

What can be learned from traditional, small-scale irrigation?

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Shadoof irrigation in Nigerian farming systems

For the most part, Northern Nigeria is situated in the geographical region of the West African Savanna. It is characterized by an open grassland with few scattered trees and a lot of shrubs. The rainfall pattern is seasonal with a wet season varying from 5-6 months in its lower part to about 2-3 months in the upper north where it borders the Sahara. The dry season is usually longer than the wet season. The agricultural production is subject to rainfed conditions with mostly sorghum, millet, groundnut, cowpea and cotton as the dominant crops.

During the dry season in the low land areas and river banks called *fadama*, wheat, barley and vegetables are traditionally grown by farmers under irrigation. The water in the rivers, or water dug up from wells can be lifted using the shadoof irrigation system. This irrigation system is still practiced widely by small scale farmers all over the northern part of Nigeria. A random sample interview with farmers in Erhabor, northern Nigeria (1982) reported that out of the 125 farmers interviewed, 114 used the shadoof lift system and only 11 used motor driven pumps. Forty-two farmers operated two shadoofs on their farms but only one farmer operated two pumps. All the other farmers irrigated with only one lifting device.

The Shadoof System

This is the traditional system of water lifting by small-scale farmers from its source to a higher level for the purpose of irrigating their crops during the long dry season. It is considered to be a primitive lifting device which originated along the Nile and was first recorded in tomb drawings at Thebes dating from 1250 B.C. It is one of the simplest and oldest devices for raising water from streams, shallow wells and ponds by human power. It is easy to construct, simple to maintain and can be replaced inexpensively with locally available material. Generally, the lift range of the shadoof is between one and three meters. When the lift from stream to fields exceeds this range it becomes necessary to use two or more of the devices in series (Erhabor, 1982). The device is laborious to operate and lifts a limited amount of water per day. Hence it is generally for irrigating small plots of land. The technical specifications of shadoofs operated by most farmers consist of a frame, pole, rod, counterweight, calabash, rope and wooden inlet (Fig. 1). By pulling the rod down, the operator lowers the calabash into the stream or well where it is filled with water. When the rod is released the counterweight lifts the calabash up

from the water source to the level of the operator where he pours the water into a wooden inlet from which it flows onto the field (Erhabor, 1982; Isrealen and Hansen, 1962).

Operation of Shadoof

A typical operation of the shadoof system involves two operators. One person lifts water with the shadoof to a height of about 2.4 m and the other person distributes the water in the field by opening and closing the channels between rows. Each farm is irrigated at least twice a week with each operation lasting about four hours. The amount of water lifted depends on the height, the size of calabash, and the number of men working. An earlier study conducted in the Zaria area of Nigeria reported that an average of 10 buckets or calabashes were lifted per minute (Erhabor, 1982). Since the average calabash size is two gallons, this means 20 gallons per minute or 1200 gallons per hour (4,542 liters/hour).

Type of Crops Irrigated

Most farmers using the shadoof irrigation system grow between two and eight crops on their farms while three crops is most common. The crops mainly grown are onions, peppers, garden eggs and tomatoes, with wheat, okra, spinach and tobacco in smaller quantities. The field sizes under shadoof range from 0,029 to 0,614 hectares with 0,158 hectares as the average field size. The output of these crops are generally sold directly from harvest to the public either in the immediate environment or - in most cases - purchased and transported to urban centres. The farmer thus earns a lot of money with this system and has enough to feed his family. The money they collect from these sales provides capital for other business, clothes for their family, pays school fees and provides medical care.

Lessons from the System

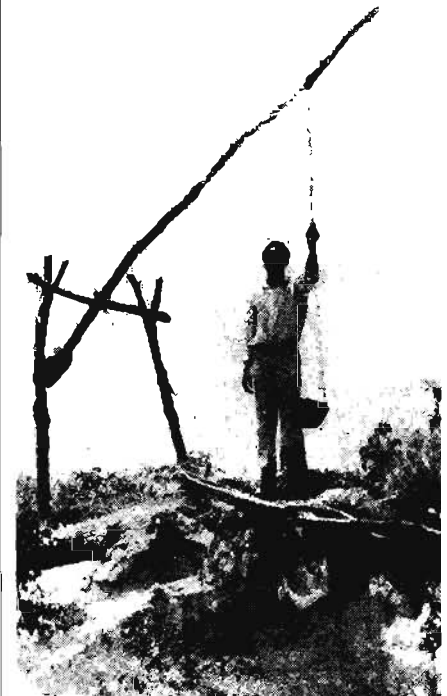
This system though laborious and consuming a bit of time in operating is of course in the traditional system of farming efficient enough for the small-scale food producer, considering the fact that it is all made out of local resources. It is cheap, easy to construct and maintain. It has also demonstrated the farmer's ability to evolve in time a system that is ecologically sound for his sustenance. However, some of the farmers who have saved some money over time are now changing this system for a motor driven pump. This pump was introduced in the late 1970's by agricultural instructors and friends of the farmers to increase their

operational efficiency and area of cultivation. However, the motor driven pump is not likely to stand the test of time due to frequent break-downs of the machines and high cost of maintenance. Therefore, it is important to improve the shadoof system of irrigation, its water lifting capacity and the possibility of increasing the area of production should be looked into, preferably still using local materials, which the farmers can easily construct and maintain by themselves.

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A traditional shadoof irrigation device in Nigeria (Photo: N.A. Gworgwor)