

Farmer-Managed Irrigation Systems: A Case Study from India

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INTRODUCTION

IN INDIA, AS in many other developing countries, farmers have built irrigation systems suitable to local needs and conditions, and have managed them successfully for generations. The designs, based on environmental considerations and technical solutions seem to be simple but have contributed effectively to the success of farmer-managed irrigation systems. In addition, the hydraulic designs and local dynamics associated with the socioeconomic conditions of the beneficiary groups have interacted for years to ensure the sustainability of the systems. Hence, a number of lessons can be learned from examining well-founded and time-tested farmer-built and -managed systems to incorporate measures for initiating new projects or rehabilitating old ones. With this objective in view, an attempt is made to present a case study of a farmer-managed irrigation system in an economically backward and frequently drought-prone district of Andhra Pradesh, India. The salient features of the system, the canal design, operation and maintenance procedures, irrigation organization, cropping pattern, and conflict-resolution methods are discussed.

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A PROFILE OF THE KUTALA MADUGU NALA IRRIGATION SYSTEM

The Kutala Madugu Nala (KMN) farmer-managed irrigation system is a centuries-old, spring-based system, located in the village of Nyamaddala in Anantapur District of Andhra Pradesh, India. The village is situated 5 kilometers (km) from the National Highway and has a total area of about 4,523 hectares (ha). According to the 1981 census there are 913 households with a total population of 4,479. Out of the total cultivated area of about 2,141 ha only 192 ha, or 9 percent, are irrigated.

The total number of beneficiaries is 23. Elders among the beneficiaries report that the system was originally built and managed by the farmers of a shepherd community and of a community of oil extractors. Over a period of time, ownership appears to have changed so that now the majority of the beneficiaries are weavers and traders. Only three members of the shepherd community are presently beneficiaries. About 80 percent of the present landowners are absentee landlords who rent their lands. The majority of the tenant cultivators are from the oil-extractor community.

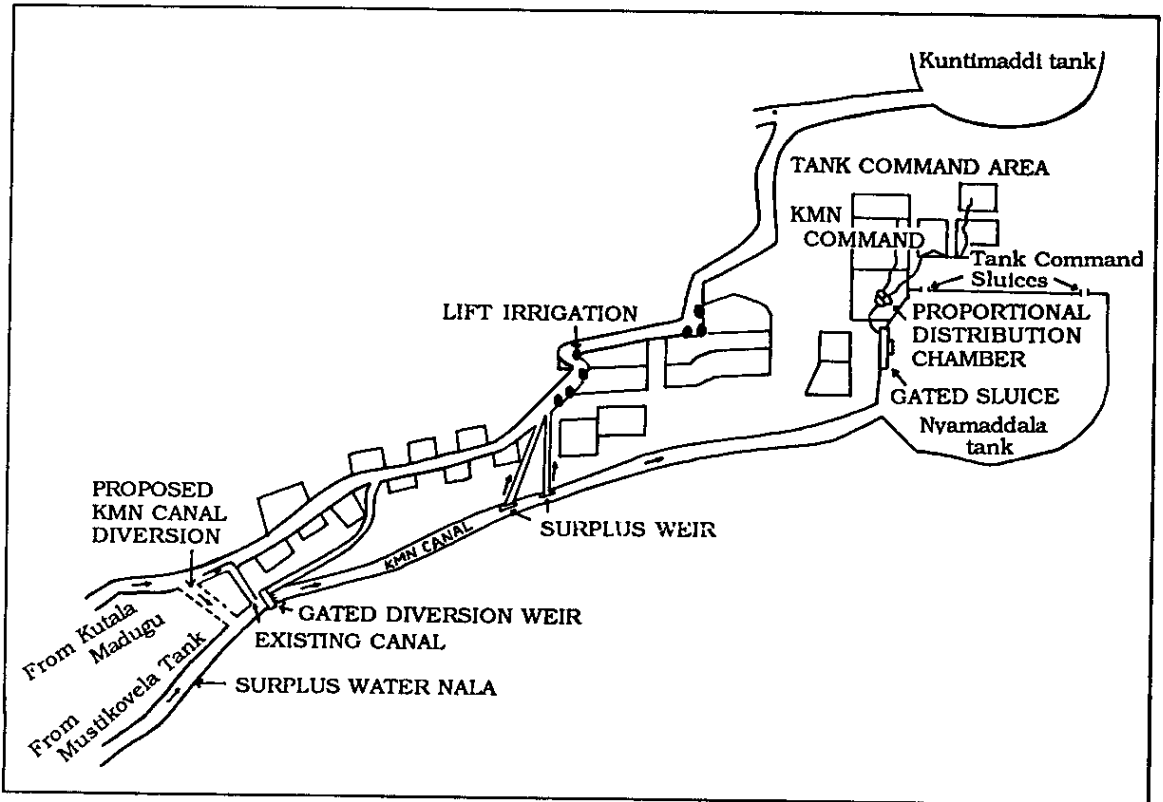
Physical Design of the Kutala Madugu Nala Irrigation System

The source of water for the Kutala Madugu Nala irrigation system is a natural spring from which a small stream called the Kuntimaddi Vanka originates. The stream cuts across the boundaries of three villages and a tank is built in the third village to harness the water. The Kutala Madugu Nala canal, which takes off from the stream is about eight kilometers in length from source to fields. The culturable command area¹ served by the canal is 13 ha, divided into 20 parcels of equal size, each 0.65ha (1.6 acres).

