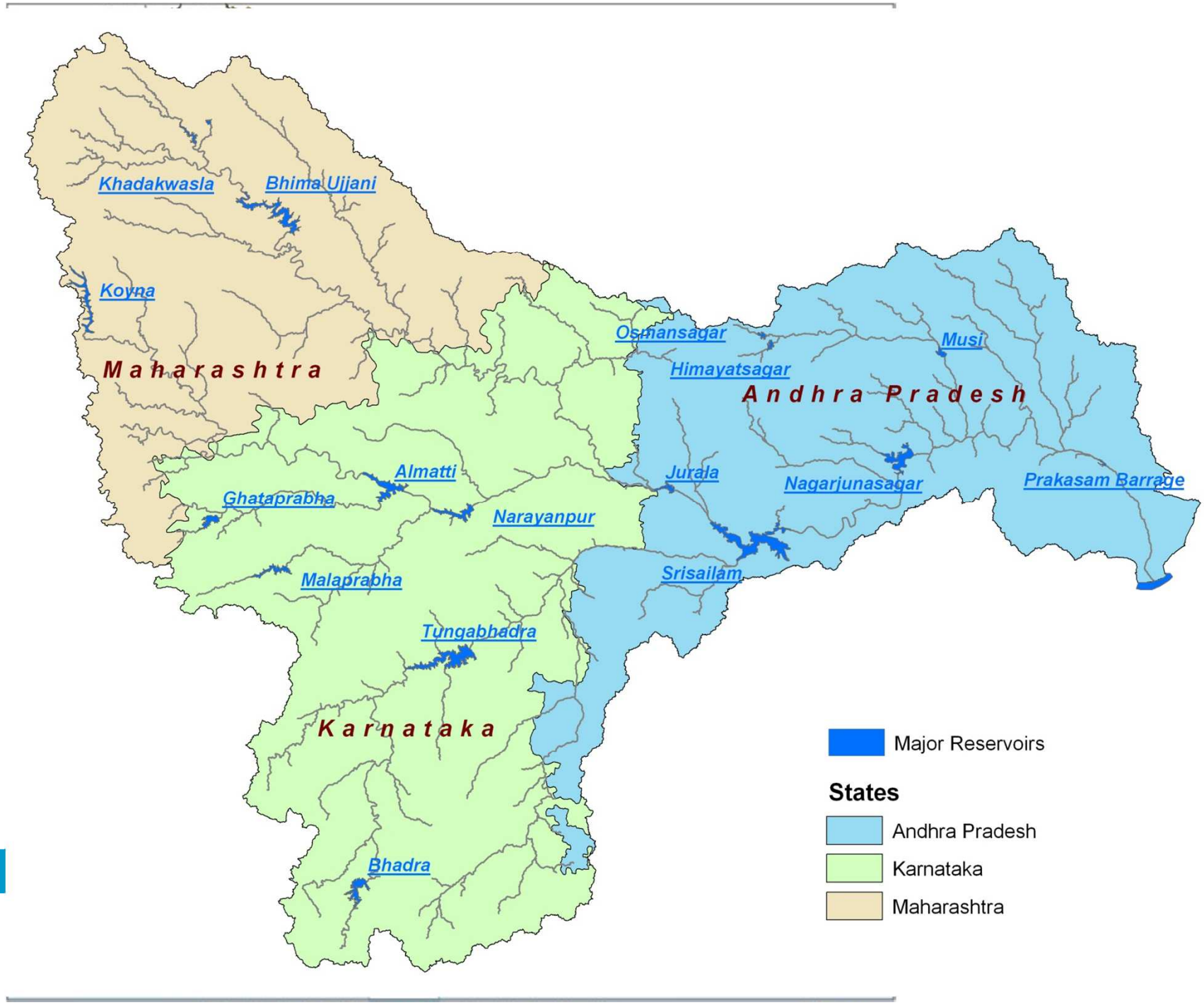
Farmers and irrigation

Irrigation and Drainage
CT4410

Maurits Ertsen
December 14, 2011

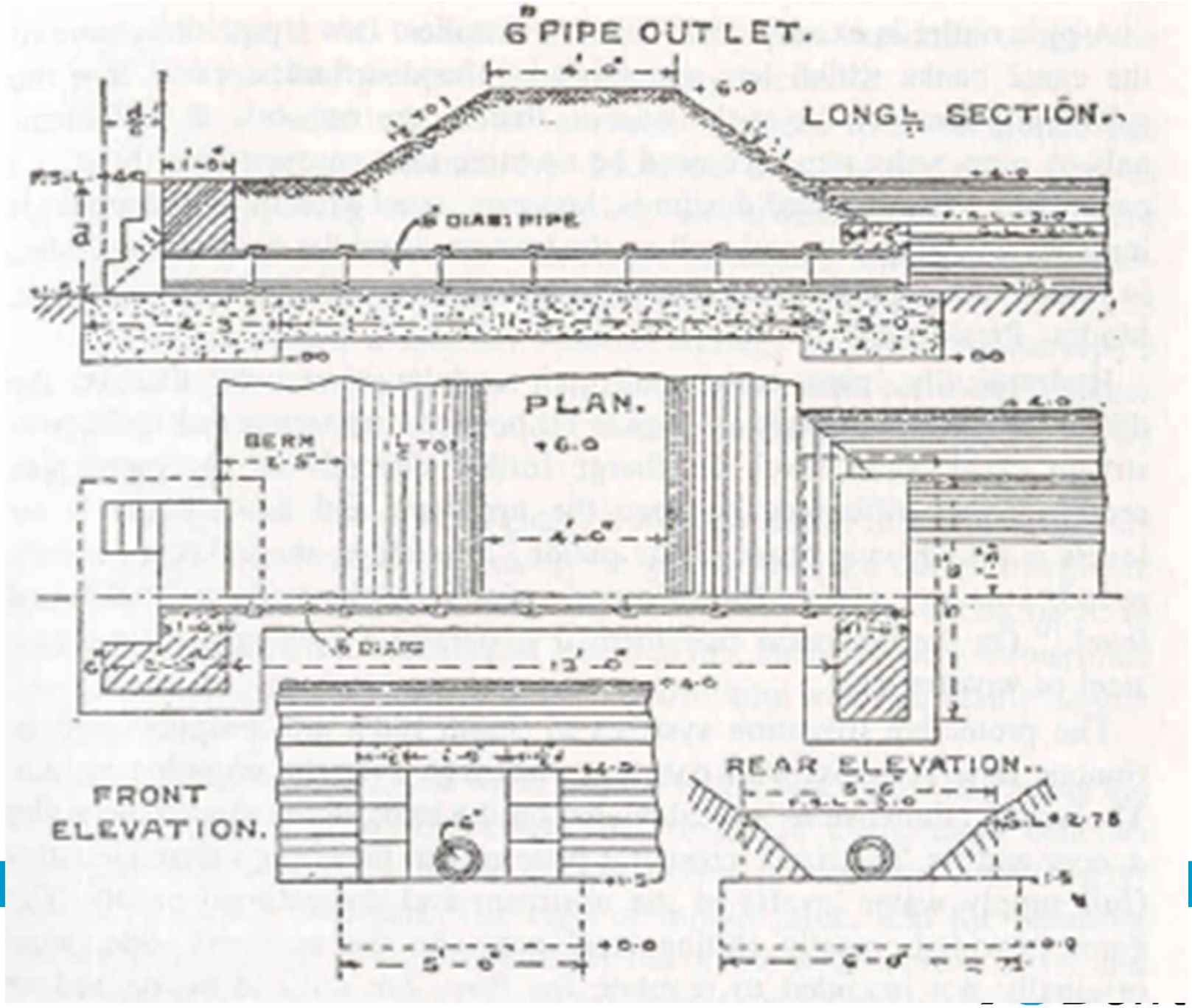
Water Resources Management

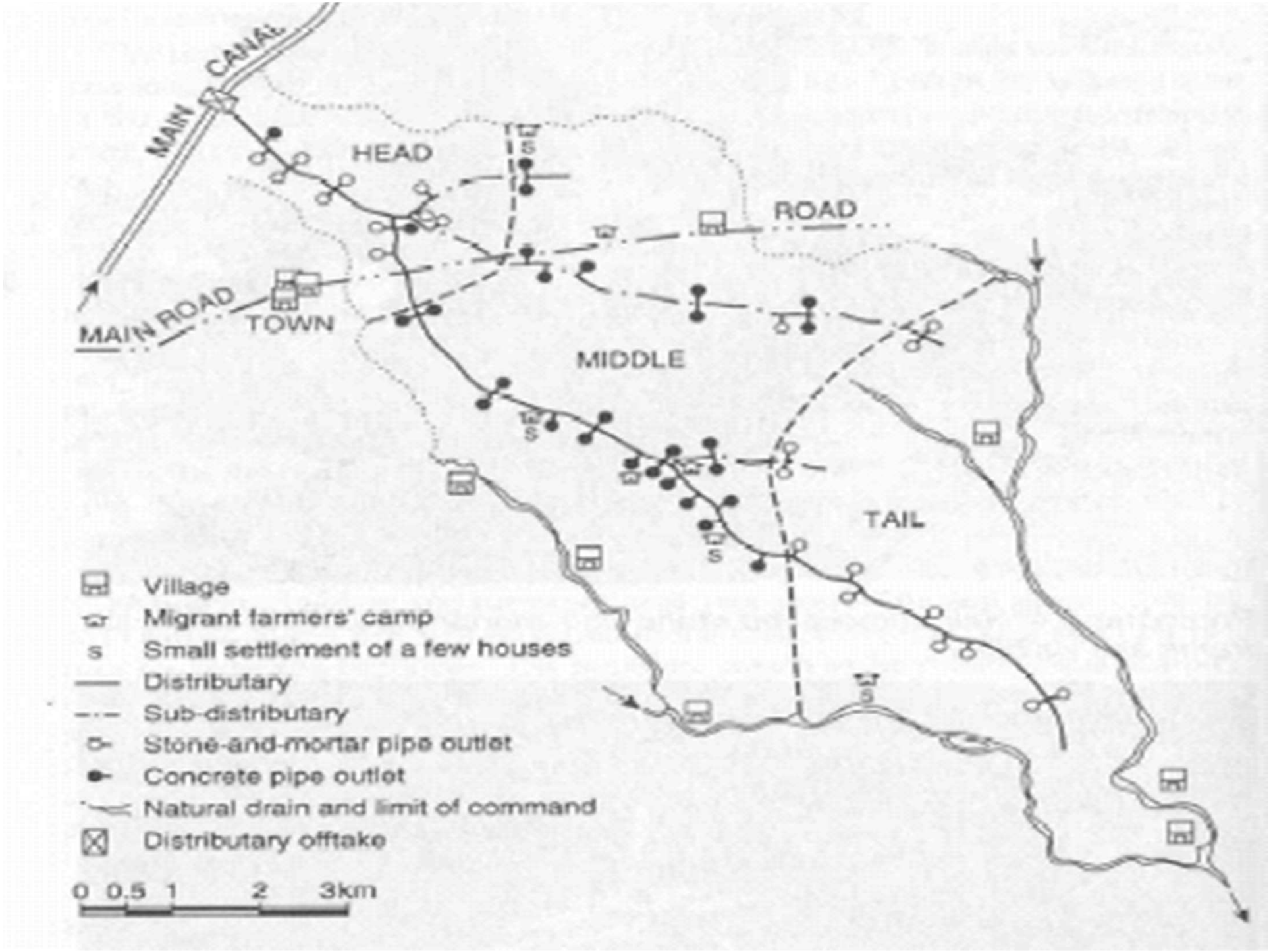
Technische Universiteit Delft

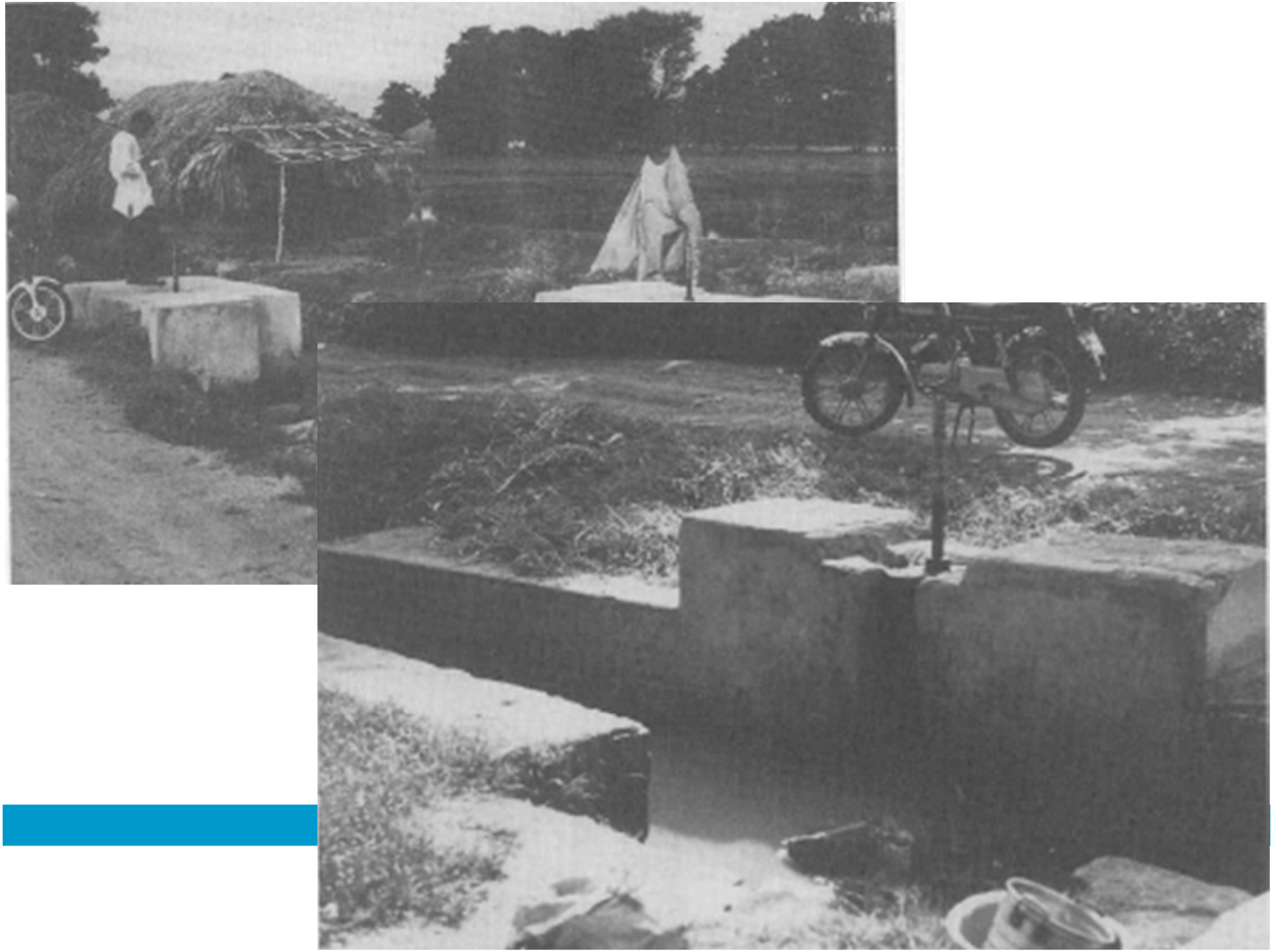

Khadakwasla
Bhima Ujjani
Koyna
Maharashtra
Osmansagar
Himayatsagar
Musi
Andhra Pradesh
