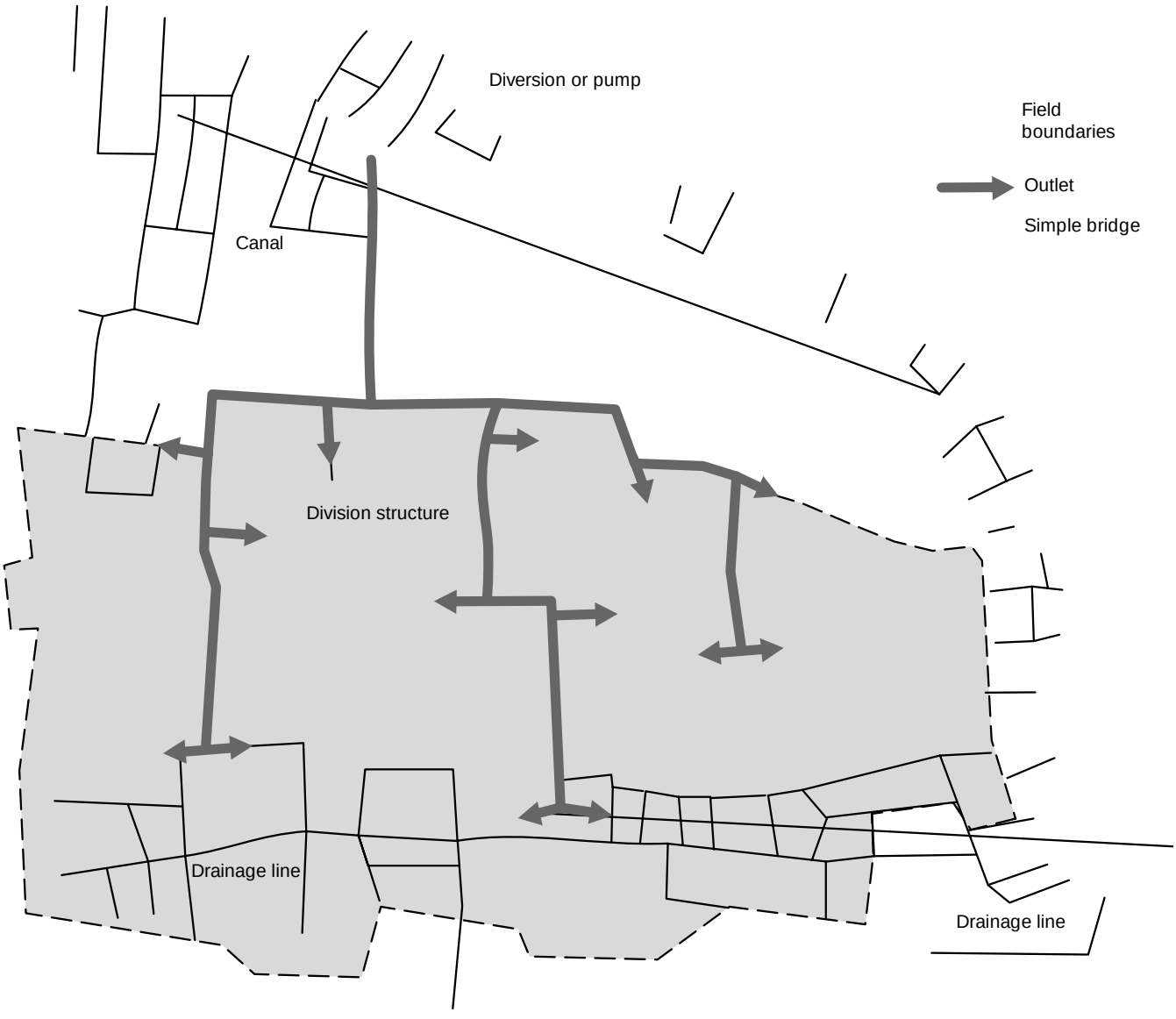
Diversion or pump
Field boundaries
Outlet
Simple bridge
Canal
Division structure
Drainage line
Drainage line

Canal design

Water may be conveyed from the source to the field by unlined or lined canal; pipeline; or a combination of the two. The unlined canal is the most common method in use.

A typical cross-section of an unlined earthen canal for small-scale irrigation is shown in Figure 2. To minimize losses, the canal banks should be built from clayey soil and constructed in layers, with each layer compacted using heavy rammers.

The required size of the canal can be decided using Manning's formula:

$$Q = \frac{A \cdot R^{2/3} \cdot s^{1/2}}{n}$$

Q = discharge (m^3/s. Note: 1 m^3/s = 1000 l/s)
A = wetted area (m^2)
R = hydraulic radius (m)
(= wetted area/wetted perimeter)
s = slope (fraction)
n = Manning's roughness coefficient (commonly taken as 0.03 for small irrigation canals)

A design chart, such as Figure 3, can be used.

For example, for a trapezoidal canal in clay soil with side slopes of 1 to 1.5, a design discharge of 44 l/s, and a slope of 0.001 (or 1 m/km), use a bed-width (B) of 0.5 m, and a depth (D) of 0.25 m.

Table 1. Evapotranspiration (ET_o) in mm per day for different agro-climatic conditions (FAO, 1977)

Regions	**ET_o in mm per day**		
Mean daily temperature	*<10°C*	*20°C*	*>30°C*
Tropics			
Humid	3-4	4-5	5-6
Sub-humid	3-5	5-6	7-8
Semi-arid	4-5	6-7	8-9
Arid	4-5	7-8	9-10
Sub-tropics			
Summer			
Humid	3-4	4-5	5-6
Sub-humid	3-5	5-6	6-7
Semi-arid	4-5	6-7	7-8
Arid	4-5	7-8	10-11
Winter			
Humid - sub-humid	2-3	4-5	5-6
Semi-arid	3-4	5-6	7-8
Arid	3-4	6-7	10-11
Temperate			
Humid - sub-humid	2-3	3-4	5-7
Semi-arid - arid	3-4	5-6	8-9

Distribution outlets

Outlets or division structures are used
among a group of farmers. If the flow
farmer can probably use it efficientl
through one outlet, but larger flows n
between several outlets. In either ca
outlets can be closed when not in use

Figure cast concrete circular gate and panel with outlet structure

Further reading

CLIMWAT for CROPWA atabase for irrigation planning and management, FAO Irrigation and Drainage Paper No. 49, FAO, Ro

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