

## 4. EXISTING WATER USAGE

### 4-1 Water Usage in Study Area

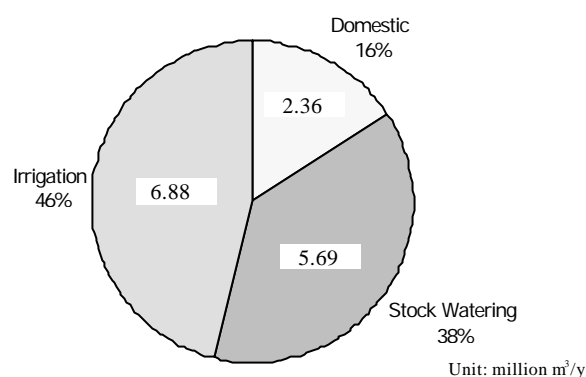
On the basis of existing statistical information and the hydrocensus, which was conducted in this study, water usage amounts to 14.97 million m<sup>3</sup>/y in total and its sectoral breakdown is shown in the pie diagram. It is remarkable that irrigation makes up almost a half of the diagram.

#### 4.2 Irrigation

##### (1) Irrigation Area and Water use

Commercial farms practicing irrigation are mainly located along the Auob River. In the Stampriet area (Area II), 23% of the total number of irrigation farmers consumes 78% of the total irrigation water. (refer to Table 4-1 and Fig. 4-1)

The permitted irrigation area is 399 ha of 2000 ha based on DWA's data. The difference between this and 546 ha in Table 4-1 is attributed to small irrigation area less than one hectare that need no permission, or to illegal irrigation. The main crops in the irrigation area are Lucerne, vegetable and maize.



< Fig. 4-1 Water Usage in Study Area >

< Table 4-1 Irrigation Area and Irrigation Water Use >

Area No.	No. of Irrigation Farmers	Total Farm Area (ha)	Total Irrigation Area (ha)	Average Irrigation Area	Irrigation Water Use		
					(m³/y)	%	(m³/ha/y)
I	22	173,929	22	1	224,840	3	10,220
II	38	285,716	412	10.84	5,334,341	78	12,947
III	6	112,403	11	1.83	112,420	2	10,220
IV	10	200,833	24	2.4	394,119	6	16,422
VII	83	4,719,973	77	0.92	810,712	12	10,598
Total	163	6,306,250	546	3.35	6,876,432	100	60,407
Average	-	-	-	2.8	-	-	10,068

##### (2) Irrigation Permission

Farmers who intend to operate irrigation farming over one hectare or more have to get permission for water allocation from DWA. Once permission is given it is valid for five years on average. At present, 54 irrigation permits are approved for the commercial farms in the Stampriet Artesian Basin amounting 8.27 million m³/y. New permit applications are currently

given various allocations in terms of irrigation permit areas as follows. (refer to Fig.4-3 )

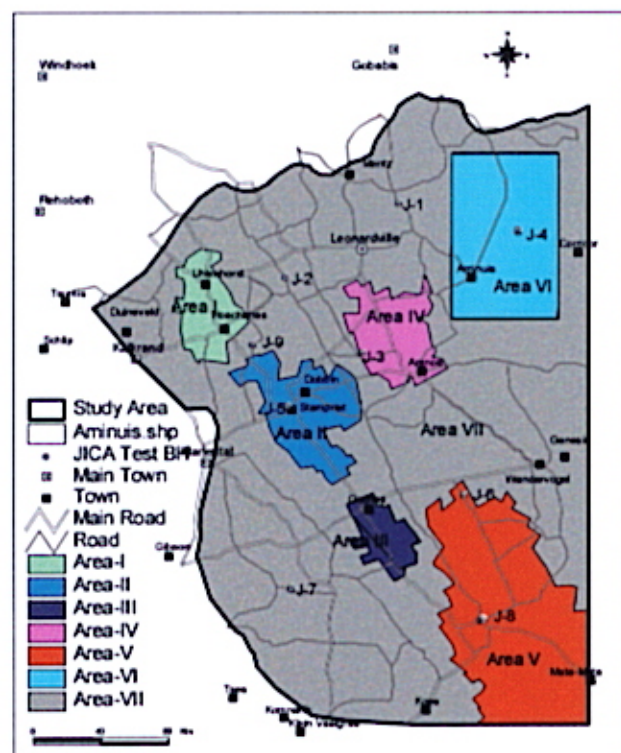
- Permit Area 1: 19,000 m<sup>3</sup>/y
- Permit Area 2: 54,000 m<sup>3</sup>/y
- Permit Area 3: 45,000 m<sup>3</sup>/y