Almatti
Ghataprabha
Narayanpur
Jurala
Nagarjunasagar
Prakasam Barrage
Malaprabha
Srisailam
Tungabhadra
Karnataka
Bhadra
Major Reservoirs
States
Andhra Pradesh
Karnataka
Maharashtra

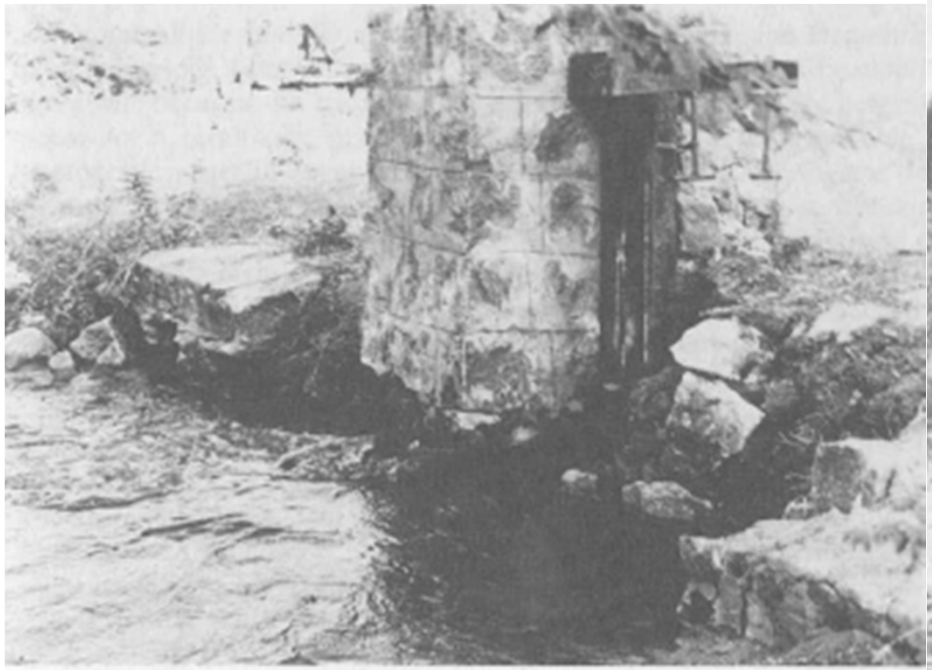
2. Throughout the irrigation season all pipe outlets (referred to locally as "POs") should be open constantly at design flow. Partial or complete closure of them to save irrigation water serves no purpose, as the allocations are already so small. Only during high rainfall should some outlets, or the entire canal, be closed for a short period. The outlets should not be opened to more than design discharge because they will then take water which is meant for other outlets. This applies at every level of the Scheme. Similarly, the distributary inlet should not be opened to more than design discharge as it, too, will then take water meant for other distributaries.

3. The distributary should run continuously at the same design flow throughout the season. In addition, because of the absence of proper water-level and flow-control structures, flow in the canals should always be kept at the same (design) levels, in order to maintain the same level of head on the outlets.

