Small-scale irrigation can be defined as irrigation, usually on small plots, in which small farmers have the controlling influence, using a level of technology which they can operate and maintain effectively. Small-scale irrigation is, therefore, farmer-managed: farmers must be involved in the design process and, in particular, with decisions about boundaries, the layout of the canals, and the position of outlets and bridges. Although some small-scale irrigation systems serve an individual farm household, most serve a group of farmers, typically comprising between 5 and 50 households.

Small-scale irrigation covers a range of technologies to control water from floods, stream-flow, or pumping:

Flood cropping

- Rising flood cropping (planted before the flood rises).
- Flood/tide defence cropping (with bunds).

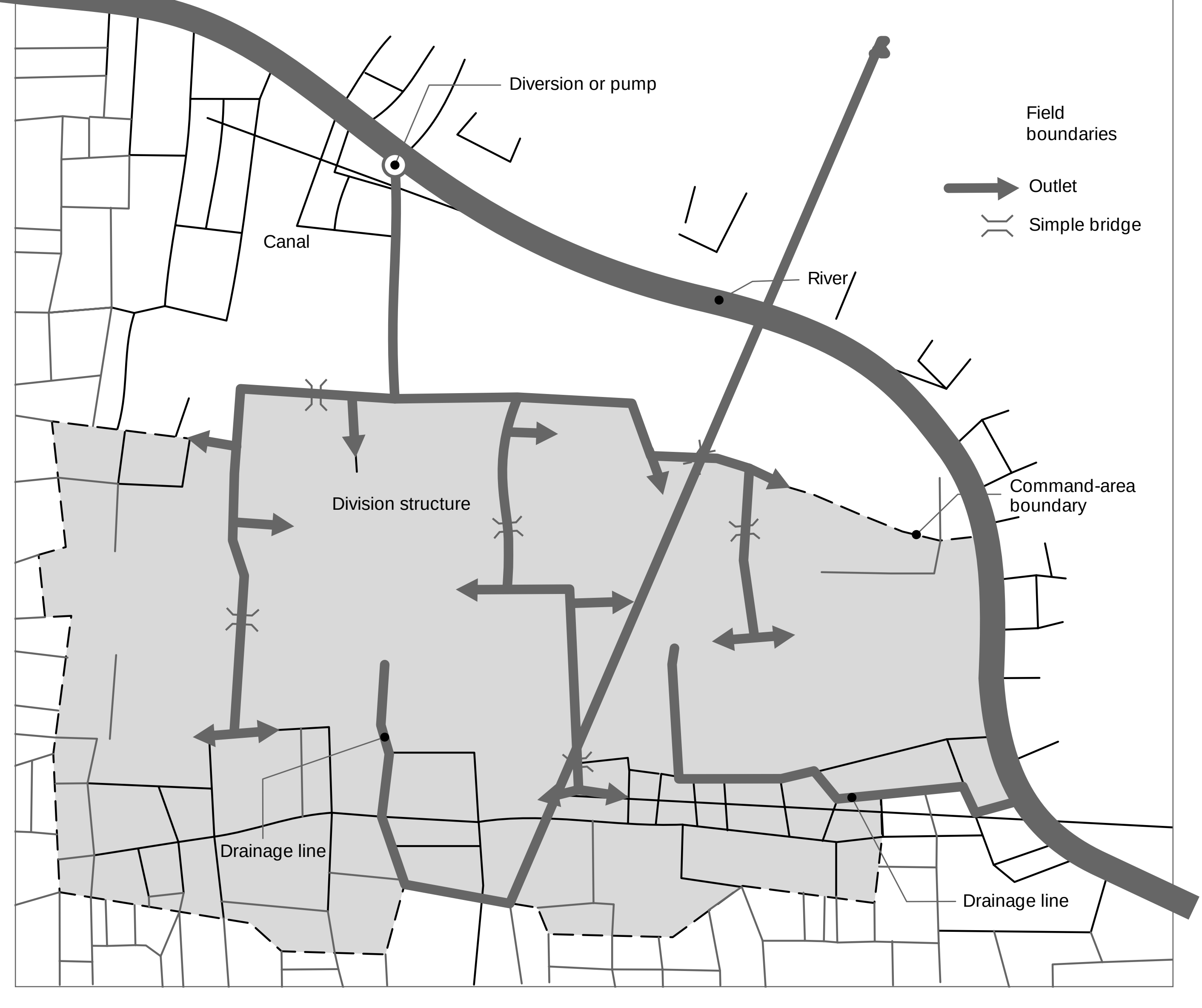
Stream diversion (gravity supply)

- Permanent stream diversion and canal supply.
- Storm spate diversion.
- Small reservoirs.

Lift irrigation (pump supply)

- From open water.
- From groundwater.

Figure 1. A schematic plan view of a typical small-scale irrigation system



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 =

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	*<10ºC*	*20ºC*	*>30ºC*
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 efficiently
through one outlet, but larger flows ne
between several outlets. In either ca
outlets can be closed when not in use,

Figure st concrete circular gate and panel with outlet structure

Further reading

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