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Pre-fabricated Soil, Cement Tiled Lining for Irrigation Channels

by

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Introduction : A considerable quantity of water is lost by percolation through the unlined irrigation channels affecting the farmer by increased cost in lifting water. No doubt the lining of channels by cement concrete is a permanent measure; but a small land holder cannot easily adopt this, as the cost of such lining is prohibitive. Therefore, there is imperative need for evolving cheap lining materials.

Investigation : A number of cheep lining materials like (i) soil, rice bran and sand in a ratio of 10:2:1, (ii) clayey soil, paddy husk and cowdung in a ratio of 9:3:1, (iii) clay, sand, cement in a proportion of 10:1:1, (iv) soil cement in the proportion of 8:1, (v) asphaltic mixture and (vi) polythylene lining have been experimented upon in different soils. The soil-cement lining was found to be effective and the average loss worked out 5%. But, in the soil-cement lined channels, weeds penetrated the lined channel and minor cracks developed. To overcome this problem, it was experimented to pre-fabricate

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the soil cement lining in a proportion of 8:1 (soil must contain 80% sand) and this gave encouraging results.

Materials and Methods : The method adopted for soil cement tiles are broadly classified as follows :

a) Preparation of tiles
b) Initial curing of tiles
c) Preparation of channel bed
d) Laying tiles and cement pointing
e) Curing of the channel

a) *Preparation of tiles :* The method is very simple and an ordinary village potter can prepare these tiles, just like making country bricks. In the latter case baking is to be done in the kiln which is not necessary for soil cement tiles.

Two sizes of the wooden frames have to be made for the preparation of tiles. The sizes vary according to the required cross section of the channel to the designed flow and they can be made with ordinary wood as shown in Figure 1.

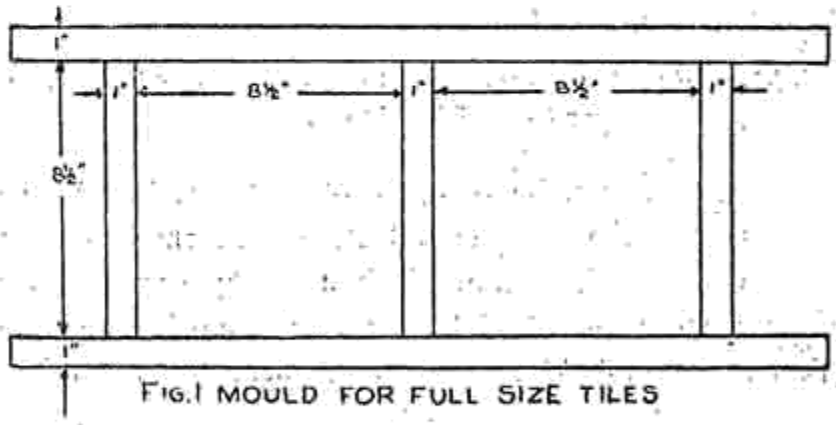


FIG.I MOULD FOR FULL SIZE TILES

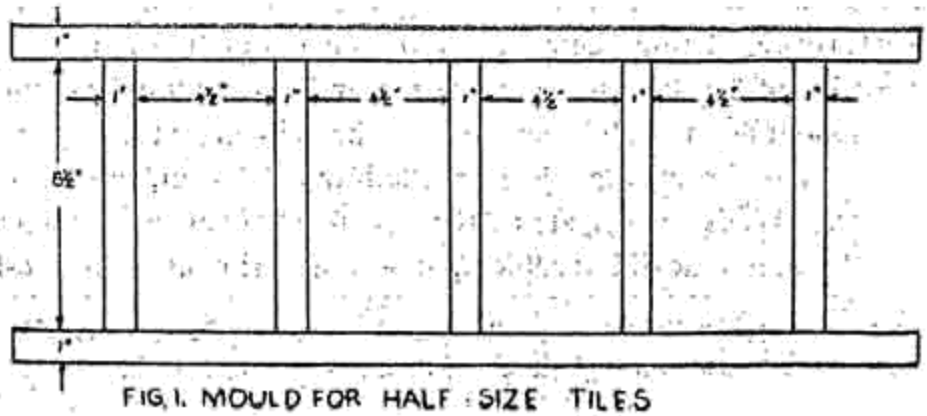


FIG. I. MOULD FOR HALF SIZE TILES

The full size frame can have two or three compartments each of size $8\frac{1}{2}'' \times 8\frac{1}{2}'' \times 1''$ and the half size mould with four compartments of $8\frac{1}{2}'' \times 4\frac{1}{2}'' \times 1''$ for easy handling. The available natural soil in the field preferably red soil with sand contents about 70 to 80% are found to be the best suited for the purpose of pre-fabrication. The soil is mixed thoroughly with cement in a proportion of 8:1. Clods have to be broken and small pebbles if any have to be removed from the mixture. The required quantity of water is to be added for the mixture and it should be well mixed.