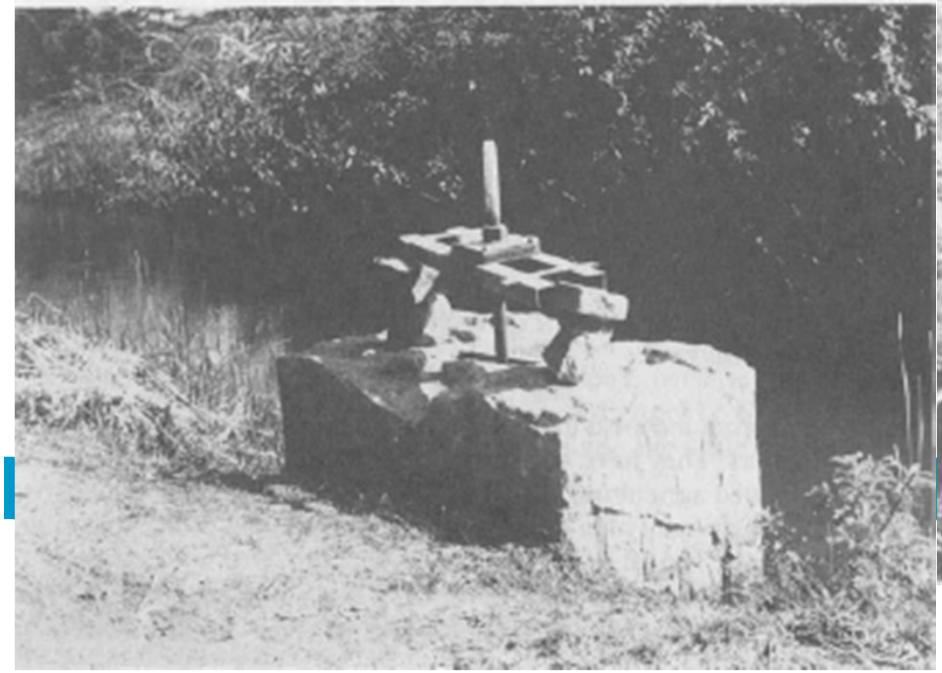

6" PIPE OUT LET.
LONGL SECTION.
6" DIAM: PIPE
PLAN.
BERM
FRONT ELEVATION.
REAR ELEVATION..


MAIN CANAL
HEAD
ROAD
MAIN ROAD
TOWN
MIDDLE
TAIL
Village
Migrant farmers' camp
Small settlement of a few houses
Distributary
Sub-distributary
Stone-and-mortar pipe outlet
Concrete pipe outlet
Natural drain and limit of command
Distributary offtake
0 0.5 1 2 3km





Photograph 4 *Half demolished stone-and-mortar pipe outlet with gate frame still visible*



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Groundwater use in Pakistan

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Tajikistan
China
Afghanistan
Iran
India
Arabian Sea
NWFP
Jammu & Kashmir
Balochistan
Punjab
Sindh
Swat
Kabul
Warsak
Tarbela
Attock
Kala Bagh
Mangla
Rasul
Marala
Jhelum
Chenab
Khanki
Qadarabad
Gomal
Chashma
Kurram
Zhob
Trimmu
Ravi
Balloki
Taunsa
Sidhnai
Sutlej
Suleimanki
Islam
Panjnad
Indus
Guddu
Sukkur
Kotri
Hub
Lora
Mashkai
Nal
Hab
LEGENDS
International Boundry
Provincial Boundry
Coastal Area Boundry
River
Reservoir
Barrage
100 0 100 200 300 400 500 Kilometers


