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MALARIA CONTROL IN CUKUROVA-AMIKOVASI
AN INTEGRATED - MULTIDISCIPLINARY - PHC APPROACH

by

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Geography

The area of Cukurova-Amikovasi covers the provinces of İçel, Adana and Hatay in the southern part of Turkey.

It is surrounded by the Taurus mountains in the north (reaching a level of 3585 metres above the sea), the Antitaurus mountains in the east and the Mediterranean sea in the south.

Although there are ancient towns e.g. Tarsus (Cukurova) and Antokiya (Amikovasi) found in the area, in earlier days, big parts of Cukurova were only used by nomads. But in the '60 a large project known under the name of "Lower Seyhan Irrigation Project" was established, permitting the agricultural and hydroelectrical development of the area. The lower Seyhan plain is limited east and west by the Ceyhan and Berdan rivers respectively. Together with the Seyhan river, they form a relatively flat, alluvial delta below 50 metres level with slopes varying between 1% and 0.1%, which contains around 220 000 ha of land of which at present 170 000 are irrigable. The monotony of the flat landscape is from time to time interrupted by small, isolated hills. A narrow band of sand dunes runs parallel to the coast line, obstructing the natural drainage of rainwater into the sea. The dunes are interspaced with lagoons and swampy, poorly drained areas. The largest of the lagoons, Akyatan, is more than 16 kms in length and covers 5000 ha. All excess water from the irrigation project is collected in three main drainage canals reaching the sea or the two main lakes. Akyatan and Tuz Gölü.

A major malaria problem in the Cukurova is the height of the water table which in many areas is less than one metre below the surface and in consequence entails the drainage ditches always containing water. The third phase of the "Lower Seyhan Irrigation Project", which has not yet been implemented due to financial restraints would involve the pumping out of the water to the sea and in itself would relieve many of the drainage problems by a lowering of the water table over the Cukurova.

The surface of the area is 38 506 km². According to the 1980 census, the total population is 3 185 945 in 1380 localities. With regard to administrative divisions and habitat, the population is distributed as follows:

	Urban	%	Rural	%	Total
Adana (Cukurova)	842 845	56,72	642 898	43,28	1 485 743
Içel (Cukurova & S11)	424 544	50,30	419 387	49,70	843 931
Hatay (Amikovasi)	366 550	42,80	489 721	57,20	856 271
Total	1 633 939	51,28	1 552 006	48,72	3 185 945

(Taken from State Planning Organization, - Statistical Institute, 1980 census.)

In addition, about 700 000 seasonal workers increase the total population by 22% and the rural population by 45%

The age-sex distribution of the population can be seen from the following table (data taken from Sağlık ve Sosyal Yardım Bakanlığı - Türkiye Sağlık İstatistik Yıllığı, 1975-1978)

<u>Age Groups</u>	<u>Total</u>	<u>%</u>	<u>Male</u>	<u>%</u>	<u>Female</u>	<u>%</u>
Total	40 197 670		20 417.200	50,79	19 780 470	49,21
0-4	5 403 290	13,44	2 757 050	6,86	2 646 240	6,58
5-9	5 446 490	13,55	2 786 940	6,93	2 659 550	6,62
10-14	5 210 480	12,96	2 720 650	6,77	2 489 830	6,19
15-19	4 462 540	11,10	2 307 420	5,74	2 155 120	5,36
20-24	3 537 590	8,80	1 827 700	4,55	1 709 890	4,25
25-29	2 839 060	7,06	1 447 980	3,60	1 391 080	3,46
30-34	2 185 720	5,44	1 089 360	2,71	1 096 360	2,73
35-39	2 169 920	5,40	1 031 260	2,57	1 138 660	2,83
40-44	2 155 220	5,36	1 091 960	2,72	1 063 260	2,65
45-49	1 724 990	4,29	900 950	2,24	824 040	2,05
50-54	1 296 260	3,22	652 530	1,62	643 730	1,60
55-59	779 040	1,94	387 620	0,96	391 420	0,97
60-64	1 066 460	2,65	515 930	1,28	550 530	1,37
65-69	721 840	1,80	352 320	0,88	369 520	0,92
70-74	558 430	1,39	261 110	0,65	297 320	0,74
75-79	283 320	0,70	135 810	0,34	147 510	0,37
80-84	151 800	0,38	56 500	0,14	95 300	0,24
85 +	98 500	0,25	33 900	0,08	64,600	0,16
Unknown	106 720	0,27	60 210	0,15	46 510	0,12

The area is one of the most fertile and most densely populated parts of the country.

An enormous economic development took place in Cukurova from 1950 to 1980. This can be seen from the increase of the population:

	<u>Population Turkey</u>	<u>Population Adana Province</u>	<u>Adana x 100</u>
1950	20 947 188	508 518	2.43%
1970	35 605 176	1 035 377	2.91%
1980	44 737 000	1 485 743	3.32%

Several ethnic groups from the surroundings are represented in Cukurova. In some settlements the G6PD-deficiency is found in relatively high proportions of the population, up to about 20%, a matter which may cause difficulties in the radical treatment of malaria cases with primaquine unless great care is taken.

Table no. 1 shows the results of a special house survey carried out in the month of September 1981 in the rural area of a sector in Cukurova. It can be observed that the average number of persons per house was found to be 4.0. Only 2.5% of the population present at the moment of the survey were visitors.

TABLE No 1

RESULTS OF HOUSE SURVEY
KARATAŞ SECTOR

LOCALITIES	TOTAL POPULATION	SEX DISTRIBUTION		DISTRIBUTION		TOTAL HOUSES	TOTAL ROOMS	AVERAGE SQ. MT HOUSE	AVERAGE M ³ HOUSE
		M	F	RESIDENT	VISITOR				
KUÇUK KARATAŞ	303	149	154	302	1	63	465	314	225
OYMAKLI	262	135	127	244	18	53	485	456	239
HELVAÇI	143	69	74	136	7	38	250	450	207
KADIKOY	307	140	167	307		109	779	588	329
ÇAVUŞLU	244	119	125	239	5	57	448	466	238
TOTAL	1259	612	647	1228	31	320	2427	486	263

However, as agriculture is the main activity of the area, migrant workers are found in the district at different seasons of the year. They usually arrive in waves, the first one beginning around the middle of April. By the end of June - beginning of July, they leave Cukurova to return to their places of origin or they go to work in other areas of the country (Antalya or Aydın). The second wave comes in September and returns to South-East Anatolia by the end of October or mid-November. Some migrant workers do not follow the above-mentioned pattern, but may remain for a longer time until the arrival of the winter, some will stay until the end of the agricultural season while some others will settle down in the town of Adana, attracted by the opportunity of finding a permanent job in the industrial areas of the Cukurova.

Socioeconomic studies carried out in 1978/1979 have clearly shown the excess exposure to risk of malaria of the poor migrant population during their stay in the Cukurova. It was found that the man biting rate inside and outside is several times higher in the tents of migrant workers than in permanent houses. However, it cannot be said that housing is the only socioeconomic factor linked to the malaria risk. There are also many other factors like income, occupation, education, etc., which play an equally important role.

Another important problem which owes to be mentioned is the irregular urbanization of the city of Adana. Adana is made up of 72 districts (mahalle) and it is the 4th largest city in Turkey. However, 23 districts are classified as squatter areas where the environmental conditions favour the development and spread of several diseases. The same situation is repeated in rural areas when migrant workers establish their camps in the neighbourhood of rural villages without adequate sanitary conditions: The presence of the seasonal workers, and their socioeconomic status makes the overall health situation worse and represents one of the major problems the malaria campaign in Turkey is facing.