### (3) Water use efficiency

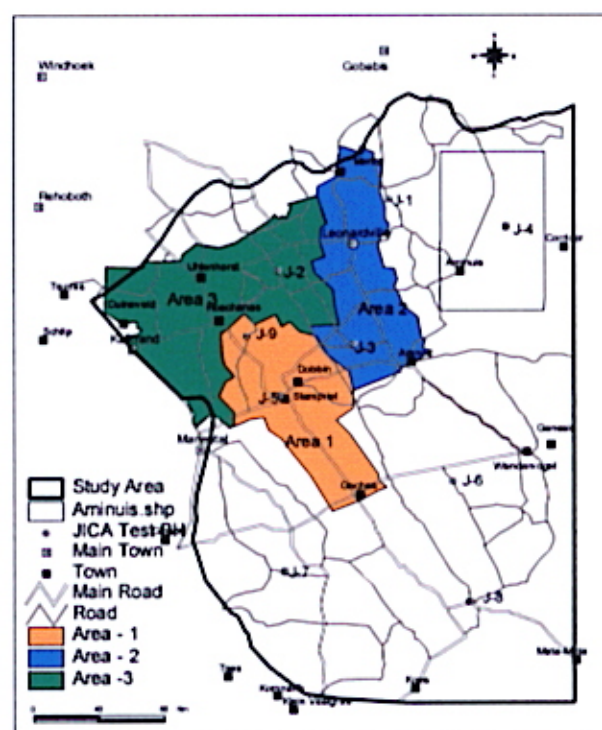
Although the total irrigation water use is 6.87 million m<sup>3</sup>/y under the current total permitted amount, an excessive water use is practiced illegally at nine farms in Area II. (refer to Fig.4-2 and 4-4)

### (4) Irrigation method

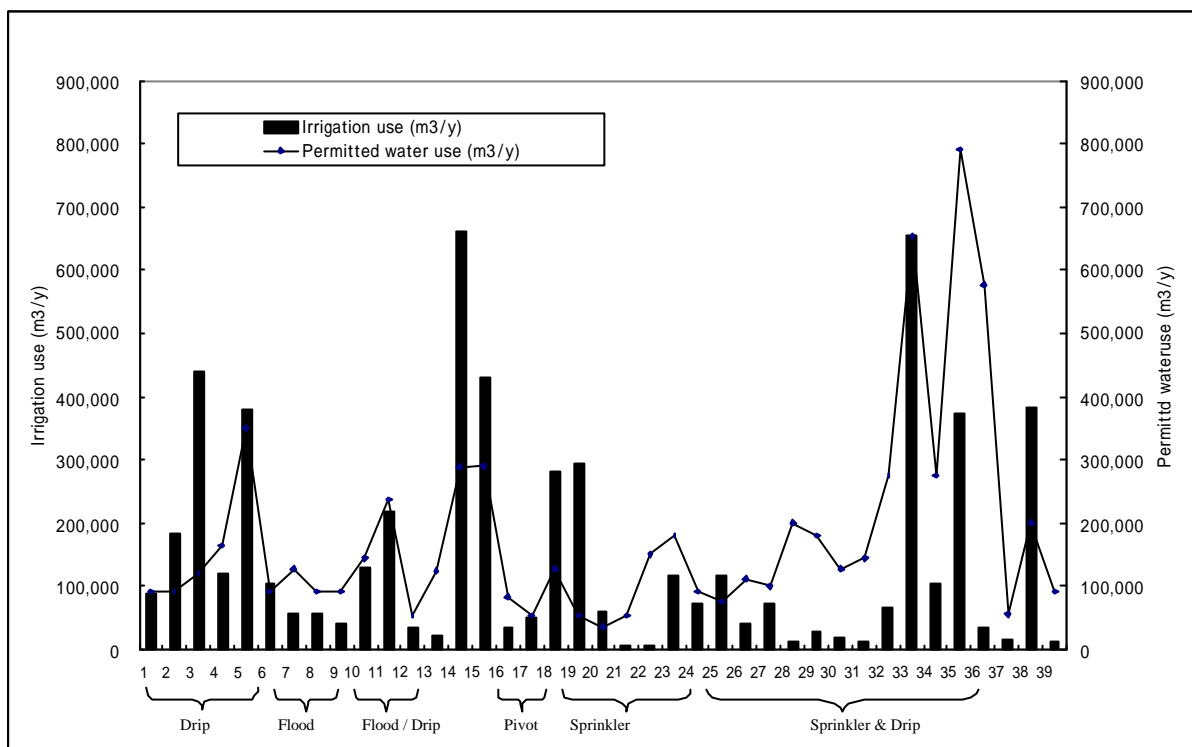
Drip irrigation is widely applied in the study area and its area amounts to 104.6 ha which is 23% of total irrigation area. The other methods in used, in the area are sprinkler and mixed applications (sprinkler, drip and others) respectively. When considering mixed applications together with drip irrigation, 58.9% of the farm areas can be considered to apply efficient irrigation methods. Farm areas, which apply only flood irrigation, are relatively few, and the total area amounts to about 30.5 ha (6.8%). Therefore, bearing this in mind, an alteration of irrigation methods is not to result in a drastic saving in water.