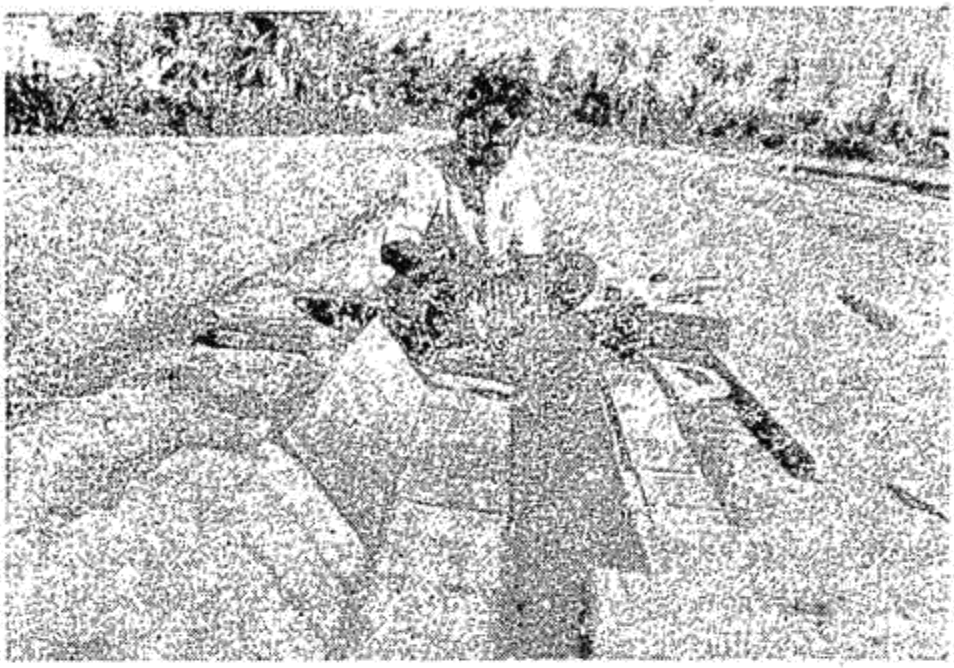
The ground in which the moulds are to be placed should be levelled first and small layer of 3" sand can be spread over and then sprinkled with water. The moulds or frames prepared should be placed in the above site and the mixture is filled up within the compartments of the frame and well compacted by means of a leveller (12" length wi.h a thickness of 1" reaper), the top surface is smoothened. Then the mould should be removed carefully without shake so that the edges of the tiles should not get disfigured, to have a perfectly square tile of the desired size.

b) *Curing of tiles* : The tiles should be dried in the sun for 48 hours. However, water has to be sprinkled periodically to ensure good curing. After allowing the tiles to sun dry, they should be allowed to cure atleast for seven days to get a good effect.

c) *Preparation of channel bed :* The channel beds are prepared according to the sizes of the tiles allowing a clearance to the mortar thickness of $\frac{1}{4}''$. In this case the top width is 1'-9", bottom width 9" with a side slope of 1:1. The ground surface in which the channel is to be formed is well consolidated first by sprinkling enough water and rammed, preferably with hand rollers. As far as possible the weeds and roots should be removed before the formation of the cross section of the channel. Then the channel is formed to the required cross section by excavating duly giving an allowance of 1" on all sides so as to accommodate the thickness of the tiles. The desired longitudinal gradient should however be maintained throughout the length of the channel.

d) *Laying of the tiles :* After the surface section of the channel is prepared, the tiles (after enough curing) are laid with the help of a skilled mason. The full size tiles are laid at the bottom and sides and the half size tiles are laid at top side of the channel so as to have berm for the channel, in a staggered manner (*vide* Plate I.) The joints should be pointed with cement mortar 1:3.

e) *Curing the channel :* After completing the laying and pointing the tiles, water is to be sprinkled frequently on the joints for about two days and then water is allowed to stagnate in the channel for atleast seven days to have good and proper curing. Then the channel is cleaned and used as regular water channel.