Meteorological data for Adana (Cukurova) and Hatay (Amikovasi)

Taken from T.C. Gıda-Tarım ve Hayvancılık Bakanlığı, Devlet Meteoroloji İşleri Genel Müdürlüğü - Ortalama ve Ekstrem Kıymetler Meteoroloji Bülteni, Ankara, 1974

a) Adana: 20 m. above sea level (1929-70) 36°59'N - 35°18'E

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly
T													
E													
M													
P													
oC													
Mean min.	4,8	5,7	7,8	11,2	15,0	19,0	22,0	22,4	19,0	14,8	10,6	6,7	13,2
Mean max.	14,2	15,8	19,0	23,4	28,2	31,9	33,8	34,8	33,0	28,9	22,9	16,8	25,2
Mean	9,3	10,3	12,9	17,0	21,2	25,1	27,6	28,1	25,2	20,8	15,7	11,1	18,7
Rel. Humid.													
mean%	67	68	66	68	67	66	68	67	62	60	63	67	66
Precip.													
mm	112,2	98,5	69,4	46,7	50,5	20m7	4,3	4,5	15,5	39,4	66,6	120,2	646,8

b) Hatay 100 m above sea level (1940-70) 36°15'N - 36°07'E

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly	
T E M P oC	Mean min.	4,8	5,9	8,1	12,0	16,2	20,8	23,8	24,2	20,9	14,7	9,8	6,2	14,0
	Mean max.	11,7	14,0	17,4	22,2	26,3	29,1	30,8	31,8	30,5	26,8	20,3	13,5	22,9
	Mean	8,1	9,9	12,7	17,1	21,1	24,7	27,0	27,6	25,4	20,2	14,6	9,6	18,2
	Rel.humid. mean%	76	73	69	67	66	66	69	68	65	65	68	76	69
	Precip. mm	221,7	189,5	154,1	102,9	64,3	33,3	2,5	11,7	34,2	82,3	92,6	193,0	1173,

The plains have a Mediterranean climate. There is a high humidity throughout the year with hot summers and moderate winters.

The coldest month is January, with a mean temperature of 9.3° C in Adana, the mean maximum temperature being 14.2°C and the mean minimum 4.8°C. April shows a mean temperature of 17.0°C with mean maximum of 23.4°C and mean minimum of 11.2°C. The warmest month is August with a mean temperature of 28.1°C (mean maximum 34.8°C and mean minimum 22.4°C). November is still rather warm, mean temperature being 15.7°C with a mean maximum of 22.9°C and mean minimum of 10.6°C.

With regard to rain, December has the highest precipitation with 120.2 mm. Rainfall decreases slowly, reaching 50 mm in May, 20.7 mm in June, 4.3 mm in July and 4.5 mm in August. In September the rain starts again with 15.5 mm followed by October with 39.4 mm.

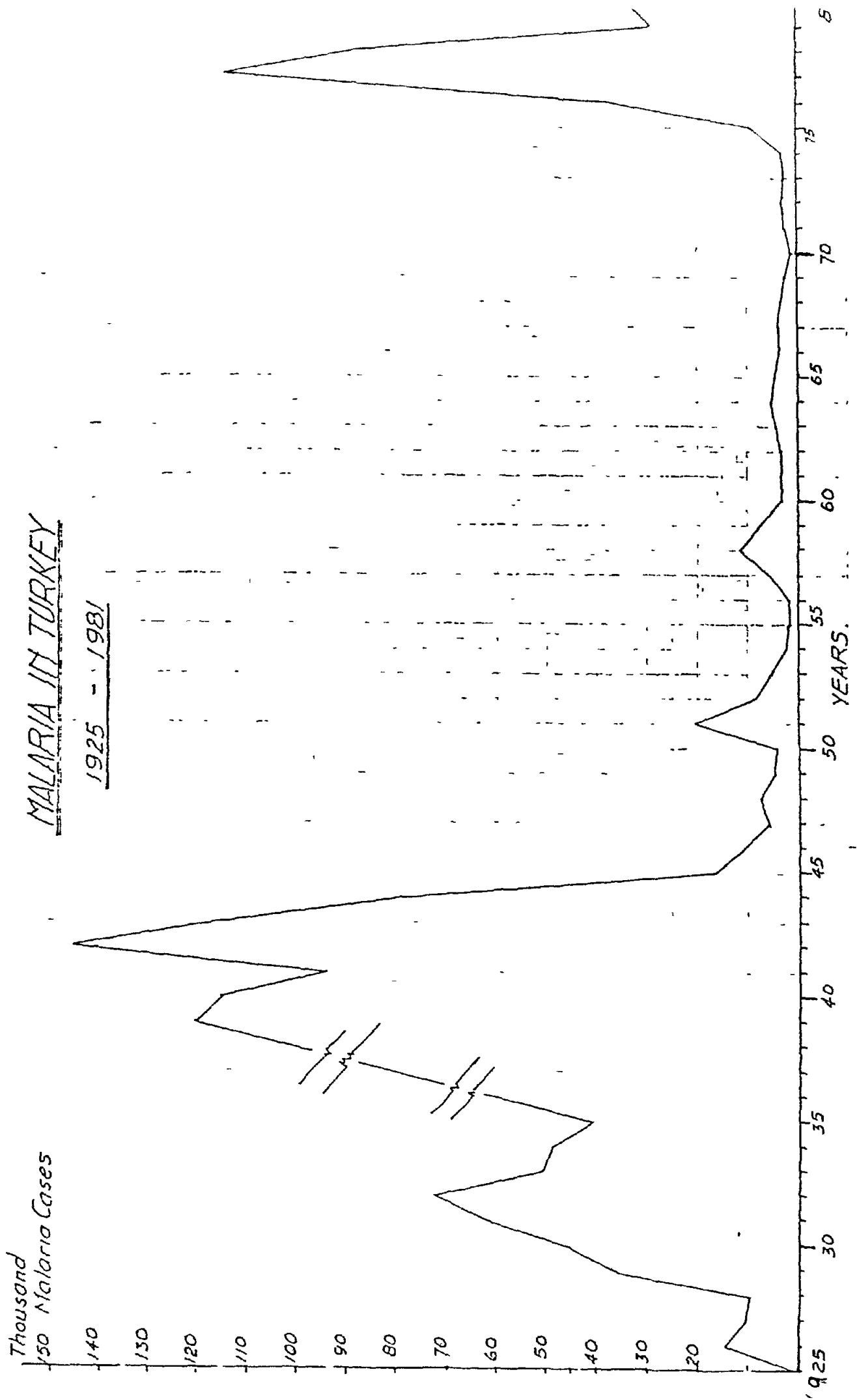
Hatay shows the same trends as Adana.

Historical Background

In 1925 the government established a malaria control programme and founded the Malaria Institute in Adana, i.e. in the most malarious area of the country. During the second world war, the country suffered very much from the disease, but soon after the end of the war the use of DDT was introduced. Graph no. 3 shows the (incomplete) number of malaria cases for the whole country. The number of reported cases for the whole country in 1945 was 146 000. In 1954, P. falciparum accounted for 20% of the malaria cases in Adana.

The malaria eradication campaign started in 1957. The reported number of malaria cases for the Adana region was 5128 in 1958. Systematic residual indoor spraying was carried out using Dieldrin and DDT.

The attack phase lasted until 1963. From 1961 to 1963, a total of 25 malaria cases only were reported from Adana. The area passed to the consolidation phase. Spraying rounds were interrupted and focal spraying only was carried out in villages where a positive case occurred.



