0.4061	0.4424	0.6848
16	0.5879	0.3091	0.6606	0.3697	0.1152	0.6000	0.7939	0.2727	0.6242	0.7939
17	0.6000	0.4788	0.6606	0.4061	0.5152	0.7091	0.6000	0.3818	0.6121	0.6970
18	0.5394	0.4788	0.6606	0.3818	0.4909	0.7697	0.6606	0.5394	0.6121	0.7697
19	−0.2242	−0.3212	0.2000	0.1515	0.3091	0.3697	0.4424	0.8788	−0.0788	0.4909
20	0.6727	0.7091	0.6242	0.0909	0.6364	0.6121	0.3576	−0.2364	0.6000	0.5515

settlers	11	12	13	14	15	16	17	18	19	20
1	0.7576	0.5758	0.7212	0.8061	0.4424	0.5879	0.6000	0.5394	−0.2242	0.6727
2	0.6242	0.2485	0.6606	0.6242	0.3212	0.3091	0.4788	0.4788	−0.3212	0.7091
3	0.7939	0.7333	0.7455	0.6000	0.8061	0.6606	0.6606	0.6606	0.2000	0.6242
4	−0.1273	0.2606	0.2364	−0.0667	−0.1636	0.3697	0.4061	0.3818	0.1515	0.0909
5	−0.0182	0.3333	0.6848	0.2485	0.4061	0.1152	0.5152	0.4909	0.3091	0.6364
6	0.3939	0.7697	0.6970	0.5636	0.7091	0.6000	0.7091	0.7697	0.3697	0.6121
7	0.6121	0.7697	0.5636	0.2485	0.6970	0.7939	0.6000	0.6606	0.4424	0.3576
8	−0.0545	0.4182	0.2970	−0.2848	0.4061	0.2727	0.3818	0.5394	0.8788	−0.2364
9	0.5394	0.6242	0.6848	0.6364	0.4424	0.6242	0.6121	0.6121	−0.0788	0.6000
10	0.5515	0.8667	0.6606	0.5273	0.6848	0.7939	0.6970	0.7697	0.4909	0.5515
11	1.0000	0.4424	0.5879	0.6364	0.4182	0.5394	0.5758	0.4909	−0.1152	0.4909
12	0.4424	1.0000	0.6242	0.4545	0.8545	0.8667	0.6121	0.6727	0.3939	0.3212
13	0.5879	0.6242	1.0000	0.6727	0.7091	0.4667	0.8788	0.8303	0.3576	0.7333
14	0.6364	0.4545	0.6727	1.0000	0.4424	0.3091	0.5394	0.3818	−0.3576	0.7091
15	0.4182	0.8545	0.7091	0.4424	1.0000	0.5636	0.6242	0.6121	0.4182	0.4061
16	0.5394	0.8667	0.4667	0.3091	0.5636	1.0000	0.4909	0.6727	0.2485	0.1394
17	0.5758	0.6121	0.8788	0.5394	0.6242	0.4909	1.0000	0.8545	0.5030	0.7455
18	0.4909	0.6727	0.8303	0.3818	0.6121	0.6727	0.8545	1.0000	0.6364	0.5152
19	−0.1152	0.3939	0.3576	−0.3576	0.4182	0.2485	0.5030	0.6364	1.0000	0.0182
20	0.4909	0.3212	0.7333	0.7091	0.4061	0.1394	0.7455	0.5152	0.0182	1.0000

Table 5. Factor loadings of settlers at Ulu Jempol

settlers	Factor loadings of the 1st axis
1	0.8147
2	0.6412
3	0.8890
4	0.2346
5	0.5370
6	0.8447
7	0.7669
8	0.2244
9	0.7947
10	0.8909
11	0.6909
12	0.8342
13	0.9001
14	0.6697
15	0.7753
16	0.7385
17	0.8640
18	0.8622
19	0.3157
20	0.7122

Table 6. Spatial preference score at Ulu Jempul

Cities & towns	Raw score of spatial preference	Scaled score of spatial preference
1	33.31*	100.00
2	59.67	66.61
3	60.44	65.64
4	46.20	83.67
5	58.70	67.84
6	49.52	79.47
7	112.27**	0.00
8	86.50	32.64

* smallest regional score.
** largest regional score.

which is multi-variate analysis method, we can obtain factor loadings by 20 settlers which means, the regional scores as in Table 5.

The best-liked regions will tend to have low scores, while those disliked will be high (see Table 6). Since this is inconvenient and not very sensible, we shall scale them so that the most liked region has a of 100.0, while the most dislike region has a score of 0.0.