< Fig.4-2 Division for Socioeconomic Analysis >



< Fig. 4-3 Monitoring Area for Irrigation Permission Holder >



< Fig.4-4 Comparison between Irrigation Water Use and Permitted Water Allocate >

## 5. GROUNDWATER POTENTIAL EVALUATION

### 5-1 Storage of Groundwater

Storage of groundwater in each aquifer was estimated as shown in Table 5-1. Although these groundwater storages are huge in volume, it should be considered that a very little of the groundwater within the aquifers is virtually available for extraction because of technical and economical reasons. Therefore, it is necessary to consider other indices instead of aquifer storage in order to evaluate the groundwater potential of the aquifers.

< Table 5-1 Groundwater Storage of Each Aquifer >

Aquifer	Thickness (m)	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Effective Porosity (%)	Groundwater Storage (m <sup>3</sup> )
Kalahari (Saturated)	0-250	52.6E+9	2.36E+12	5	<b>120E+9</b>
Auob Aquifer	0-150	50.7E+9	3.60E+12	5	<b>180E+9</b>
Nossob Aquifer	0-60	9.98E+9	1.24E+12	5	<b>57E+9</b>

### 5-2 Groundwater Potential Evaluation

Four indices; water depth, water quality, depth of aquifer and specific yield have been selected for this purpose as shown in following table and total evaluation for each aquifer was marked out of 400 points. The results of the evaluation are illustrated in Fig.5-1

#### (1) Kalahari Aquifer

The southeastern part of the basin that it is called the “Pre-Kalahari Valley” or “Salt Block” is evaluated as poor. The area which comprises more than 275 points and evaluated as considerably good extends widely in the western part of the basin.

#### (2) Auob Aquifer

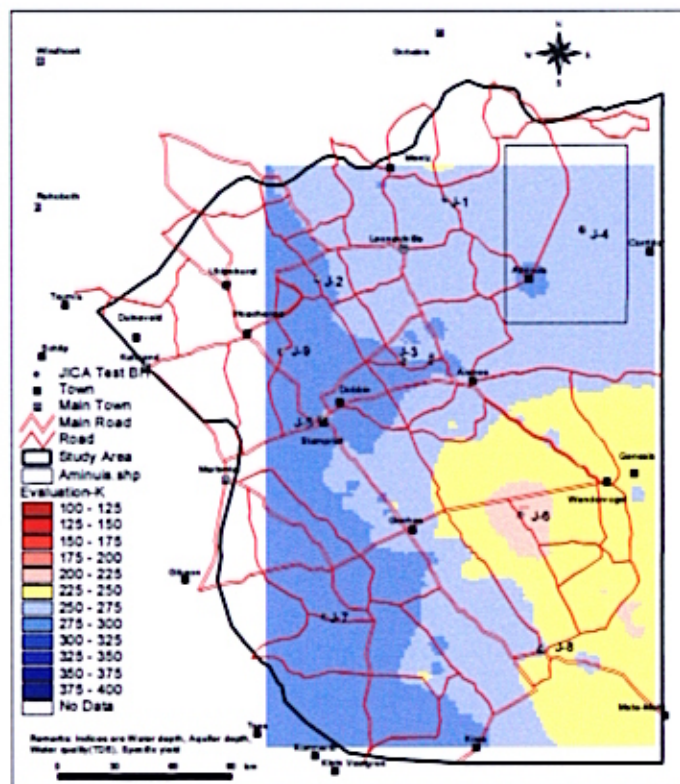
The central area of the western part of the basin including Stampriet obtains a good score of more than 300 points and it coincides with the present area of high intensive withdrawal from this aquifer. However, the area which obtains less than 225 points is extensively distributed in the southeastern part of the basin. It is remarkable that there is a considerable extent of the land that has more than 250 points in the north in Aminius.