By the mid sixties a warning was pronounced about the danger represented (each year) by the arrival of infected workers from the south-east part of Turkey where malaria transmission still remained. However, as by the year 1970 the number of cases detected in the whole country was very low, 1263 only, the international and national authorities were led to believe that the disease was totally under control. The organizational structure of the Malaria Programme of Turkey then became weakened by a reduction of not only the financial support, but also the manpower. The fact that during the same year (1970) the number of cases reported for the Cukurova had increased from 49 to 149 passed unnoticed.

MALARIA CASES BY YEAR

Total Cases	1968	1969	1970	1971	1972	1973	1974	1975	1976
Cuk.Amik.	37	49	149	978	1341	1293	1825	5665	30 852
Turkey	3318	2173	1263	2046	2892	2439	2877	9828	37 320

Meanwhile, the establishment of irrigation and industrial development gave rise to an extension of the population area of the Cukurova. The agricultural and industrial expansion demanded an increase in labour forces, either seasonal for the purpose of cultivating improved land, or stable for the new industrial developments. As a result, the disease returned gradually to the area and an epidemic (P. vivax only) hit the area during the years 1976 and 1977. The malaria figures were as follows (cases) :

	<u>1976</u>	<u>1977</u>
Cukurova - Amikovası	30 852	101 867
Turkey	37 320	115 512

A national emergency situation was then declared in the whole country, and intensive control measures were applied with the assistance of other countries and international organizations, including the following activities .

- Case Detection - active, passive and activated passive surveillance
- Treatment - presumptive, radical and limited mass drug administration at 15 day intervals, and a second radical treatment (anti-relaps treatment) during the winter months
- Vector control - residual indoor spraying with Malathion
 - indoor and outdoor fogging
 - larviciding
 - biological control using Gambusia

As a result of these efforts, the number of positive cases in 1978 and 1979 was brought down to

	<u>1978</u>	<u>1979</u>
Cukurova - Amikovası	70 468	18 828
Turkey	87 867	29 324

During the same years Turkey experienced administrative problems and a severe economic crisis. Therefore the impact of the efforts was only relative and it was later impossible to maintain the downward trend. The malaria situation is now showing alarming signs of a return to an epidemic situation in spite of the efforts being deployed by the national authorities.

	<u>1980</u>	<u>1981</u>	<u>1982</u> (6 first months)
Cukurova - Amikovası	24 256	37 081	17 177
Turkey	34 154	54 415	27 265

Entomological Information

In the Cukurova plain, malaria is transmitted by Anopheles sacharovi.

Gonotrophic Dissociation/Hibernation of An. sacharovi

During the colder months of the year in the Cukurova, there is gonotrophic dissociation but not true hibernation. Observations during 1980/1981 have indicated the following for An. sacharovi:

- a) Egg development ceases in early November (late November in Adana city).
- b) Last male seen during the month of November (early December in Adana city).
- c) Period of gonotrophic dissociation is November/December/January.
- d) Egg development recommences in late January/early February.
- e) Egg batches first obtained in the laboratory from field collected females on 5 February in 1981.
- f) First parous females in field collection in mid-February.
- g) Emergence of first adult generation of the year as indicated by reappearance of males: 27 March for 1980, 25 March for 1981 and 29 March 1982 (observation 1979: middle of March).

Density Trends

Longitudinal studies on An. sacharovi densities in the Cukurova have shown two peaks, one in the first part of May and a secondary one at the end of September.

The annual density curve of An. sacharovi in houses and stables is found in Graph no. 4 for the village of Küçük Karatas where the capture station is situated. The variation in the proportion parous of the vectors is also indicated.

In Cukurova large number of spider's webs are found in many of the stables. Those webs form the preferred resting places of An. sacharovi.

Larval Breeding Places

An. sacharovi is found breeding in swamps, excavations, reservoirs, slow running streams, irrigation and drainage canals, roadside ditches and rice fields. The breeding sites invariably have emergent and/or horizontal vegetation. The larvae are not found in open water without vegetation.

Larvivorous Fish

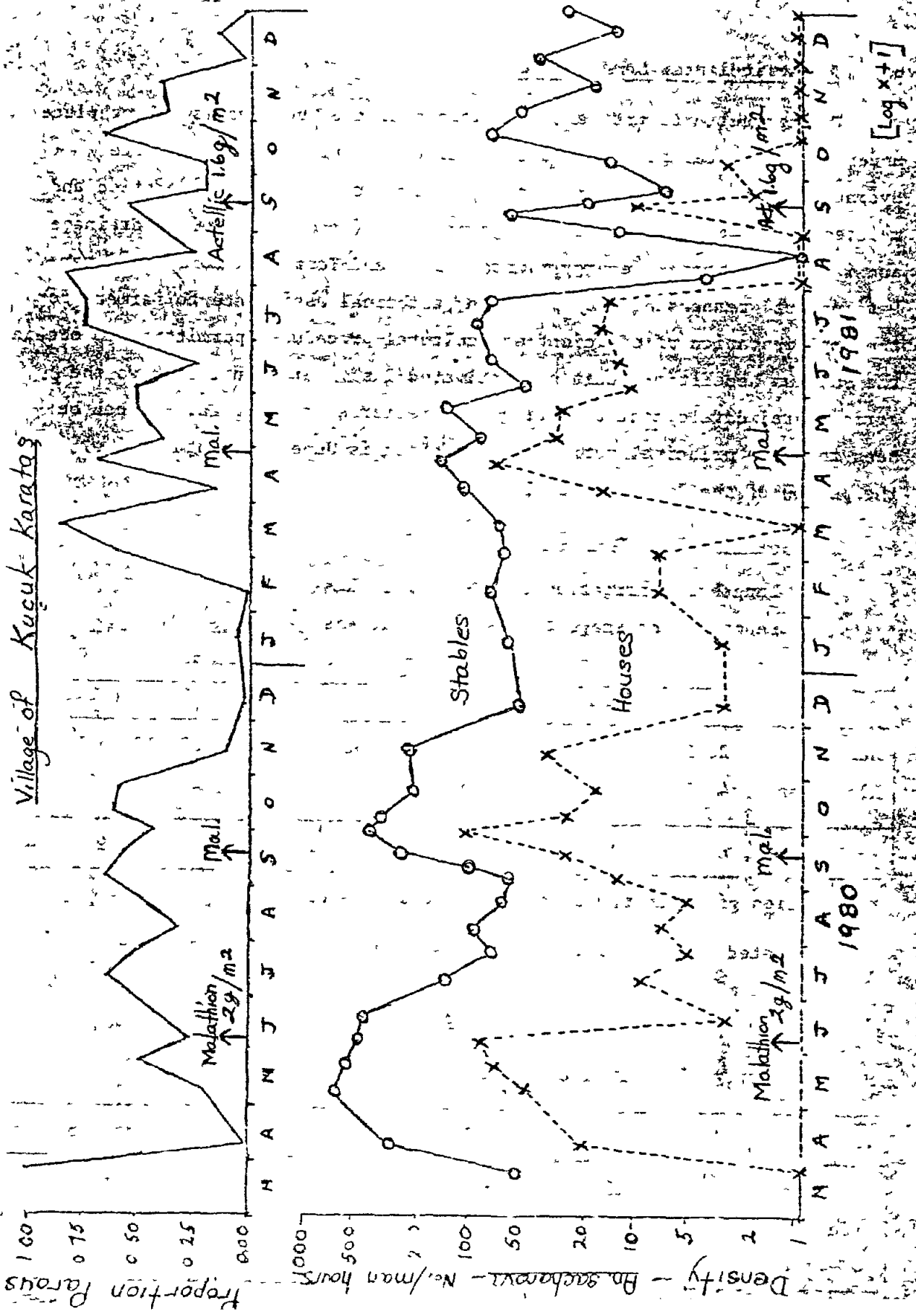
Data is limited, but in general if present in breeding places with scarce vegetation, Gambusia is found without An. sacharovi larvae being present. However, when dense vegetation is found, both Gambusia and An. sacharovi larvae are found co-existing.