This is possibly done by taking the largest score away from each of the others, and then, ignoring the signs, dividing through by the difference between the largest and the smallest score.

Finally, we multiply by 100.0 to give:

$$\text{scaled score region-m} = \frac{\left| \text{raw score region-m} - \text{largest regional score} \right|}{\text{largest regional score} - \text{smallest regional score}} \times 100$$
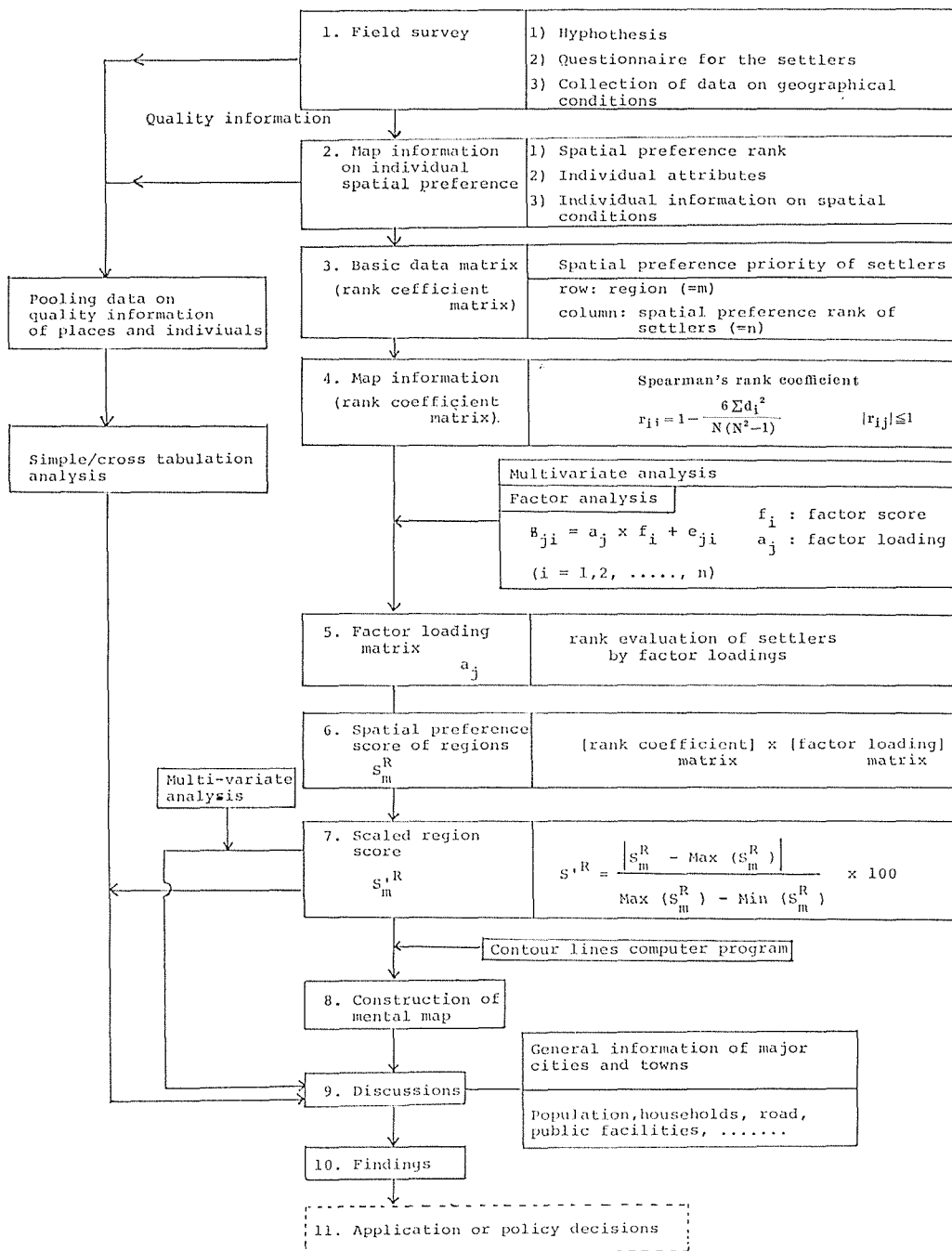
The straight line brackets in the equation means that, we take the absolute difference, ignoring the sign.

The regional scores can now be plotted cartographically to construct mental map for the whole settler groups (see Table 6 and Table 7). The scores are used as control points to draw contour lines or residential preferences as illustrated in Figure 6, 7 and 8 which shows that the hills are the desirable surfaces which are places people would like to in, while the valleys are places that are shunned.