The design, execution, and operation of an irrigation system by the farmers tend to be simple and need-based, mostly free of complex hydraulic engineering technology. This is particularly true in the case of traditional and old systems like the Kutala Madugu Nala system. The system was designed for gravity flow. The alignment of the canal follows the natural ravine through which the stream runs for about five kilometers. By using the natural ravine, the cost of canal construction was greatly reduced. A separate canal which runs along the contour of the landform diverts water from the stream. It is connected to another stream across which a gated diversion weir is constructed (Figure 1). From the diversion weir the canal runs along the contour of the land through the embankment of the Nyamaddala tank and through a gated sluice in the tank to the command area. There are no control structures between the weir and sluice from where water is diverted to the system's command.

¹The net area irrigated by an irrigation system is the culturable command area.

Figure 1. Kutala Madugu Nala farmer-managed irrigation system (sketch).



The Kutala Madugu Nala sluice is a gated, masonry structure located at the surplus water weir of the tank. As the canal leaves the sluice it crosses the road and reaches the command boundary where it branches off into two field-irrigation channels. A proportionate dividing chamber made of wood is installed here. The water flow is directed through vents made in the wooden chamber to discharge water in proportion to the area irrigated by each field channel. There are no other irrigation structures on the farms. Maintenance of canal bunds and irrigation structures is the collective responsibility of all the beneficiaries.

An interesting feature of this irrigation system is that the spring-fed channel is linked with the village tank. Because the village is situated close to the tank bund and because of the topography of the area it is necessary for the canal to pass through the ponded area of the tank. When the tank is filled the canal becomes part of the tank. Thus, the Kutala Madugu Nala command area has two sources for irrigation water.

Although the canal is linked with the tank it maintains its water rights. The Kutala Madugu Nala command area has a separate gated sluice so that water can go either into the tank or water from the tank can be used for the command area. There are two other sluices in the tank which are controlled and operated by the government agency. These sluices are only opened when the water level in the tank reaches a certain level to insure a water supply to all farmers in the tank's

command area for a minimum time during a crop season. Individual farmers have no control over the operation of those sluices. However, the farmers of the Kutala Madugu Nala command area are not governed by the tank-irrigation rules. Their canal committee has the exclusive right to operate and maintain their sluice as they wish. This right was granted because the Kutala Madugu Nala command area does not necessarily depend upon irrigation from the tank but rather upon the water in the canal.

Although the Kutala Madugu Nala irrigation system's design is simple it is suitable for operational efficiency. The alignment of the canal along the natural ravine has facilitated a smooth flow of water as well as reduced construction costs. Because the canal runs in a ravine there is no possibility of the bunds being broken and water being stolen. The canal is vulnerable to breaches between the diversion point (brush dam) and the gated weir. In order to prevent canal breaching by the downstream farmers and cattle trampling, the farmers hope to realign the canal between the diversion point from the Kutala Madugu and the weir so that the canal will be tamper-proof from the source to the field.

Water Users' Organization

The Kutala Madugu Nala system has a well-knit organizational strategy to maintain and operate the system and its irrigators' association has legal recognition from the government. Rooted in caste factors related to the original formation of the system, the executive body of the organization has only two members. The headmen positions are held by the owners of certain specified parcels of land. For example, the parcel owned by the headman representing the original caste of oil extractors has been purchased by another farmer belonging to a different caste who has thus received the position as one of the headmen. At present the executive committee also includes a treasurer.

The farmers' organization is headed by the executive committee which resolves any dispute regarding operation and maintenance, and water use. The executive committee coordinates all operation and maintenance activities. General issues pertaining to canal repairs, cropping pattern, and sowing and harvesting dates are discussed in a meeting of the general body of irrigators which convenes when called by the executive committee. All beneficiaries are obligated to attend general meetings. If the head of a household is away someone else from his family must attend or a fine is levied against the absentee. All farmers who attend the meeting, irrespective of age or social status must wear a special head covering called a turban, or be fined.