The Agricultural Development

The agricultural and land development of the Cukurova is taking place under the technical guidance of two national institutions, the State Hydraulic Works (DSI) in charge of the design, construction, operation and maintenance of irrigation and energy projects (water reservoirs, drainage and irrigation canals, energy plants, etc.) and Topraksu (Soil and Water Development) responsible for providing technical assistance to farmers for the implementation of efficient agricultural procedures permitting to obtain the maximum benefit per unit of cultivated land. Graph no. 5 shows the agricultural development and irrigation patterns of the area. It can be seen that the principal period of irrigation is June/July/August, i.e. the period of the lowest rainfall.

The following tables illustrate the volume of the activities of the projects:
(cf. page 8)

Density Indices and Proportion Parasit - Anopheles sacharovi - 1980-1981



AGRICULTURAL PRACTICES

Graph No 5

		1977	J	F	M	A	M	J	J	A	S	O	N	D	TOT	%
		AV EVAP mm	633	493	869	914	1165	1421	1577	1641	1522	1258	852	648		
COTTON	Chr			P F I	-----	Fertil			▼▼▼▼▼	Harvest					99000 ha	90 ⁺
	Water						Ir	=====	Insecticiding						780750 x 1000 m ³	97 ⁺
MELONS	Chr		P F	-----					H	▼▼					4950 ha	4.5
	Water				I	-----									990 x 1000 m ³	0.1
WHEAT	Chr				F				F						2200 ha	2
	Water									=====	Herbiciding				negligible	
CITRUS	Chr		H	-----	P				F	Herbiciding					1430 ha	1.3
	Water						Ir	=====	Ir	=====	Irrigation				17160 x 1000 m ³	2.1
RICE	Chr									Herbiciding					550 ha	0.5
	Water														1100 x 1000 m ³	0.1
VEGETABLE	Chr									P F					330 ha	0.3
	Water														3300 x 1000 m ³	0.4
MAIZE	Chr									P					330 ha	0.3
	Water														2723 x 1000 m ³	0.3
ALFALFA	Chr									P F					negligible	
	Water														negligible	
VINES and OTHERS															1210 ha	1.1
POPULAT MOVE MENT															110000 Ha	
AGRIC INSEC-TICIDE																

Mountains 600 000 160 000 Nomads
 SE Anatolian Workers Meca Pilgrins Plains

Petrol + Tourists

Agricultural Insecticide

COTTON Decamethrin, Permethrin wheat DDT + Difterex

MELONS Sulphur, Malathion, Diazmon VEGETABLES Malathion, Bromophos

CITRUS White Oil Polyvor Dursban

LOWER SEYHAN PROJECT

NOTE Information taken from a Report of
a mission Dr MEC GIGLIOLI

Irrigation Data Lower Seynan Project

- (a) Length of irrigation canals 2553 kms
- (b) Length of drainage canals 1310 kms
- (c) Volume of irrigated water (see table below, 1980 data)

Area	May	June	July	August	Sept	Oct	Total
Left Bank	26 381	83 453	146 553	171 656	92 171	27 217	547 431
Right Bank	42 329	40 409	101 860	105 167	63 333	26 335	379 433
Total	68 710	123 862	248 413	276 823	155 504	53 552	926 864*

*Quantities given in thousands of cubic metres of water

Irrigated area 343 540 (Dekar) or 84 354 hectares
 Average m^3/Dk 1 099
 Average m^3/Ea 10 990

(d) Irrigation canal design features (Trapezoidal shape)

Canal Type	Length km	Flow Rate m^3/sec	Width (top)	Width (bottom)
Primary	423	5 to 20	15 to 25 m	2 to 9 m
Secondary	593	0.5 to 5	8 to 15 m	0.8 to 2 m
Tertiary	1 537	0.05 to 0.5	1.0 to 1.5 m	0.4 to 0.8 m
Total	2 553			

(e) Drainage canal design features (Trapezoidal shape)

Canal Type	Length (kms)	Flow Rate m^3/sec	Width (top)	Width (Bottom)
Primary	300	variable	15 to 35 m	5 to 25 m
Secondary	300	variable	10 to 15 m	2 to 5 m
Tertiary	710	variable	5 to 10 m	1 to 2 m
Total	1 310			

(f) Maintenance Methods

- Chemical, and
- Mechanical

Mechanical methods are the most commonly used. The use of herbicides has been restricted to a minimum, due to lack of facilities for importing these products.

(g) Maintenance Output

It varies from year to year depending upon the financial possibilities. One complete round of maintenance is achieved after 3 to 7 years only, due to lack of heavy duty mechanical shovels. The maintenance production per year for irrigation canals is considered to be 1/3 of the total length of the system.

For drainage canals it is estimated that a complete maintenance round is achieved as follows:

- Primary drainage canals: 6 to 7 years
- Secondary drainage canals: 4 to 5 years
- Tertiary drainage canals: 3 to 4 years

Detailed Epidemiological Information

Malariometric data for 1977 to 1981 is presented in Table no. 6 for the Cukurova-Amikovasi area. The information permits to observe the evolution and epidemiological importance of the Adana Zone in relation to other zones of the Cukurova-Amikovasi area.

The epidemiological figures from the Adana sector show for the year 1977 (Table 8) when the epidemic (mainly P. vivax) passed uncontrolled, that there is a build-up of positive cases with a maximum in July, followed by a rapid decrease. In 1978 indoor residual spraying was applied in two cycles as a protective measure, in April and July.

Although three yearly spraying rounds were planned for 1979/1980/1981, only two were carried out and the second spraying rounds were implemented later than previewed. The quality of the operations decreased due to several factors among which was resistance against spraying from the population. An increase of the number of malaria cases took place. It should be remembered that in 1977, the year when the epidemiological curve was not affected by the application of control measures, the maximum number of cases was found in July, corresponding to a maximum of transmission in the last part of June. This can also be seen from Table no. 7 showing the positive infants and from the An. sacharovi density curve.* It is interesting to compare this with the period of maximum irrigation (June-August). One may say that the larvae which are bred in the drainage water from the active irrigation system can only have little to do with the ascending phase of the epidemiological curve while those that are bred during the spring time when the irrigation system is inactive may affect it.

