Overview of Challenges and Opportunities of Spate Irrigation Development in Oromia Region

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Abstract

Spate irrigation in Oromia, Ethiopia is not new. The challenges and opportunities in spate irrigation development in the region are effective design of headwork, conveyance system and silt management. Living with all these challenges, Oromia Irrigation Development Authority has constructed systems that are irrigating tens of thousands of hectares benefiting tens of thousands of households. This chapter concludes that to make modern spate irrigation development sustainable and more beneficial, improvements to designs and engineering are required.

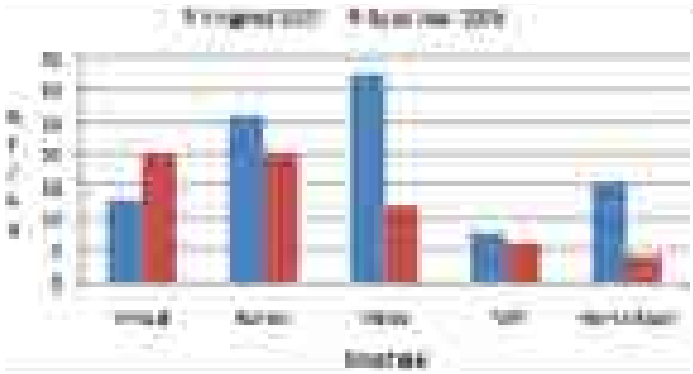
Key words: *Spate irrigation, supplementary irrigation, headwork, conveyance system, silt management*

Introduction

In general spate irrigation is not new for Ethiopia and specifically for Oromia. It is branded as 'Gelecha' in Afan Oromo. Different expert meetings in Ethiopia estimate the spate potential of the country to be 140,000 ha which area is believed to be underestimated. More than 40% of this resource is believed to be found in Oromia region, dominantly in lowlands of Oromia: Harer, Borena, Guji, Bale and other part of the region. It is agreed that spate irrigation has a significant yield increment when compared to a good year rain season and nonirrigated crops (Kebebew et al. 2008).

Farmers in lowlands of Oromia have experienced spate irrigation for subsistence farming, for pasture; recently, some private investors are asking for spate land for commercial farming. Having this in mind, the regional government intervened to modernize or increase the efficiency of traditional spate irrigation. The main challenges in spate irrigation are proper and sound headwork, conveyance and distribution system and silt which the beneficiaries can manage. Comparison of spate and rain-fed irrigation is shown in Figure 7.1.

Figure 7.1. Comparison of spate and rain-fed irrigation.



Spate irrigation is a risky business especially when it is modern: It is the major option where rain-fed and conventional irrigation systems fail to address crop production. High investment but unpredictable return for equitable water distribution and silt are major challenges at the headwork and main canal.

Material and Method

The region has vast experiences in spate irrigation - Boru Dodota, Hargeti, Billilo, Ija Gelme Wako and many projects irrigating up to 5,000 ha. These schemes have different types of headworks, conveyance systems and management.

Results and Discussion

Spate Classification in Oromia

Spate in Oromia is classified as lowland and midland or supplementary spate. In midland spate (Boru -1,200 m a.s.l, Hargeti, Billioo) flow originates from the highland area and can last in duration from hours to one or two months with different quantities, frequencies and timing. In such cases, conflict is minimal. Lowland spate (Ije Gelme Wako) is mostly short duration flood/flow. Both types are exercised in the region in a small scale, but in many places where there are no wadis, roadside flood diversion is common.

Agroecology of Oromia

Oromia is classified in three agroecological zones as seen in Figure 7.2; highland (>2,500 m a.s.l), tropical humid (1,500 -2,500 m a.s.l) and lowland (<1,500 m a.s.l). The rainfall pattern in the lowland area is erratic with uneven distribution, which makes rain-fed irrigation difficult as shown in Figure 7.3, which also shows representative rainfall distribution in the lowland of Oromia.

Figure 7.2. Agroecology of Oromia.