Table 7.   Results of spatial preference by factor analysis

region		Ulu Jempol		Jengka-19	
		scaled score	rank	scaled score	rank
major cities & towns in Jengka Triangle	1. Temerloh	100.00	1	100.00	1
	2. Jerantut	66.61	5	33.01	6
	3. Mentakab	65.64	6	66.92	3
	4. Maran	83.67	2	35.47	5
	5. Bandar Pusat	67.84	4	55.84	4
	6. Sungai Jerik	79.47	3	0.00	8
	7. Kuala Kerau	0.00	8	2.16	7
	8. Kampong Awah	32.64	7	74.10	2
10 districts in Pahang	1. Bentong	23.47	8	62.42	3
	2. Cameron H.	0.00	10	0.00	10
	3. Jerantut	69.36	4	49.62	5
	4. Kuantan	88.25	3	59.21	4
	5. Lipis	38.15	6	17.85	8
	6. Pekan	63.77	5	28.47	7
	7. Raub	26.98	7	35.25	6
	8. Temerloh	88.31	2	100.00	1
	9. Rompin	. 2.72	9	1.65	9
	10. Maran	100.00	1	68.61	2
11 states in Peninsular Malaysia	1. Johor	58.89	3	32.41	6
	2. Kedah	38.72	5	38.12	4
	3. Kelantan	36.09	6	7.52	10
	4. Melaka	26.91	9	11.77	8
	5. Negeri S.	23.34	10	21.49	7
	6. Pahang	100.00	1	100.00	1
	7. Perak	35.05	7	60.11	3
	8. Perlis	0.00	11	0.00	11
	9. Pulau P.	27.67	8	37.38	5
	10. Selangor	62.99	2	79.71	2
	11. Terengganu	57.59	4	8.89	9

Figure 3.   Block Chart of Analysis for Finding Spatial Preference
of Settlers and Constructing a Mental Map

1. Field survey	1) Hyphothesis
	2) Questionnaire for the settlers
	3) Collection of data on geographical conditions

Quality information

2. Map information on individual spatial preference	1) Spatial preference rank
	2) Individual attributes
	3) Individual information on spatial conditions

3. Basic data matrix (rank cefficient matrix)	Spatial preference priority of settlers
	row: region (=m)
	column: spatial preference rank of settlers (=n)

Pooling data on
quality information
of places and indiviuals

| 4. Map information (rank coefficient matrix). | Spearman's rank coefficient $r_{ii} = 1 - \dfrac{6\sum d_i^2}{N(N^2-1)}$ $|r_{ij}| \leqq 1$ |

Simple/cross tabulation
analysis

Multivariate analysis

Factor analysis

$$B_{ji} = a_j \times f_i + e_{ji}$$

$(i = 1,2, \ldots, n)$

f_i : factor score
a_j : factor loading

| 5. Factor loading matrix a_j | rank evaluation of settlers by factor loadings |

| 6. Spatial preference score of regions S_m^R | [rank coefficient] x [factor loading] matrix   matrix |

Multi-variate
analysis

| 7. Scaled region score $S_m'^R$ | $S'^R = \dfrac{\left| S_m^R - Max\ (S_m^R) \right|}{Max\ (S_m^R) - Min\ (S_m^R)} \times 100$ |

Contour lines computer program

| 8. Construction of mental map |

General information of major
cities and towns

| 9. Discussions |

Population,households, road,
public facilities, ...

| 10. Findings |

| 11. Application or policy decisions |

4. Summary of the Field Study

This study was carried out between November and December 1986, in Jengka Triangle, Pahang — the state with the largest FELDA project in peninsular Malaysia. The study area consisted of six schemes : 3 oil palm and 3 rubber as the main crops. Each scheme was chosen from different phases of development, that is, the old, the middle-age and new schemes which were opened up during 1960's, 1970's and 1980's respectively (see Figure 4 and Tables 1 and 2). A questionnaire was administered to 20 settler families in each scheme and is composed of the following 20 items :

1. name of scheme, major crop (oil palm or rubber)
2. year of entry and background : age and education
3. children and their addresses outside the scheme
4. birth place and place before entry
5. working place before entry
6. frequencies of reading : newspaper and magazine
7. perception on road condition to major towns in Jengka
8. relatives in major towns of Jengka Triangle
9. close friends in major towns of Jengka Triangle
10. contacts with relatives and friends in major towns of Jengka Triangle
11. frequencies of visit to major towns or cities
12. impression on major towns in Jengka Triangle
13. preference for major twons and cities in Jengka Triangle
14. evaluation of FELDA scheme
15. longest place of residence
16. requirements of environmental items by priority
17. spatial preference for districts
18. spatial preference for states
19. residential area after retirement
20. general comment