PAKISTAN
Gujrat
Gujranwala
Lahore
PUNJAB

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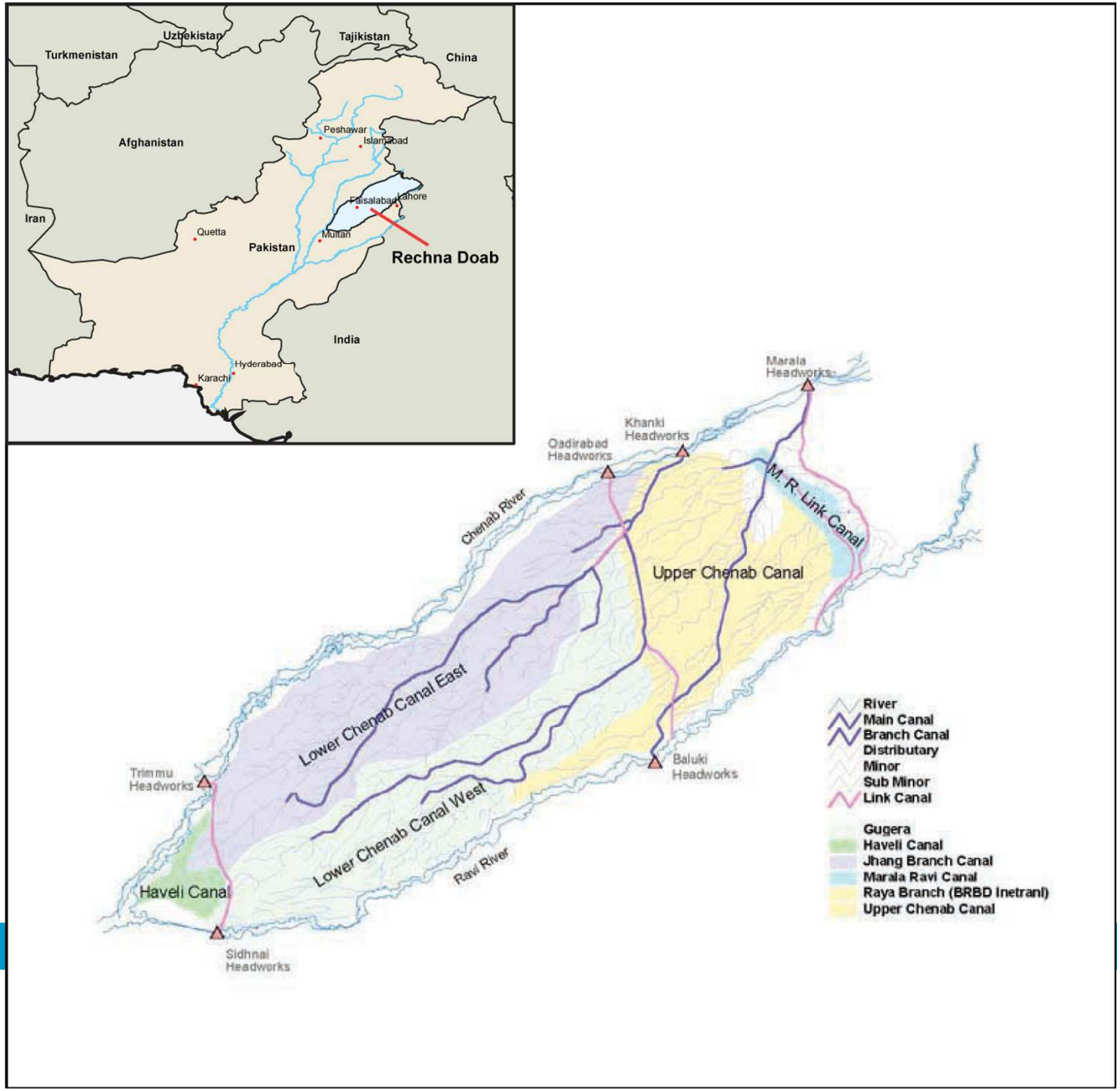
Uzbekistan
Tajikistan
Turkmenistan
China
Afghanistan
Peshawar
Islamabad
Faisalabad
Lahore
Iran
Quetta
Multan
Pakistan
Rechna Doab
India
Hyderabad
Karachi
Marala Headworks
Khanki Headworks
Qadirabad Headworks
M. R. Link Canal
Chenab River
Upper Chenab Canal
Lower Chenab Canal East
Lower Chenab Canal West
Trimmu Headworks
Baluki Headworks
Ravi River
Haveli Canal
Sidhnai Headworks
River
Main Canal
Branch Canal
Distributary
Minor
Sub Minor
Link Canal
Gugera
Haveli Canal
Jhang Branch Canal
Marala Ravi Canal
Raya Branch (BRBD Inetranl)
Upper Chenab Canal


VERSACE

Campo de Cartagena

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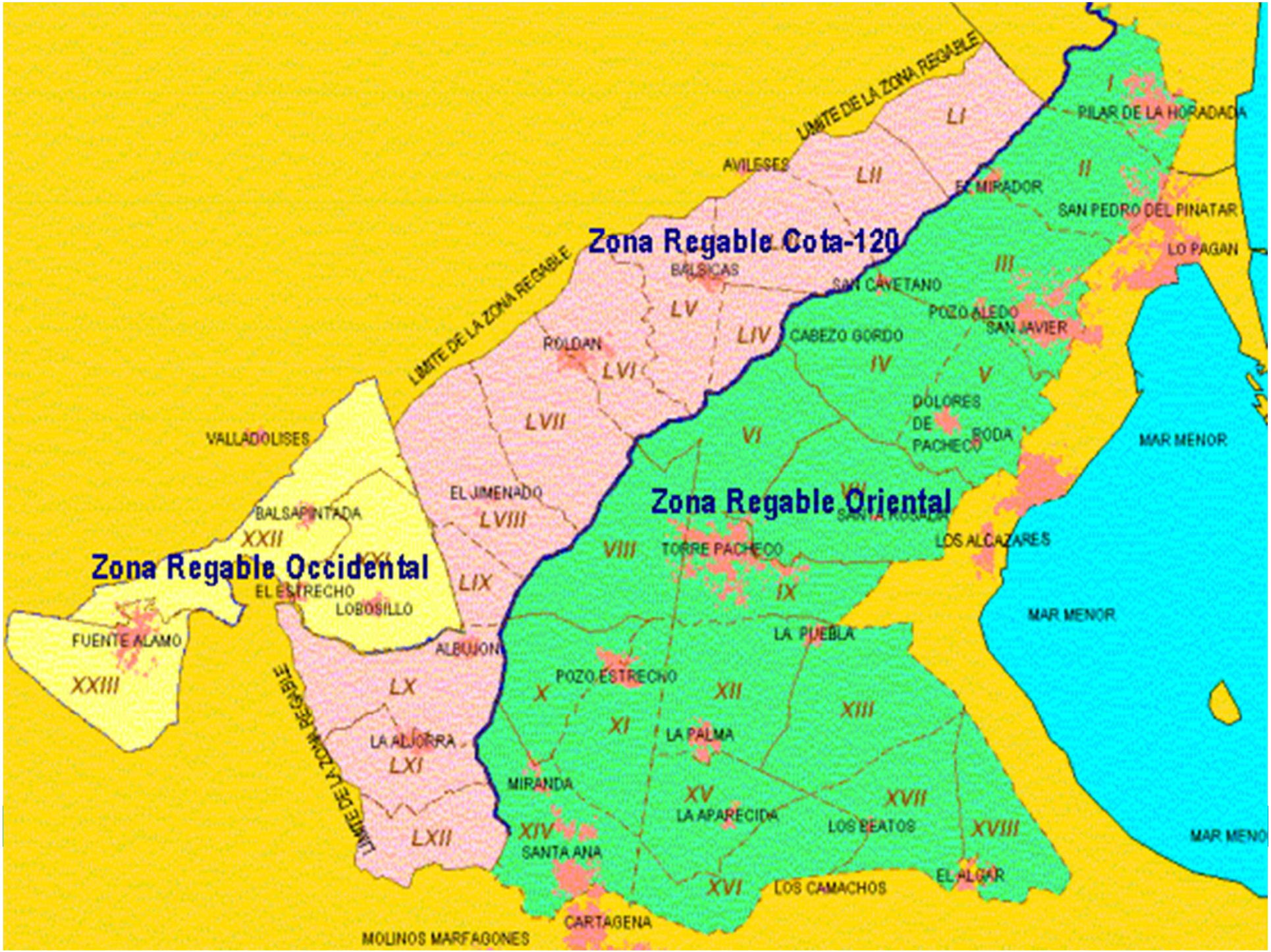