Results : In the unlined channel, seepage loss ranged from 12 to 18% according to soil conditions. In the pre-fabricated soil cement lined channel, seepage loss was only 1 to 2%. The cross section of the lined channel is shown in Figure 2.

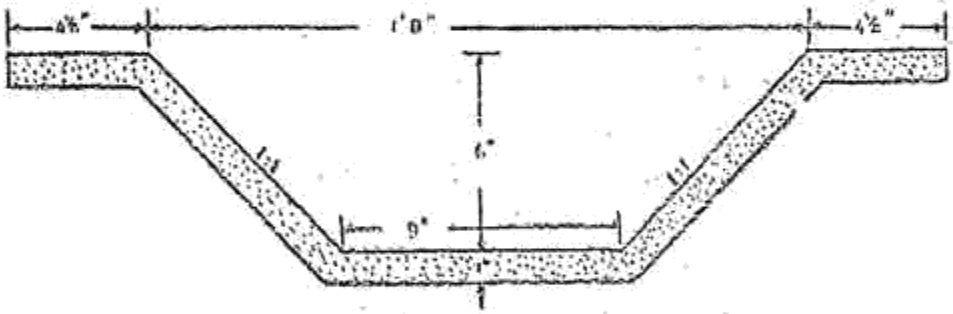


FIG. 2.

TABLE 1: *Seepage loss in Soil Cement tiled channel*

Clock Time		Inflow			Outflow			Loss in (cm)	% of loss inflow (cm)
H	M	Sill level of V notch (cm)	Head over V notch (cm)	Actual outflow (cm)	Sill level of V notch (cm)	Head over V notch (cm)	Actual outflow (cm)		
10	30	86 30	95.80	9.50	86.80	95.90	9.10	0.40	4.21%
11	00	-do-	96.05	9.75	-do-	96.30	9.50	0 25	2.56%
11	15	-do-	96.18	9.88	-do-	96.52	9.72	0.16	1 61%
11	30	-do-	96.19	9 89	-do-	96.56	9.76	0.13	1.31%
11	45	-do-	96.14	9.84	-do-	96.55	9.75	0.09	0 92%
12	00	-do-	96.14	9 84	-do-	96.55	9.75	0.09	0.92%
12	15	-do-	96.14	9.84	-do-	96.55	9.75	0.09	0.92%

N.B: A constant inflow could not be maintained during the test since the inflow water was delivered by two submersible pumps directly during the test. However, the last three readings were constant and can be taken as a constant loss.

The seepage measured in the lined channel, tested by means of inflow and outflow method are presented in Table 1.

Conclusions and recommendations : The cost of the soil cement tiles channel works out to 33 paise per sq. feet inclusive of materials and labour charges. Preparation of tiles and formation of the channel can be done by an ordinary mazdoor saving 25% of expenditure. The one great advantage is the prevention of weed growth, and it is durable compared to other lining materials such as asphalitic lining, polyethene film lining *etc.*,

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Salt Tolerance of Rice

by

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Introduction: In order to cater to the needs of nearly two lakhs acres cropped with rice under either saline or alkaline soil conditions in Madras State, rice breeding work was started at the Research Centre, Peravurani in 1960. Apart from field scale tests, pot culture studies were also undertaken during 1963 to 1966 for assessment of the salt tolerance capacity of some of the reputed salt resistant varieties and hybrid progenies of crosses effected between saline resistant types and high yielding strains.

Review of literature: Pearson (1960) reported that growth of rice is retarded by soil salinity. The grain production is affected much more than the vegetative growth. Rice can produce half its normal grain yield only if the average electrical conductivity of the soil solution during the growing season is 8 millimhos or less per cm. Pan (1961) found the tolerance capacity of rice to salinity to lie between 3 and 6 millimhos/cm, (roughly 0 2% and 0.4% salt) and it varies with different varieties. Pearson (1961) reported that three and six week old seedlings survive at soil salinity levels upto 9 and 14 millimhos/cm, (approximately equivalent to 0.6% and 0.9% salt) whereas younger seedlings are sensitive to salinity at 1 to 2 leaf stage. Salinity has an adverse effect on the germination of pollen grains which results in an increase in the number of sterile florets per panicle. The degree to which rice is affected by salinity depends on the criterion measured and varieties involved. Pan (1964) reported that rice cannot survive and grow to maturity in water with electrical conductivity of 6 millimhos/cm and over. Rice yield is directly affected by the salt content of irrigation water. Rice yield would be most affected when irrigated

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