Sampling of respondants			
1960's	oil palm	20	
	rubber	20	40
1970's	oil palm	20	
	rubber	20	40
1980's	oil palm	20	
	rubber	20	40
		Total	120

Figure 4.   Jengka Triangle Development Area in Pahang
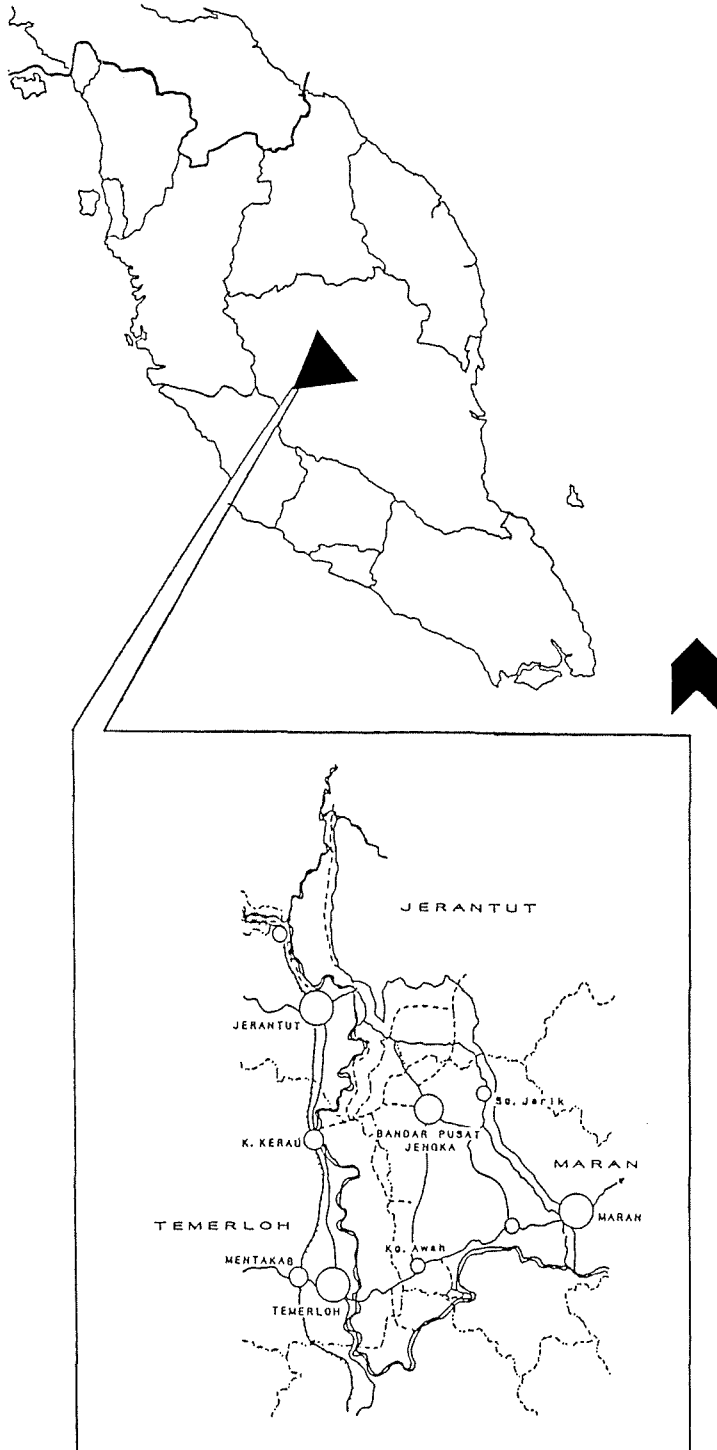
5. Settler Mental Maps of the Regional Development Areas

For the purpose of this paper, the mental maps drawn are based on the data collected in two locations, that is, Ulu Jempul and Jengka 19. The perception of the settlers in these schemes is sufficient to explain the application of mental maps in this context.

5. 1   *Mental map of major towns in Jengka Triangle*

It was found out that the high score of Ulu Jempul settlers for Temerloh town (100) was generally due to the better public facilities and amenities compared to any other towns in the development area. Other factors which favoured Temerloh town were its easy accessibility to and from those locations and as a gate-way to the capital city, Kuala Lumpur and other parts of the highly developed west coast of Malaysian peninsular. Next to Temerloh were Maran (84) and Sungai Jerek (80); both towns were very much associated with the settlers in Ulu Jempul. Other towns in Jengka Triangle, especially from the perception of the settlers in Ulu Jempul were relatively homogeneous, except for the case of Kg. Awah On the other hand Kuala Krau recorded the lowest score which were common to both the maps (see Figure 6).