Operation and Maintenance of the System

The Kutala Madugu Nala irrigation system has only six structures from the source to the field: one gated diversion weir, three road crossings where cross drainage is provided, a gated sluice, and a proportioning distribution box at the outlet. Except for the weir, all are of simple design. The weir was constructed by the government during the British colonial period after the original

farmer-built one was washed away. As there are only a few structures problems associated with main system management are less. Desilting and weed clearance are the major maintenance tasks performed by the farmers. As long as the tank is full the irrigators' association pays little attention to desilting and weed clearance. The problem becomes acute only after the monsoon, particularly when the tank becomes empty.

The association raises its own funds for system maintenance. All beneficiaries must contribute labor in proportion to their landholding size for desilting and canal repairs. Those who fail to contribute labor are fined. All cash expenditures for canal repairs are shared by the beneficiaries in proportion to landholding size. However, many landowners are not the actual cultivators. They lease their land on a share-cropping system. The tenant cultivators usually represent the landowners in all meetings and irrigation activities. If a tenant fails to comply with the rules and regulations of the association the owner is held responsible.

Operation of the system below the outlet point is the responsibility of the watermen. They are appointed by the association and are responsible for distributing water to all the parcels of land in the command area.

A peculiarity of the Kutala Madugu Nala irrigation system is that it has two sources of water supply by being linked to the village tank. The tank has three sluices of which one is exclusively for the irrigation system. Water release from the tank is regulated by the Public Works Department. Farmers from the same village using the same source of water are governed by two different sets of rules for water use, which sometimes leads to conflicts because the Kutala Madugu Nala command need not follow the government water-release schedule. The special rights of the system were once challenged by the other farmers in the tank-command area but the courts upheld the Kutala Madugu Nala system's special rights and allowed them to operate their sluice as they wished.

Cropping Pattern

The cropping pattern is decided by the irrigators' association at a meeting of all the beneficiaries. Water availability, crop rotation, and other issues are taken into consideration when deciding upon the cropping pattern. Once the crop pattern is decided all the farmers are required to follow it and are restricted to mono-crop cultivation. Sowing and harvesting dates are decided collectively by the farmers. These operations are staggered over a week to accommodate labor constraints.

Rice is the main crop. Crop intensity is usually 200 percent and may go up to 300 percent in some years. In contrast, the tank-command farmers are not assured of even one crop. The average yield of rough rice in the Kutala Madugu Nala command is about six tons per ha whereas in the adjacent tank command yield varies between 2 and 3 tons per ha. The assured, adequate, and timely supply of water for the Kutala Madugu Nala system makes sure of a higher yield. Because of the higher returns the demand to obtain land on lease in the command is quite high. However, there is a trend in recent years of reduced demand to lease land in the command area. Reasons for this are government land grants being given to the landless poor, and the cultivation of groundnuts under rain-fed conditions which has become more profitable than cultivation of irrigated crops.

If the water supply is insufficient, the area irrigated is reduced accordingly. Each farmer is allowed to cultivate only 50 percent of his usual area. In drought years the association may reduce the area under cultivation to save water for use by households and livestock. During years of water surplus water may be sold to the farmers in the tank command.

Conflict Resolution

The Kutala Madugu Nala executive committee resolves conflicts among the farmers. Water distribution below the outlet point is the exclusive concern of the waterman appointed for that purpose, and if some parcels are not irrigated properly, the waterman is held responsible. Farmers who are found guilty of stealing water are fined and if they do not comply with the rules they do not receive irrigation water and are also ostracized.

Social Contributions

The Kutala Madugu Nala irrigators' association performs a number of social services in the village. The first and most important of these is the provision of drinking water for livestock in times of drought. In addition, the association helps in arranging social, religious, and community functions in the village.

Physical Improvements for the Future

The Kutala Madugu Nala irrigation system maintains its uniqueness in the region. To date the basic management structure has not changed. However, the system needs minor changes in the design of the original canal, for which the farmers have sought help from the government. The alignment of the canal upstream of the existing weir needs to be changed. A small weir has to be constructed a few hundred meters upstream to connect the stream with the existing weir to prevent downstream farmers from breaking the canal bund and stealing water. Although the government did provide a grant to effect the change in alignment, the work was not accomplished by the contractor, and the irrigators are again organizing to seek government help.

The existing proportioning-distribution box made of wood needs to be replaced by a reinforced concrete or a stone structure.

CONCLUSION

Because it has two sources of water supply and special privileges for operating the sluice from the tank the Kutala Madugu Nala farmers are able to obtain higher cropping intensities and higher yields than the farmers in the adjacent tank-command area. The alignment of the canal along the contours of a ravine and a few and simple irrigation structures make operation and maintenance of the irrigation system relatively simple and free from intensive maintenance. Furthermore, a strong irrigators' association which has operated in essentially the same way for generations assures the beneficiaries of adequate and timely water supply and reduces conflicts.

References

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