* Graph no. 2

MALARIOMETRIC DATA 1977-1981

CUKUROVA / AMIKOVASI AREA

ZONES	1977			1978			1979			1980			1981		
	+	SPR	A.P.I	+	S.P.R	A.P.I.	+	S.P.R	A.P.I	+	S.P.R.	A.P.I	+	S.P.R	A.P.I
MERSIN	14 029	8,43	27,64	9 462	6,29	18,64	1 145	0,84	1,94	790	0,70	1,22	836	0,61	1,26
TARSUS	9 971	9,01	53,47	5 829	5,04	31,26	1 792	2,15	7,95	1 912	3,89	8,11	1 652	2,30	6,61
ADANA	45 413	17,25	67,97	23 402	11,27	35,10	10 109	4,42	14,64	15 413	11,10	20,95	23 650	14,54	31,59
KOZAN	7 684	16,77	25,56	5 224	6,80	17,38	428	0,84	1,49	426	1,40	1,42	1 156	2,89	3,82
OSMANIYE	16 319	24,75	53,53	18 953	14,92	62,17	3 392	4,79	10,51	3 648	6,16	10,87	6 758	8,63	19,95
HATAY	8 451	4,96	9,73	7 598	4,62	8,74	1 962	1,26	2,39	2 067	1,79	2,51	3 029	2,68	3,48
TOTAL	101 867	12,38	35,91	70 468	8,40	24,84	18 828	2,60	6,41	24 256	4,79	7,88	37 081	6,16	11,68

FREQUENCY DISTRIBUTION OF POSITIVE SLIDES TAKEN FROM YOUNG CHILDREN
1976/77/78 BY MONTH AND AGE AT THE MOMENT OF SLIDE COLLECTION

CUKUROVA

Number of Slides Taken in Calendar Month

	AGE IN MONTHS	Number of Slides Taken in Calendar Month											
		J	F	M	A	M	J	J	A	S	O	N	D
CUKUROVA 1976	12-23		1	1	3	3	2	15	22	25	34	49	12
	11										1	1	
	10						1		1	2	4	3	
	9							1	1	1		2	
	8	1								2	4	5	
	7							2	2	2	5	9	
	6								2	2	2	4	
	5							1	2			2	
	4									4	4	3	
	3								3	5	4	4	
	2								1		1		
1								1					
CUKUROVA 1977	12-23	9	12	25	44	80	162	396	326	46	42	17	8
	11				5	3	5	17	9	3	1		
	10				1	1	10	30	17	1	2		
	9			1	3	11	16	25	24	3	3	1	
	8		1	2	5	12	23	43	43	9			
	7		1		5	5	11	37	21	3	6	2	1
	6			1	1	14	11	47	43	4	1	3	
	5			1		2	13	34	23				
	4			2	2	7	7	22	23	3	1	2	
	3				4	6	3	25	20	2	1		
	2				2	3	4	15	13	1	1	1	
1					1	2	6	2	1				
CUKUROVA 1978	12-23	20	44	102	71	130	88	44	35	13	10	4	1
	11		1	1	3	9	6	3	4				
	10	3	1	8	4	9	15	7	4	2			
	9	2	1	4	7	9	13	4	3	1	1		
	8		1	5	4	11	11	6	2	1			
	7	3	1	5	3	11	4	3	6	3	1		
	6			5	5	5	13	9	3		3		
	5	1		1	2	1	8	2	1	2	1		
	4	2				7	6	2	1	1	1		
	3	1	1		1	4	4	2	3	1			
	2		1	1	1	2	3	3					
1							2						

The total figures for the whole of Adana sector show only one yearly peak of positive cases (Table no 8 , 9) while the picture for Karatas sector shows a smaller secondary peak in October. The same is seen in some other places and the rainfall and entomological figures concur with the picture, so there are good reasons to believe that there is a smaller secondary peak of transmission in many places in September, although some of the October cases may be relapses. The number of infections in new-born children is too small to bring out this peak clearly. Both the figures for Adana sector and Karatas sector show an alarming increase in 1981, the number of positive cases in Karatas in 1981 passing even above the one in 1977.

Control Methods Information

Surveillance and Chemoprophylaxis

The general plan of surveillance for the year 1982 gives the following distribution of Surveillance Agents for Cukurova :

Once a month surveillance .	144 Surveillance Agents
Twice a month surveillance:	436 Surveillance Agents
Total surveillance:	580 Surveillance Agents

The estimated output per Surveillance Agent is as follows :

Once a month	: 5000 persons visited per agent per month
Twice a month	: 2500 persons visited per agent per month

The responsibilities of Surveillance Agents are multiple. In addition to case detection, he is also responsible for :

- treatment of cases
- follow-up of cases
- housing numbering control
- population census
- mass chemoprophylaxis where this controle measure is used
- health education

MALARIA CASES ADANA SECTOR

1977 - 1981

MONTHS	1977	1978	1979	1980	1981
January	191	660	128	105	124
February	309	1.804	266	239	233
March	1.006	3.681	546	548	633
April	2 260	2 589	654	1.165	1.183
May	2 512	2.323	598	1.478	1.827
June	5.698	2.252	700	1 285	2 753
July	11 491	1 889	1.213	1 512	3 654
August	4.266	1.122	1 281	1.617	3.427
September	997	514	1.147	1.646	1.301
October	871	312	616	972	810
November	595	245	328	853	586
December	737	89	123	287	316
TOTAL	30 933	17.480	7.600	11.707	16 847

67 Localities

101 982 Houses

611 588 Inhabitants (including ADANA TOWN)

1.582 km²

MALARIA CASES KARATAŞ SECTOR
1977 - 1981

MONTHS	1977	1978	1979	1980	1981
January	76	170	28	35	29
February	105	293	45	46	82
March	128	368	74	113	161
April	232	262	117	214	237
May	625	644	118	209	293
June	682	634	220	333	929
July	461	380	234	376	1.094
August	399	66	182	208	562
September	113	62	100	125	254
October	163	50	177	163	299
November	162	76	127	220	375
December	30	12	31	78	106
TOTAL	3.176	3 017	1.453	2.120	4.421

73 Localities

7 684 Houses

34 421 INHABITANTS

1 292 Km²

Residual Indoor Spraying

Spraying with Malathion 2g/m² is carried out twice a year.

Graph no. 10 is a graphical representation of the decrease in spraying coverage and insecticide consumption which has occurred since the beginning of the operations in 1978.

Larviciding

There exists a variety of potential breeding places such as rice fields, irrigation canals, drainage canals, permanent land depressions and water pools, large man-made borrow-pits, road embankments, etc. Irrigation canals normally do not represent a breeding place problem, but sometimes over-flow or leak through the joints of canalets or through failures in the system may eventually create pools of standing water. Obstructed irrigations siphons can also be a problem.

The dynamic character of the breeding places of the Cukurova area is a factor which cannot be neglected. Substantial modifications occur in time and in space. Breeding places change in number and in shape according to meteorological and human factors also (rain, irrigation, borrow pits). It is therefore almost impossible to keep track throughout the year of the continually changing situation of the breeding places.

Two types of insecticide formulations have been used: Abate Sand Granules 1% and Abate 50% Emulsion Concentrate. The insecticide dose adopted is as on average 110 g of active ingredient per hectare. Granules are used when emerging vegetation is present.

Filling

Sanitary filling as a method of larval control is used by the Adana Municipality. A large land depression in one of the bands of the Seyhan river is used for the disposal of the garbage of the town.

DSI and Topraksu also carry out some filling of important land depressions in the neighborhood of main towns, but this activity is limited by the insufficient number of earth moving equipment of both institutions.

