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Policies for sustainable land management in the highlands of Ethiopia

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Small-scale irrigation in Tigray: Management and institutional considerations

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Introduction

Irrigated agriculture is at the heart of the agricultural development-led industrialisation and food security strategy of the Ethiopian Government. Increased availability of irrigation and less dependency on rain-fed agriculture is taken as a means to increase food production and self-sufficiency of the rapidly increasing population of the country.

In line with the development policy of the country, the Regional Government of Tigray is promoting irrigation development so as to increase and stabilise food production in the region. Since the establishment of the Commission for Sustainable Agriculture and Environmental Rehabilitation (Co-SAERT) by the regional government, many earthen micro-dams and river diversions have been built or rehabilitated. Other non-governmental organisations and communities are also undertaking water resource development activities with the same objective. Besides development of new schemes, some traditional systems are also being rehabilitated.

The major emphasis of the irrigation development initiatives in Tigray has been on technical issues. Issues such as beneficiaries selection, land tenure, water use rights and allocation, determination of minimum irrigable plot size, operation and maintenance, water fee, and establishment and strengthening of water users associations are important for sustainable and effective irrigation development. The implementation of irrigation projects will bring changes in land use pattern and intensity, land and labour productivity, household resource requirements and tenure issues which require management and institutional consideration. However, very little is known about how these socio-economic and institutional factors are affecting irrigation development in Tigray. This paper tries to assess the status of irrigated agriculture development in Tigray and to identify the major management and institutional issues which are worthy of further consideration.

Methods

The results are based on data collected in two separate surveys: a survey on land tenure issues in small-scale irrigation development in Tigray conducted in 1999–2000; and a community-level survey on land management conducted in 1998–99. The former survey

covered seven selected irrigation sites, including both traditional and newly constructed irrigation schemes. The community survey also covered experiences relating to irrigated farming in 50 *tabias* or communities in Tigray. Descriptive information generated from the survey was used to characterise the irrigation systems, and the role of local communities and external organisations in irrigation management in Tigray.

The setting

Tigray is the northern most region of Ethiopia and it covers an approximate area of 80 thousand km². It has a population of more than 3.3 million and an annual population growth rate of 3%. The region is one of the most drought prone and food insecure regions of Ethiopia. The climate of Tigray is mainly semi-arid and for most of the region the major rainy season (locally called *kiremti*) lasts for 3 to 4 months, between June and mid-September. The mean annual rainfall ranges from 980 mm on the central plateaux to 450 mm on the north-eastern escarpments of the region. The annual rainfall shows a high degree of variation with a coefficient of variation ranging from 20% in western to 49% in eastern parts of Tigray. Temperature ranges depend on altitude and vary from temperate type in the higher areas to tropical in the lower areas. The average temperature in the region varies from 16°C in the south west to 25°C in the extreme eastern areas.

The economy of Tigray is entirely dominated by peasant agriculture involving traditional methods of crop production and livestock rearing. Agriculture accounts for 64.5% of the regional gross domestic product. However, the annual growth rate of production is only 1.2%, which is below the national average, while population is growing at 3% per annum.

The water resource of Tigray is not well studied. Available studies indicate that only about five perennial streams have flow rates of more than 10 litres/second. The loss of water through the three major drainage systems of the region during the annual rainy season is immense. In total through the Tekeze, Mereb and Dennakil basins 9 billion cubic metres of water goes from Tigray to neighbouring countries every year; this is almost equivalent to the 9.21 billion cubic metres of the total estimated rainfall in the region. If 50% of the 9 billion cubic metres of runoff was used, 500 thousand hectares (ha) of land, which could feed three-times the present population of Tigray, could be irrigated. Thus, water harvesting and management practices are of paramount importance so that excess water can be stored and used later for irrigation and other purposes. In Tigray, the estimated irrigation potential is 324,286 ha; currently, only 15,495 ha are irrigated, mainly through traditional practices. Large-scale water resource development has not yet started.

Irrigation systems

Although there is inadequate documented evidence regarding the history of irrigation practices in Tigray, some evidence dating back to 500 BC indicates that irrigation was

practised in the ancient village of Yeha in Adwa and some other places. Descriptive data from the 50 communities surveyed indicate that 49 of the communities have access to two or three minor irrigation sources. Data also indicate that 90% of the micro-dams and 62% of the introduced river diversions were constructed after 1991.

In Tigray, surface irrigation is the predominant form of irrigation; it includes spring development, river diversion, flood spreading, micro-dams and pond systems. The canal systems are mainly unlined and the density of tertiary canals on farmers' fields is often not high enough to ensure efficient water management. There are also limited ground water systems.

Study results indicate that within the communities surveyed, a total area of 1895 ha is irrigated using spring systems. Moreover, irrigated agriculture in the region constitutes about 4500 ha by river diversion systems, 5000 ha by flood diversion and spreading systems, and 2018 ha by micro-dam systems. The significance of the pump and pond system is, however, not well known.

Results of the descriptive analysis indicate that there are a few cases in which farmers encounter minor problems of farmland loss, conflict over access to irrigation or increased incidences of diseases and pests. In the majority of irrigation systems these problems are almost non-existent. However, some of these problems evolve over time and their absence currently does not mean that they will not occur in the future. Thus, to protect and control these problems regular follow-up and proper management is necessary.

Socio-economic, institutional and management issues

The following issues were identified as being worthy of further consideration to ensure the effectiveness of irrigation development in Tigray:

- Economics of small-scale irrigation in Tigray are not well understood. Economic evaluation of optimal plot size, cropping patterns, technologies, agronomic practices and resources utilised in the irrigation schemes is necessary.
- Small-scale irrigation systems are often scattered widely and thus the provision of inputs, services and technical advice may be difficult given the poor infrastructure. Involvement and co-operative effort of beneficiaries are required.
- Local communities are playing major roles in irrigation development in Tigray. The current approach, which focuses on empowerment of local communities, should continue and be institutionalised.
- Lack of technological support is the major problem in development of irrigation in Tigray. Participatory research and on-farm testing of low-cost technologies should be an immediate priority of the rural technology centres, and research and extension institutions.
- Local marketing and trade should be promoted by improving infrastructure and by institutional changes. Lack of viable product markets and marketing institutions are major problems. Government and other institutions should focus on overcoming marketing problems.

- Rural credit systems should encourage adoption of available low-cost technologies.
- Promotion of complementary enterprises should be given due attention, so as to optimise the efficiency of irrigation systems.
- The relationship between water rights and rights to land is not clear in Tigray. It requires clarification so that expensive irrigation water can be utilised properly.
- In water resource development, harmonisation of the different demands for water, establishment of irrigation priority rights between upstream and downstream users, and consideration of the rights of existing users of water from floods, which may be modified by dams, is essential. However, this issue has not been addressed in Tigray. Currently, local communities resolve the matter through their community norms; however, it requires a formal institutional approach based on local experience.
- A comprehensive irrigation policy which clarifies the water rights, water fee and cost recovery systems, irrigation technology, intervention affecting traditional irrigation practices, and the role of local communities and individuals should be finalised and implemented.

Conclusions and implications

Rapid growth of small-scale irrigation constitutes a major achievement for the agricultural development and food security strategies in the region. However, this achievement should be assessed in an integrated manner. The planning process for irrigated agriculture should assess the socio-economic, institutional and management issues as well as the technical issues.