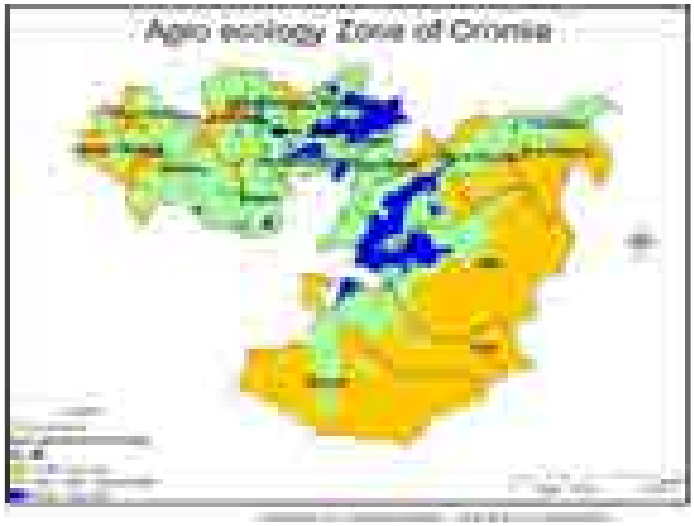
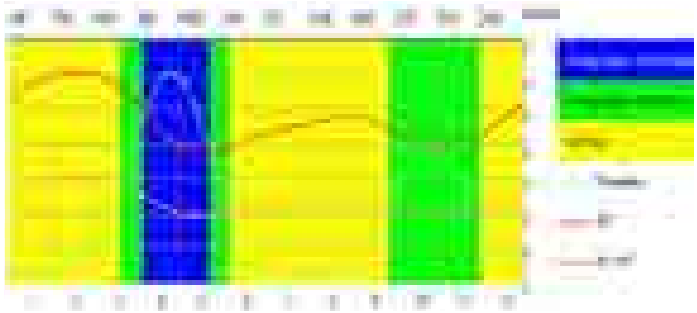


Figure 7.3. Representative rainfall distribution in the lowland of Oromia - Retrieved from FAO-Loclim.



Spate Headwork

The headwork of spate irrigation can be generally classified as modern and traditional, each with its own benefits and challenges. The traditional irrigation headwork is temporary or seasonal; its location can be changed according to the command area maximum head, but it is also easily eroded and requires frequent maintenance. The modern headwork is fixed in location, in maximum water intake ability, and in intake level. Even if the modern headwork reduces the beneficiary's routine construction of the headwork, it does not allow the option of changing the location, level and maximum intake of flood.

To optimize the above characteristics, the region has exercised different types of headwork: conventional, deflector, simple intakes and silt minimizing weirs. Despite all these experiences the region is not satisfied with existing headwork types; some are costly, some enable silt impact, some cannot effectively address spate floods and so on. Figure 7.4 shows different types of headworks exercised in the region.

Figure 7.4. Different types of headworks exercised in the region.

Conveyance system, other structures and drainage

The conveyance, hydraulic and drainage structures of spate irrigation pose the main challenge in the region, especially in modern irrigation. Critical decisions must be made on factors by which to design canals, with issues including canal capacity, command area size, varying levels of flooding (minimum, typical) and varying flood frequency, among others. Similar issues are also true for hydraulic structures. Drainage is also still a debate, requiring decisions on whether a drainage system is needed and, if so, at what level. Silt and water management, including organizational management of the scheme, are also a challenge. Given these challenges, the region has tried to design and construct different types of canals and structures, though it is still looking for better approaches and designs. Figure 7.5 shows the canal systems in the region.

Figure 7.5. Canal systems in the region.

Silt management

The common challenge in both modern and traditional spate irrigation is silt. Silt in spate irrigation can be said to be both a curse and a blessing. In the perspective of the agricultural development, silt is beneficial, whereas for the headwork, canals and structures, it is a problem. Silt has been observed in spate projects in Oromia: there is siltation in 30-45% canals and 20-40% of structures (Yohannes et al. 2009). To maximize the blessing and minimize the curse, the region exercised proper headwork and canal design to manage silt. A reliable design approach has not been achieved as yet.

Capacity Building

The region has also conducted different national and international capacity-building trainings and workshops in collaboration with different stakeholders and universities. These trainings have been given for more than 60 experts, mainly form the Oromia regional line department, based on other regions and foreign experts.

Discussions

The design approach has to be sorted out and researched. Modern spate irrigation could minimize routine construction, allow flexible flood intake, different intake-level regulation systems and conveyance systems, while adopting nonsilting, non-scouring velocity for big discharges in earth canals, at low cost and with hydraulically effective structures.

Conclusion

Despite the strong challenge, the region has constructed systems for 10,250 ha at nearly 93 million Ethiopian Birr, benefiting more than 20,000 households. Currently, three supplementary spate projects are under construction at 8.5 million Ethiopian Birr, which can irrigate 350 ha to benefit 700 households. An additional 17 projects are under study and designed by consultants. This will need more than 271 million Ethiopian Birr. Thsee projects can irrigate nearly 31,000 ha and can benefit more than 31,000 households. This is even with the challenges raised above.

References

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