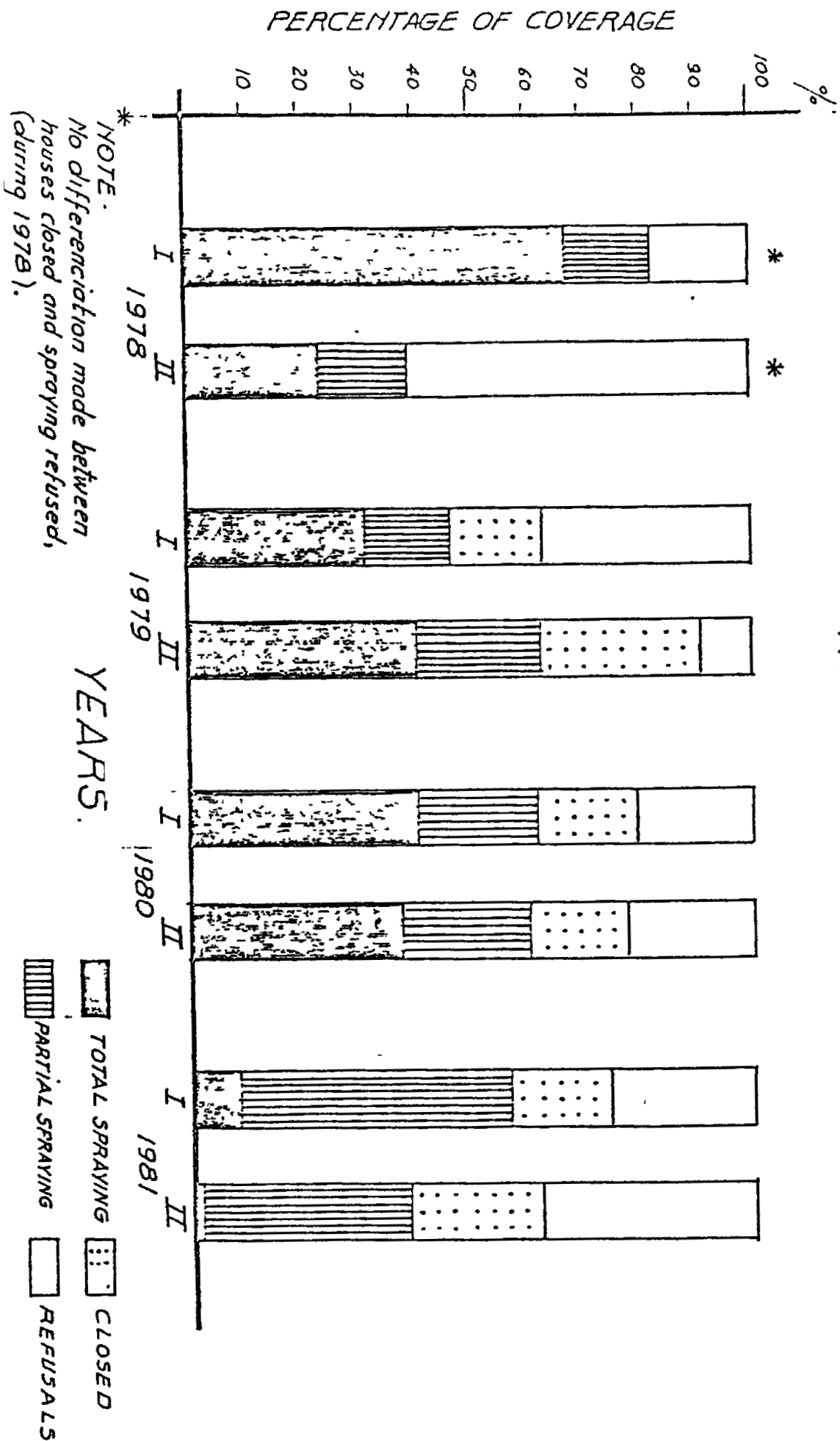
Canal maintenance

Climatological and human factors play an important role in the obstruction of canals. DSI has a department responsible for the maintenance of the irrigation system. Information is available regarding the different types of emerging vegetation, the speed of growth, the optimal interval between the consecutive silt removal operations and the mechanical output of each type of engine used for the maintenance of canals (linear metres of canal cleaned per engine per cross-section of canal). Silt cannot be removed in the rainy season. Vegetation returns in less than two months after removal.

Drainage

This is not a routine operation, neither for DSI nor for Topraksu. In the past, some land depressions have been drained.

RESIDUAL INDOOR SPRAYING COVERAGE ADANA ZONE.



Water pumping

This operation is carried out only during emergency situations at urban level, in Adana town when flooding occurs.

Water Reservoir Maintenance

Several natural and man-made water reservoirs exist. Very little or no maintenance operations are carried out in natural water reservoirs : Akyatan Lake, Tuz Gölü, land depressions in Bahçe and Karatas. There are two man made reservoirs, the artificial lake constructed for the agro-energetic project of Adana (DSI), and the equalizing water basin of the same irrigation system.

The shores of the main dam-lake are properly maintained by DSI authorities. They do not represent a mosquito problem. The same cannot be said for the equalizing water reservoir. The shores are not maintained on routine basis, neither the bottom of this reservoir which is emptied and filled-up every year according to the irrigation needs. The reservoir is emptied at the end of the irrigation season (November) and for a while it remains dry except for the river bed (Seyhan river) which continues running southward. The melting of the snow and the heavy rains from December to March take care of filling up again the main reservoir, but the equalizing reservoir is not filled until the month of April, when DSI opens the gates of the main dam-lake for completely filling the equalizing reservoir, for the irrigation season which starts in May.

The main problem with this artificial lake is the emerging and horizontal vegetation. Due to the conditions of the water bed (mud), it is very difficult for the DSI tractors and bull-dozers to operate on it to cut the vegetation and labour force is required. This kind of maintenance activity has been already tried during 1981. Unfortunately, in a few weeks time, the vegetation grows back again to the original level causing the stagnation of large masses of water where there is a development of horizontal vegetation - in 1981 over the whole surface (apart from the actual river course) - and where very high An. saccharova larvae densities occur.

During 1981 a larviciding programme carried out on a rowing boat provided a satisfactory degree of control, reducing the larva density and thus the number of malaria cases in the districts around this lake.

Space Spraying

Outdoor space spraying

Thermal fogging - Swingfog, Malathion 400 TF :

Even with doors and windows open, there was, as indicated by mortality of caged mosquitos, practically no penetration of the fog into the houses between the houses to the open areas behind or to the upper stores of the houses. It was found to be only effective if the Swingfog passed about 1 metre from an open window.

Pirimiphos-methyl ULV trial :

Planned for early 1982 but delayed as the area planned is now being treated indoors with Neopybuthrin.

Indoor Space Spraying

Winter fogging - Swingfog, Neopybuthrin .

Reduced densities considerably in January/February by 2 rounds at 15 day intervals. However coverage not determined. Density build up reduced in most areas but this also occurred in areas not treated due to 1982 rainfall being only 1/4 of normal rainfall during January to April. Dosage used 50 ml Neopybuthrin per hectare. This technique now being applied to those suburbs of Adana with high numbers of malaria cases during the last transmission season.

ULV - Fontan and Pirimiphos-methyl ULV :

Not able to obtain satisfactory kill in stables due it is believed to problems of distribution of the insecticide in more open stables. Preliminary trials in houses had given good kills at 200 ml. 50% Pirimiphos-methyl per hectare.

It should be mentioned that there has been no systematic reporting of either indoor or outdoor space spraying applications, and therefore also no epidemiological, entomological or operational assessment. Some results are expected to be known by the end of 1982 if the corresponding trials will be satisfactorily completed.

Community Participation

It is generally accepted that the success of the different methods of malaria control depends entirely on the degree of acceptance of such methods by the population involved. Therefore one should seek intensively the active participation of the communities where malaria control activities are taking place. The participation can only be developed through a well designed health education programme aimed at changing the knowledge, attitudes and practices of the community.