#### (3) Nossob Aquifer

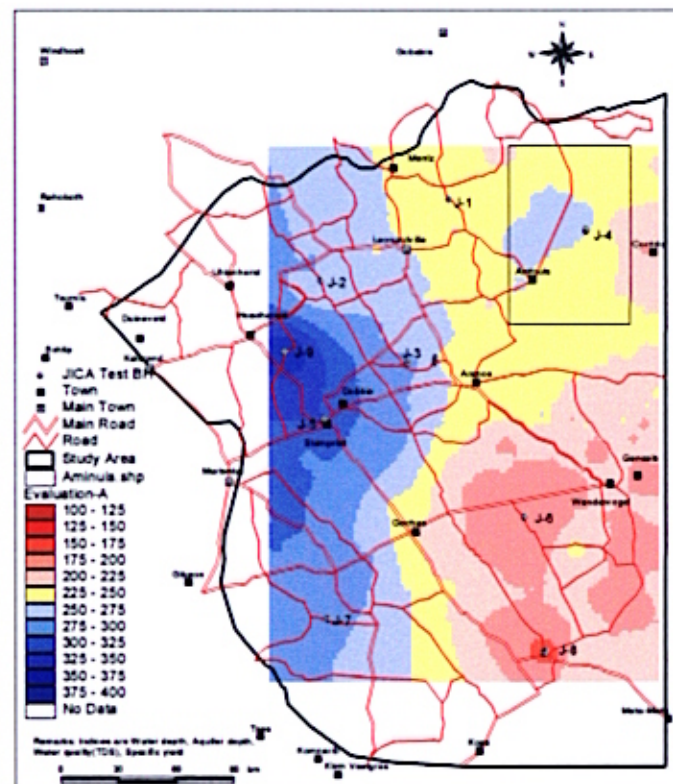
Most of the area analyzed is covered by the reddish color that implies less than 225 points and has a low or very low evaluation except for the small area around Stampriet.



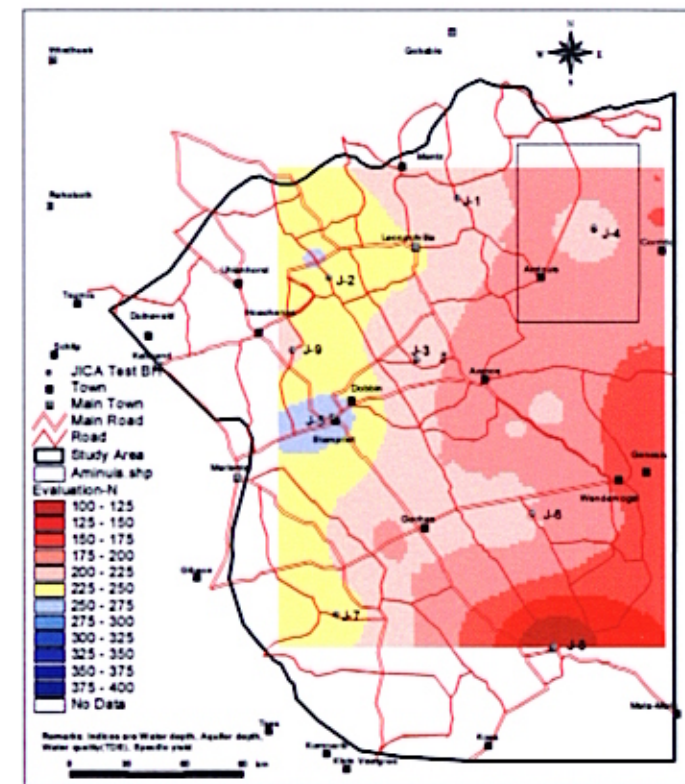
Kalahari Aquifer



Auob Aquifer



Nossob Aquifer



&lt; Fig. 5-1 Groundwater Potential Evaluation of Each Aquifer in Stampriet Artesian Basin &gt;