Zona Regable Cota-120
Zona Regable Occidental
Zona Regable Oriental
LIMITE DE LA ZONA REGABLE
LIMITE DE LA ZONA REGABLE
LIMITE DE LA ZONA REGABLE
LI
LII
LIII
LIV
LV
LVI
LVII
LVIII
LIX
LX
LXI
LXII
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
XIII
XIV
XV
XVI
XVII
XVIII
XXII
XXI
XXIII
AVILESES
EL MIRADOR
RILAR DE LA HORADADA
SAN PEDRO DEL PINATAR
LO PAGAN
BALSICAS
SAN CAYETANO
POZO ALEDO
SAN JAVIER
ROLDAN
CABEZO GORDO
DOLORES
DE
PACHECO
RODA
VALLADOLISES
EL JIMENADO
BALSAPINTADA
SANTA ROSALIA
LOS ALCAZARES
TORRE PACHECO
MAR MENOR
EL ESTRECHO
LOBOSILLO
FUENTE ALAMO
ALBUJON
LA PUEBLA
POZO ESTRECHO
LA ALJORRA
LA PALMA
MIRANDA
LA APARECIDA
LOS BEATOS
SANTA ANA
EL ALGAR
LOS CAMACHOS
CARTAGENA
MOLINOS MARFAGONES
MAR MENO

Original design

Pressurized system

Constant flow

Time measurement

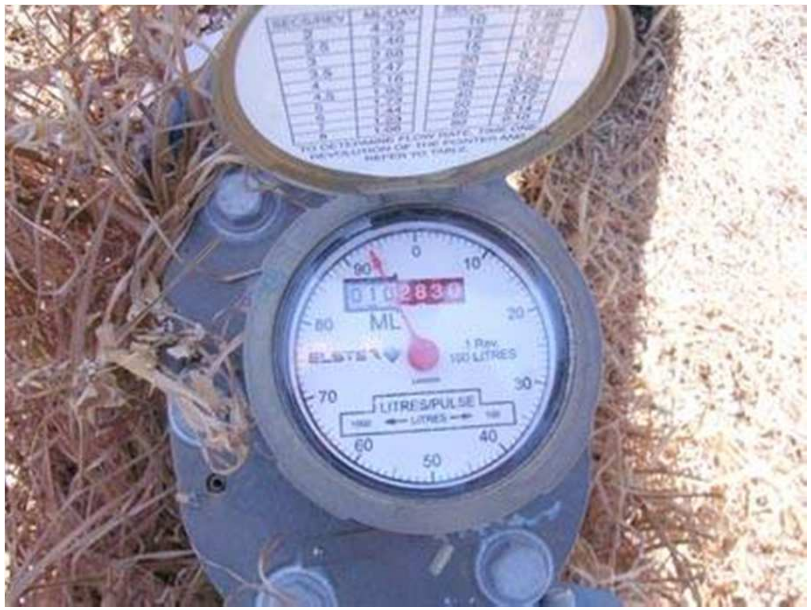
Prepared for sprinkler, suitable for surface irrigation

But, what happened?