5. 2   *Mental map of the districts in Pahang*

From the mental maps of the districts of Pahang state as in the Figure 7, Temerloh district was proven to be the best place of residence from the point of view of both the settlers in Ulu Jempul and Jengka 19, which indicated that the district was their present place of stay at the time of the survey and the had no immediate plan to move out from the district or schemes concerned. From the

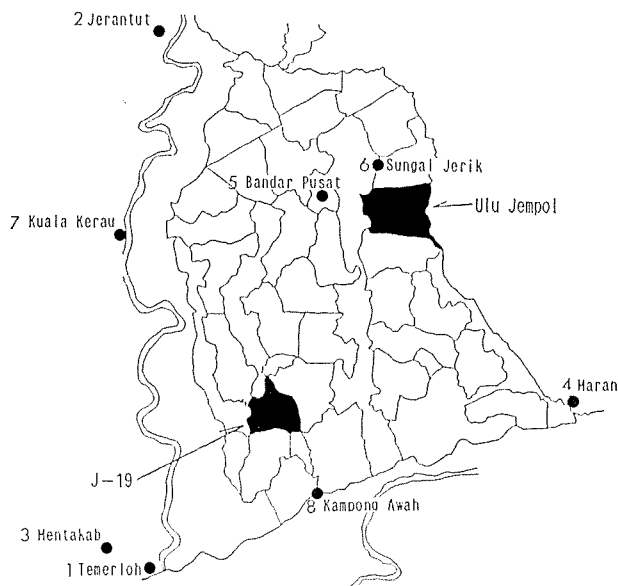**Figure 5.**   Schemes and the location of major cities and towns

Figure 6. The mental maps of FELDA settlers in major cities and towns in Jengka Triangle
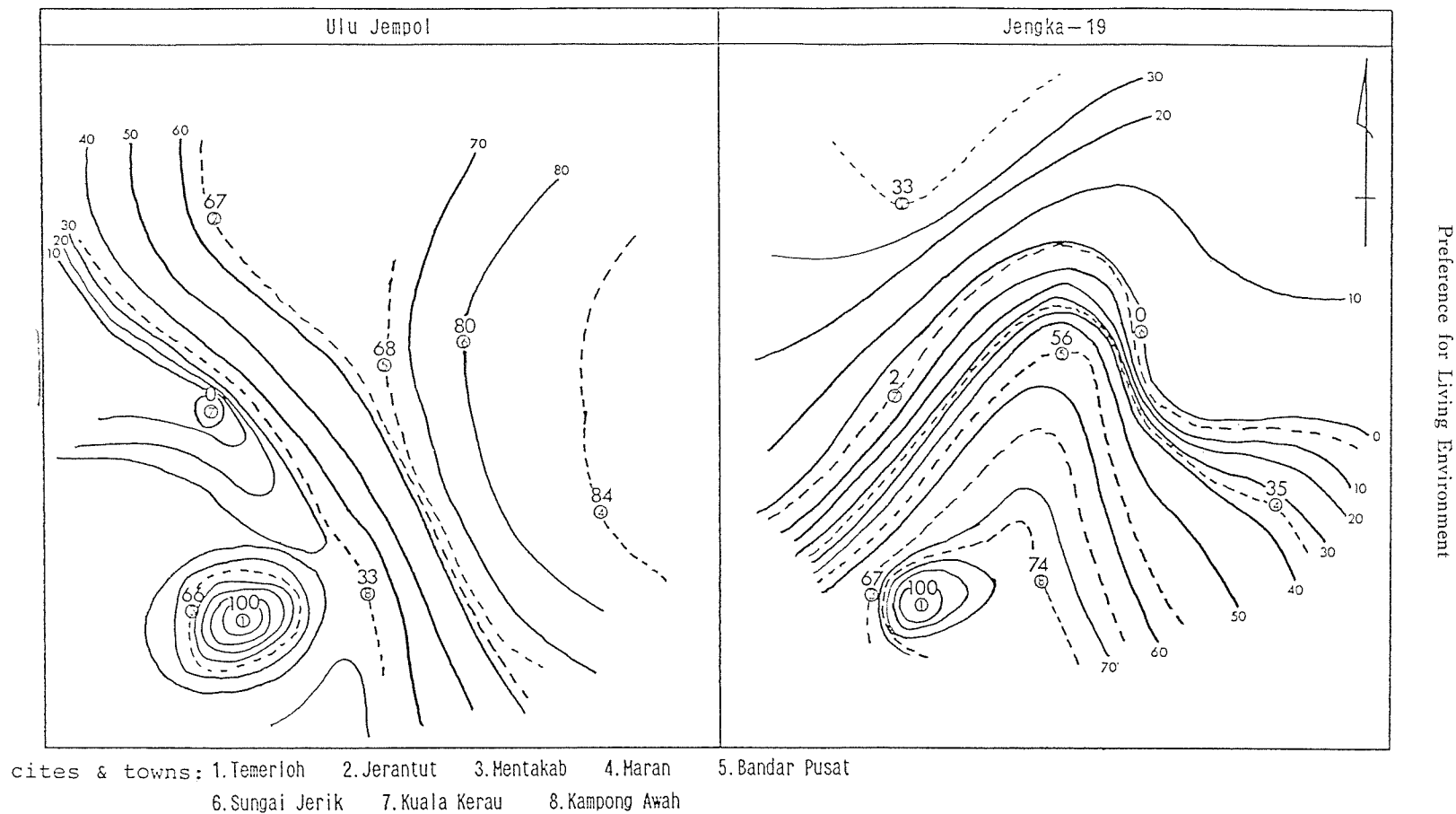