The agents of change who will be the prime movers in this approach are best chosen from the existing social structure of the particular community. Therefore, the persons involved in fostering community participation will have to count heavily on the support of the following key figures which are predominant in rural community life:

a) The Muhtar

Elected by the people of the village and paid by the government. He represents the village in all dealings with the civil administration. He registers deaths, births and marriages, and is responsible for notifying to the administration any cases of communicable diseases detected in the community.

b) The Imam

Appointed and paid by the government as the religious leader of the community. He thus advises on religious and moral matters and is highly respected. His role is that of an educator and is therefore especially important for health education.

c) The Teacher

Appointed by the government with the responsibility to educate the children. The number of teachers in the community depends on the number of classes in the school. His profession makes him a very valid aid in health education.

d) The Midwives

Appointed and paid a salary by the government, the rural midwives live in one of the group of communities for which she has responsibility. Her responsibility for health matters is wider than mother and child care. Her position as a health maker, living in the community and in touch with every day problems makes her a most valuable person for all health matters.

e) The Community Opinion Leaders

In all communities there are persons who adapt more quickly than others to new ideas and methods. These people may influence others and their support in fostering change can be very valuable.

f) The Village Elder Committees

Is composed of 8-12 members elected by the people of the community. The Imam and School Director are de facto members but there is not any representative for health. The committee meets weekly and discusses community problems including health. By reasons of the high esteem enjoyed by this committee, its contribution to the promotion of community participation may be invaluable.

g) The Health Committee

At present Health Committees do not exist at village level although it is the government's intention to establish them. At provincial level, and in the municipality of Adana, health committees exist under the chairmanship of the Governor, respectively the Mayor. However, there still remains much to be done regarding the definition of terms of reference and authority of these committees.

Multisectoral Approach

It is generally accepted that in spite of the efforts made to bring the malaria situation under control, several technical and economic problems still remain unsolved, so that the present situation may remain static for years with possible exacerbations and with a consequent loss of financial resources unless a multidisciplinary approach for controlling malaria is established. In this multidisciplinary approach, health institutions and other bodies influencing the malaria problem will provide their contribution for the elimination of the disease.

During the month of February 1981, the Ministry of Health held a workshop on the above mentioned subject. It was recommended to implement as soon as possible an integrated programme in which all national institutions having an impact on health sectors of the Cukurova-Amikovaşı area should deploy all possible efforts for improving the environmental conditions of the area. The immediate objectives of the multisectoral approach were defined as follows

- a) To define the different lines of intervention of each participating institution.
- b) To establish a coordinating mechanism between participating institutions.
- c) To prepare individual plans of operation for each participating institution defining the activities, the working schedules, the financial investments.
- d) To prepare a master plan of operations, taking into consideration each individual plan as presented by the participating institutions, and to present this master plan to the government for approval.
- e) To promote the participation of the communities in the multisectoral master plan of action
- f) To initiate, to develop and to follow up the multisectoral approach.

Several of the above mentioned objectives have already been attained, i e., the different lines of intervention of each participating institution have been already defined, the coordinating mechanism between the Malaria Service and other institutions has also been established, there is a pilot project aiming at developing active community participation. However, final decision has not yet been made regarding how the coordination and integration shall develop further.

Promoting a multisectoral approach is not an easy task when it comes to transforming ideas and purposes into real activities. In spite of the good will of participating institutions to carry out the necessary environmental modifications permitting the reduction of breeding places, this activity represents a financial burden which sometimes the institutions cannot face. However, there are always many points of common interest, like for example accumulation of water along road embankments not only deteriorates the road sub-base, but also represents an ideal mosquito breeding place. It is therefore in the interest of both organizations (the Highways Department and the Malaria Service) to improve the drainage system of such places. The removal of silt in drainage canals will restore the hydraulic characteristics of the canals and will keep the water flowing at the designed speed, avoiding therefore the creation of breeding places.

It is a reality that the major obstacle to the implementation of this multisectoral approach is the financial constraint, but it is equally true that the country cannot be condemned to continue the use of insecticides for many years not only because of the development of vector resistance and the risk of environmental pollution involved, but also because of many other inconveniences. The establishment of the legal basis for multisectoral action is therefore of high priority.

The approach that the Government of Turkey has given to this problem is simple : the Malaria Service was asked to draw a list of localities by order of priority on which immediate or medium term actions are required from the other institutions. With such a list, institutions like the DSI or the Highways Department YSE may be in the position of introducing in their respective plan of maintenance, the necessary actions to solve the particular problems of the given localities.

Primary Health Care

The Turkish Government has planned the development in Cukurova of the Primary Health Care and network of health stations as can be seen from Tables No. 11, 12, 13, and 14. This development will represent a considerable support to the antimalaria activities which will gradually and smoothly be functionally integrated with the health services at local level.

At ministerial level, a coordination committee with representations of all General Directorates has been established.

Similarly for the coordination between different public sectors, committees have been established at ministerial, provincial, and will be established at village levels.

An integration of the health services is already taking place at peripheral level, starting in 1981. This was initiated as an intense retraining programme for the general health workers who are now participating in the anti-malaria operations. A revision of the job descriptions was made and areas of duty were established (cf. Field Workers Task Description). The process developed rather smoothly, although some smaller upheavals were unavoidable. Equally an initial setback in respect of malaria control was unavoidable, but considering the future gain of arriving to a more stable situation where epidemics can be avoided, this must be considered as a low price to pay.

Field Health Workers' Task Description (PHC, MAL, WBD)

1. Rural midwives

(Resident in the village, the Rural Midwife is responsible for a population of 2-3000).

Tasks:

- to collect vital statistics
- to detect pregnancies
- to follow up pregnancies
- to assist with deliveries
- to follow up infants and young children (from 0 to 6 years of age)
- to carry out vaccinations (under the supervision of the Primary Health Health Care Centre senior staff)
- to notify communicable diseases (suspected cases)
- to collect stool specimens
- to detect cases that are in need of rehydration
- to administer rehydrating fluid to the cases (according to the instructions of Primary Health Care Centre senior staff)
- to instruct mothers on proper methods of preparing and administering fluid
- to instruct mothers on proper dietary practices to be followed during and after diarrhoea
- to take blood slides from cases suspected for malaria (in the village of her residence only)
- to carry out mass drug administration in the framework of the work of the malaria control programme (in the village of her residence only)
- to follow up cases of diarrhoea
- to follow up malaria cases (in the village of her residence only)
- to keep records on her activities
- to carry out educational action.

2. Trachoma Surveillance Agent

Tasks:

- to follow up and treat trachoma cases
- to carry out screening for trachoma in the community
- to carry out active malaria case detection in the villages where there is no midwife
- to follow up and treat detected malaria cases
- to carry out mass drug administration in malaria control programme
- to assume the function of the squad leader during the antimalaria spraying operations
- to notify communicable diseases

3. Malaria Surveillance Agent

Tasks:

- to collect vital statistics
- to carry out active case detection
- to apply radical treatment to the detected malaria cases
- to carry out mass drug administration
- to carry out larviciding
- to supervise antimalaria spraying operations
- to supervise fogging operations where necessary
- to carry out health education
- to carry out geographical reconnaissance (number of houses in the village, detection and mapping of mosquito breeding places)
- to assist in population census operations
- to notify communicable diseases
- to collect stool samples

3. Malaria Surveillance Agent

Tasks: (continued)

- to assist the vaccination campaign
- to follow up trachoma cases, to carry out treatment
- to take water samples when necessary
- to collect mosquitoes, to take care of biological control measures against them.

4. Temporary Malaria Workers

Tasks:

- to carry out active case detection of malaria cases
- to carry out radical treatment of malaria cases
- to follow up malaria cases
- to notify cases of diarrhoea
- to carry out mass drug administration
- to carry out residual spraying (antimalaria spraying operations)
- to carry out larviciding
- to carry out fogging where necessary
- to apply biological control measures in mosquito breeding places

5. Nurses

Location. health centres, dispensaries (polyclinics), mother and child health centres, hospitals, etc.