Constant flow appeared to be less constant…

Two responses from farmers:

Water meters: from time to flow



On-farm storage

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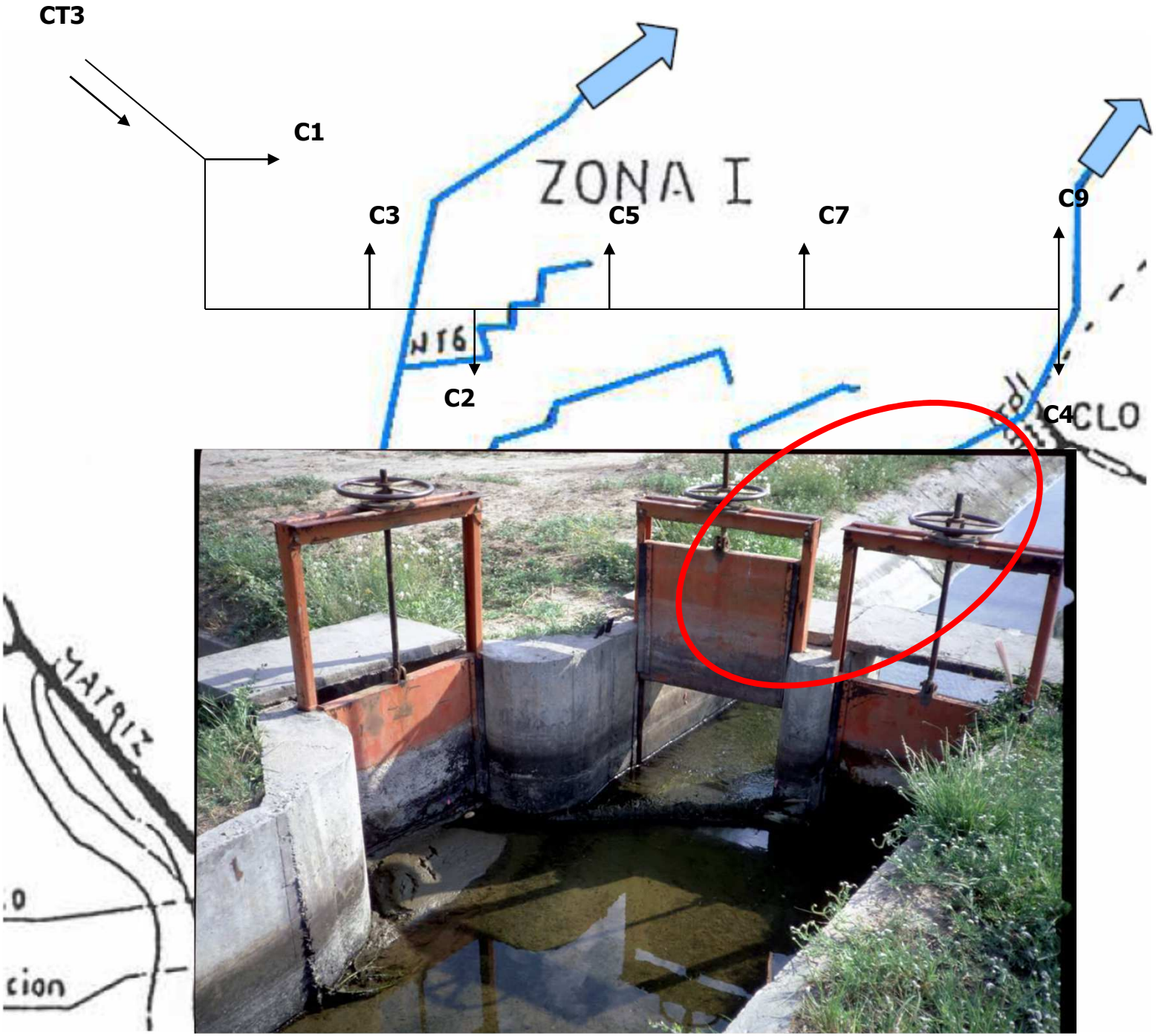
Proyecto Rio Dulce


CT3
C1
ZONA I
C3
C5
C7
C9
NT6
C2
C4
CLO
MATRIZ
.0
cion

The **average farmer** in CT3 irrigated about **7 hectares**,

using a flow of **200 l/s** for **three hours**,

thus putting on a hectare about 2.200 m3 (220 mm).

This same average farmer irrigated **2 times in the season**.

Canal	Mean	Maximum	Minimum
C2	1.2	2	1
C4	1.7	3	1
C5	1.9	3	1
C3	2	3	1
CT3 (Tertiairy canal)	***2.1***	***6***	***1***
C7	**2.3**	**4**	**1**
C9	**3.3**	**6**	**1**

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Comunero	Flow max (l/s)	Flow min (l/s)	Min/max
C2	230	172	0.75
C3	235	198	0.84
C5	290	265	0.91
C9	238	**122**	**0.51**
C4	254	**116**	**0.46**
CT3	***250***	***175***	***0.7***

Responses:

Farmers irrigate longer or more often

Farmers decrease their irrigated area during the season

Farmers increase their irrigated area during the season