cites & towns: 1.Temerloh   2.Jerantut   3.Mentakab   4.Maran   5.Bandar Pusat
6.Sungai Jerik   7.Kuala Kerau   8.Kampong Awah

Figure 7. The mental maps of FELDA settlers in Pahang

districts: 1. Bentong   2. Cameron   3. Jerantut   4. Kuantan   5. Lipis

6. Pekan   7. Raub   8. Temerloh   9. Rompin   10. Maran
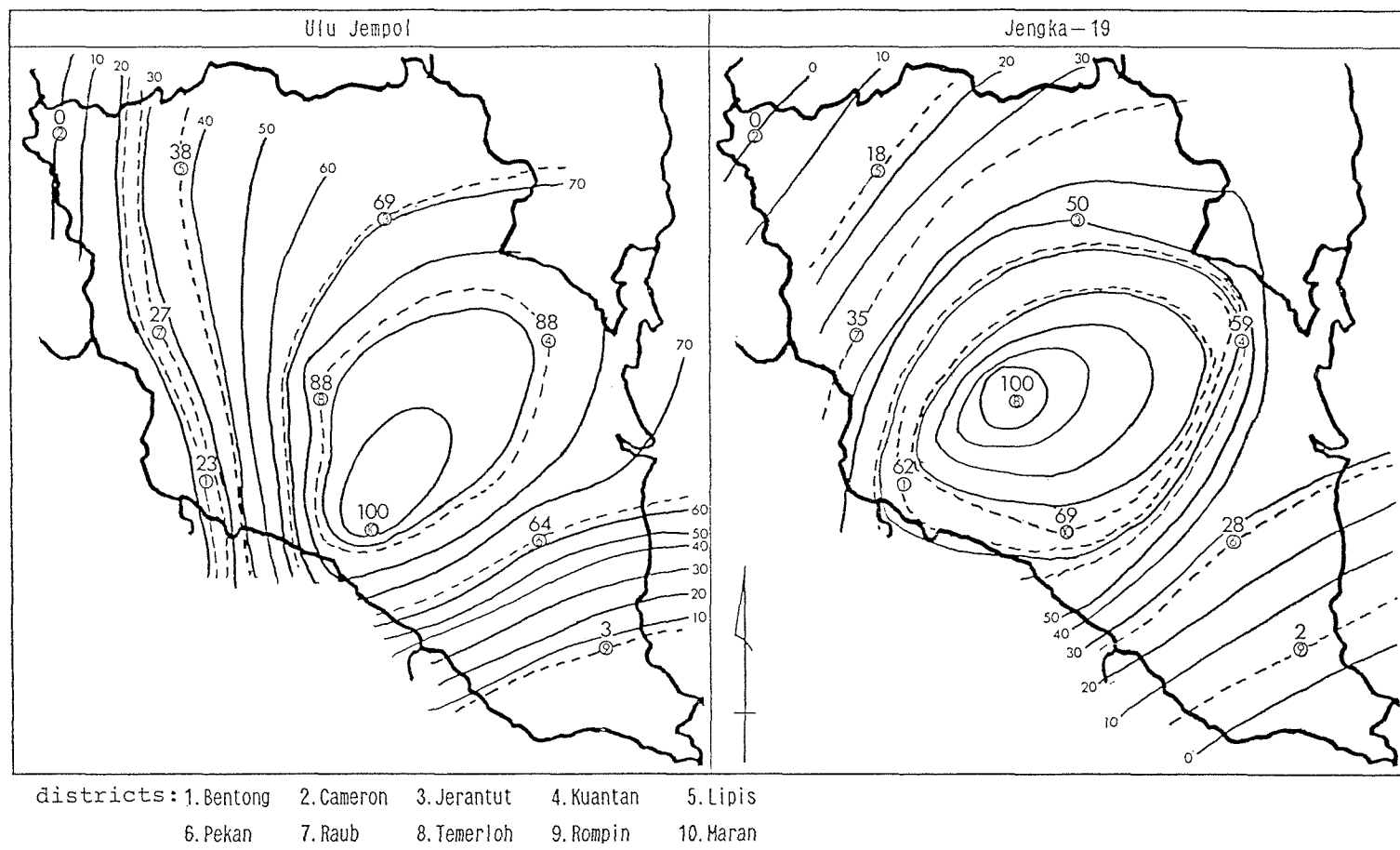
Figure 8. The mental maps of FELDA settlers in Peninsular Malaysia
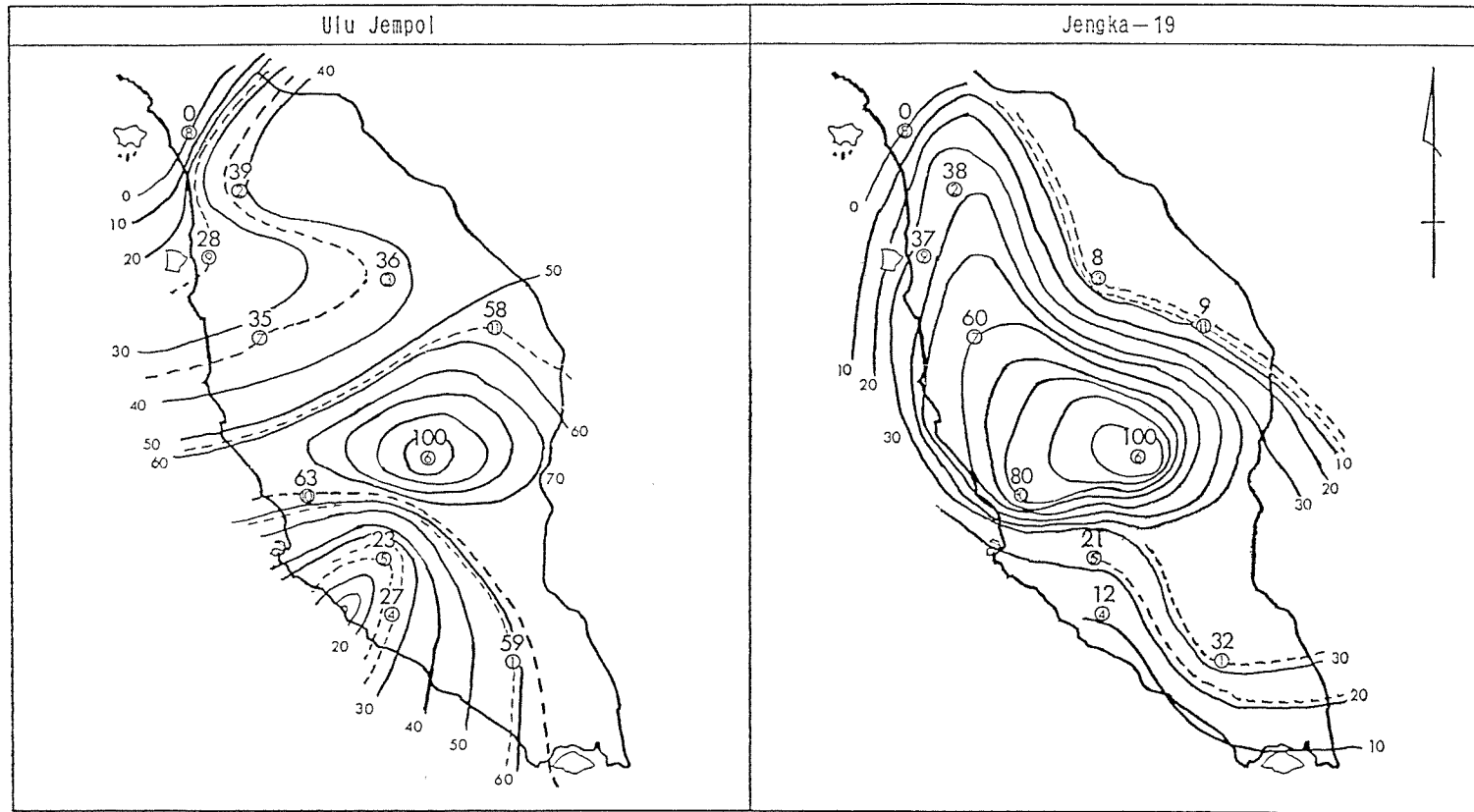
states: 1. Johor   2. Kedah   3. Kelantan   4. Melaka   5. Negeri S.
       6. Pahang   7. Perak   8. Perlis   9. Pulau P.   10. Selangor
       11. Terengganu