Tasks of an MCH Nurse

- to carry out house visits (health education, family planning, follow up of children from 0 to 6 years of age)
- to supervise midwives and to evaluate their work
- to carry out vaccinations
- to take blood slides from fever cases
- to detect cases in need of oral rehydration, administer treatment, and advise on regimen to follow
- to notify communicable diseases
- to assist physicians during examination of patients
- to dispense drugs and injections.

6. Saglık Memuru

Tasks:

- to report on overall sanitary conditions of villages or area of assignment
- to report and to advise the population on problems related to excreta disposal methods
- to report and to advise the population on problems related to solid and liquid waste disposal
- to report and to advise the population on problems related to domestic pest control
- to report and to advise the population on problems related to habitat hygiene
- to report and to advise the population on problems related to vector control (malaria vectors, etc.)
- to report and to advise the population on problems related to food hygiene
- to notify communicable diseases particularly diarrhoea
- to supervise malaria surveillance agents
- to take blood slides from fever cases (when necessary)
- to detect cases in need of rehydration, administer fluid, and advise on regimen.

6. Saglik Memuru

Tasks (continue)

- to take water samples
- to carry out vaccinations
- to take food samples
- to carry out water chlorination
- to dispense first aid
- to carry out health education.

7. Environmental Sanitary Technician (Sanitarian)

Tasks.

The same as in No. 6 except first aid and vaccination.

TABLE N° 11

Proposed construction of sub-centres

Province	Existing 1981	Years					Total nb. of sub-centres	Total Price (TUR LI)
		1982	1983	1984	1985	1986		
Ariana	0	60	35	30	35	20	186	162.750.000
Igel	0	25	20	10	20	20	95	63.125.000
Hintay	0	20	15	25	20	14	84	73.500.000
Total Cukurova		105	60	65	75	60	365	319.375.000

Price 1979: TUR LI 875.000

TABLE N^o 12

Building of Health Centres
(to be accomplished before end 1984)

Province	Exis- ting 1981	<u>Urban type</u>		<u>Rural type</u>		Total all types		
		<u>Type A</u>	<u>Type D</u>					
	Number	Price (TUR LI)	Number	Price (TUR LI)	Number	Price (TUR LI)		
Adana	2	15	65.250.000	7	33.250.000	60	210.000.000	308.500.000
Içel	0	7	30.450.000	5	21.750.000	42	147.000.000	199.200.000
Hatay	0	7	30.450.000	7	33.250.000	33	115.500.000	179.200.000
Total		29	126.150.000	19	88.250.000	135	472.500.000	686.900.000

Type	Price (1979) TUR LI
A	4.750.000
D	4.750.000
Rural	3.500.000

TABLE 1/2

PERSONNEL

(when the Health Centres are fully staffed)

Type of Centres	Adama				Icol				Hateh				Total							
	A	D	H	S	T	A	D	R	S	T	A	D		R	S	T				
Doctor	45	+ 14	+ 60	+ 0	= 119	21	+ 14	+ 33	+ 0	= 68	21	+ 10	+ 43	+ 0	= 73	87	+ 38	+ 135	+ 0	= 260
Nurse	15	+ 7	+ 60	+ 0	= 82	7	+ 7	+ 33	+ 0	= 47	7	+ 5	+ 42	+ 0	= 54	20	+ 19	+ 135	+ 0	= 193
Lab. technician	16	+ 0	+ 0	+ 0	= 16	7	+ 7	+ 0	+ 0	= 14	7	+ 0	+ 0	+ 0	= 7	20	+ 0	+ 0	+ 0	= 20
Asst. Lab. techn.	15	+ 0	+ 0	+ 0	= 15	7	+ 7	+ 0	+ 0	= 14	7	+ 0	+ 0	+ 0	= 7	20	+ 0	+ 0	+ 0	= 20
Midwife	225	+ 60	+ 240	+ 166	= 707	105	+ 66	+ 132	+ 64	= 377	105	+ 40	+ 162	+ 05	= 400	435	+ 152	+ 540	+ 305	= 1492
Statistic. clerk	45	+ 14	+ 60	+ 0	= 119	21	+ 14	+ 33	+ 0	= 68	21	+ 10	+ 42	+ 0	= 73	87	+ 38	+ 135	+ 0	= 260
Cleaner	45	+ 14	+ 60	+ 0	= 119	21	+ 14	+ 33	+ 0	= 68	21	+ 10	+ 42	+ 0	= 73	87	+ 38	+ 135	+ 0	= 260
Driver	15	+ 7	+ 60	+ 0	= 82	7	+ 7	+ 33	+ 0	= 47	7	+ 5	+ 42	+ 0	= 54	20	+ 19	+ 135	+ 0	= 193
Number of Inhabitants	1,485,743				843,031				856,271				3,185,045							

A Type A
D Type D
H-Rural Type
S-Sub-centres
T total

ACTUAL DISTRIBUTION OF PERSONNEL

TABLE No. 1

	Specialist	Practicians	Dentist	Pharmacist	Chemist	Pathologist	Nurse	Assist. Nurse	Saglik Memuru	Env. Health Techn.	Lab. Techn.	Assist. Lab. Techn.	Midwife	Driver	Malaria Surveil. Agent	Trahoma Surveil. Agent	Follow up workers	Health Educator	Office boy	
Adana																				
Health Directorate	-	23	-	17	11	-	5	-	66	12	8	-	352	57	-	-	-	1	-	
Govt. Hospital	43	6	12	27	-	-	196	151	-	-	4	-	71	-	-	-	-	1	-	
MCH centre	4	-	1	-	-	-	26	9	-	-	-	-	68	8	-	-	-	-	28	
Malaria zone	-	1	-	-	-	-	-	-	-	-	13	-	-	13	74	-	-	3	8	
Trahoma Contr. Dpt.	1	-	-	-	-	-	1	-	6	-	-	-	-	3	-	20	-	-	7	
Tuberculosis Disp.	2	-	-	-	-	1	7	2	-	-	6	-	-	2	-	-	5	-	15	
Malaria Institute	1	-	-	2	-	7	3	-	-	-	8	-	-	2	5	-	-	-	4	
Icel																				
Health Directorate	-	15	-	13	3	1	-	-	74	9	4	-	204	26	-	-	-	1	-	
Govt. Hospital	1	2	11	15	-	-	352	42	-	-	2	-	78	-	-	-	-	2	-	
MCH centre	1	-	2	-	-	-	9	3	-	-	-	-	16	2	-	-	-	1	10	
Malaria zone	-	-	-	-	-	1	-	-	-	-	13	-	-	22	83	-	-	5	15	
Trahoma Contr. Dpt.	1	-	-	-	-	-	2	-	2	-	-	-	-	2	-	12	-	-	3	
Tuberculosis Disp.	2	-	-	-	-	-	6	2	1	-	2	-	-	-	-	-	2	-	4	
Hatay																				
Health Directorate	-	11	-	3	3	3	-	-	34	12	4	-	219	16	-	-	-	1	-	
Govt. Hospital	11	1	17	13	-	-	92	79	-	-	9	-	40	-	-	-	-	-	-	
MCH centre	1	-	2	-	-	-	14	2	-	-	-	-	9	-	-	-	-	-	5	
Malaria zone	-	-	-	-	-	-	-	-	-	-	5	-	-	15	43	-	-	1	8	
Trahoma Contr. Dpt.	-	-	-	-	-	-	-	-	5	-	-	-	-	3	-	16	-	-	6	
Tuberculosis Disp.	1	-	-	-	-	-	2	2	-	-	2	-	-	-	-	-	2	-	2	
Public Health Lab.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total all services	122	62	48	90	22	18	710	292	188	33	80	-	1057	165	205	48	9	16	115	