perception of the settlers in Ulu Jempul, Kuantan district is their second choice due to their information on Kuantan and the city limelight attraction of the state capital. It is also obvious that the mental maps indicated concentration of contours around Jengka Triangle area compared to other parts of Pahang. The southern part of Jengka Triangle clearly shows very low score, which is common to both the schemes. Cameron Highlands district had the lowest score since the district was not in the mental images of the settlers and not easily accessible from those locations.

5.3 *Mental maps of the states in peninsular Malaysia*

Pahang state recorded the highest score, being the state of their present residence. It also implies that settlers who migrated to Pahang from other states were willing to reside permanently in the states. However, the next higest score was Federal Territory — Selangor. This shows that the migration potential to the cities of Kuala Lumpur and Petaling Jaya was high. FELDA regional development areas may be just transits for the rural-urban migration (see Figure 8).

6. Correlation Matrix of Spatial Preference Among Regions

From the correlation matrix Table 8, it reveals that there were three zones which reflected the mobility phenomenon of the settlers. The Jengka Triangle itself was the 'primary zone', the Pahang state the 'secondary zone', while the whole peninsular was the 'outer zone'. The correlation of the spatial preference between the settlers in Ulu Jempul and Jengka 19 on major towns and cities shows a low correlation coefficient index of 0.3861, which indicates that their preferences differ very much since both the locations had their own primary zones. On the other hand, the correlation for the districts (0.7721) was higher than that of peninsular Malaysia (0.7014), possibly due to the background of the sttlers, whereby more than 60 per cent of the sttlers were from other states. They were more familiar with other states and therefore, made wider choices compared to the districts in Pahang, whereby there were slightly limited choices or similar rankings.

Table 8.   Correlation matrix of spatial preference among regions

	regions	Ulu Jempol		
		mojor cities & towes in Jengka Triangle	10 districts in Pahang	11 states in Peninsular Malaysia
J | 19	major cities & towns in Jengka Triangle	0.3861	—	—
	10 districts in Pahang	—	0.7721	—
	11 states in Peninsular Malaysia	—	—	0.7014

7. Summary and Conclusion

The mental maps of FELDA settlers in Jengka Triangle were represented by 40 settlers, 20 each from Ulu Jempul and Jengka 19. Ulu Jempul is located nearer to Bandar Pusat Jengka and Sungai Jerik, along the Jerantut-Maran road. While Jengka 19 is down south, nearer to Kuala Lumpur-Kuantan highway. Three dimensions of environmental images were studied, that is, perception towards towns and cities for obtaining household consumption and basic services, district to reside permanently and state to settle after retirement or old age.

The main implications of the findings from the mental map presentation of the settlers perceptions are as follows :

1) The determinants for constructing mental maps are individual experiences, natural and man-made environments, and the social activities around oneself.

2) Spatial preference in relation to settlers behavior are higher for places of more information and places where they commute more regularly.

3) As the images of certain spaces in the settlers cognitive mind are broadened, the spatial preference degree converge upon different regions or zones.

4) The score for the state which the settlers were presently residing, that is, Pahang was high. The settlers who were originally from other states set high score for their original states. However, generally the capital state Federal Territory-Selangor competed closely with the state of Pahang.

5) The most favourable and most unfavourable regions or in these cases, towns, districts and statesm to the settlers were clearly observed. For example, Temerloh, the most favourable district and Cameron Highlands, the most unfavourable district were clearly identified. The average score regions were scattered and not clearly differentiated.

6) The place where an individual settler was residing recorded very high score (illustrates the regional effect of spatial preference). As the mental images move away from the individual settlement point, the scores reduce and thus, shows the effect of distance in their cognitive mind.

The above findings and mental maps presentation can be in fact, further analysed and interpreted as follows :

* Clarification of the relationship between spatial preference scores and individual or regional attributes using multi-variate analysis and Quantification Theory I, II and so on.

* Clarification of the relationship between factor loadings or spatial preference score and real human migration. Thus, the mental maps will be applicable to regional planning, forming a connection with controlled variables on the mental maps.

* On the mental map which is common to the settler groups, it can be analysed and shown how the contour lines which indicate hills or valleys of the perception surfaces are smoothed out to form perceptual plateaus and

apply the regional planning, decisions for the location of industries and location of facilities, and alike.

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