Policies for sustainable land management in the highlands of Ethiopia

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Executive summary

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Overview of papers

The papers presented at the seminar provided a great deal of information about: the interrelated problems of land degradation, low agricultural productivity and poverty in the Ethiopian highlands (emphasising the administrative regions of Tigray, Amhara and Oromiya); the proximate and underlying causes of those problems; the responses of individuals, communities and governments to the problems; the impacts of some of those responses; and the constraints and opportunities affecting the potential for more productive, sustainable and poverty-reducing development pathways in the Ethiopian highlands in the future.

The major land degradation problems in all regions include soil erosion and soil nutrient and organic matter depletion (Fitsum Hagos et al. 1999; Lakew Desta et al. in this working paper; Bezuayehu Tefera et al. in this working paper). The proximate causes of these problems include soil characteristics (such as its inherent erodibility and infertility), intense and erosive rainfall periods, the steep and dissected terrain in the highlands, deforestation, overgrazing, cultivation on steep slopes, frequent ploughing, limited adoption of soil and water conservation measures (especially outside of Tigray), declining use of fallow, burning of dung and crop residues, feeding of crop residues, soil burning and limited application of organic or inorganic fertilisers. Many factors are hypothesised as underlying causes of these problems, including population pressure, poverty, limited market development, limited market access, land tenure insecurity and land fragmentation, lack of credit, short-term perspective of farmers, unavailability of appropriate and profitable technologies or inputs, farmers’ lack of awareness of such technologies, farmers’ attitudes, high costs of inputs, external costs or benefits of land management that individual farmers fail to take into account and difficulties in achieving effective collective action to manage resources, among others. Many policy arenas can affect these factors in complex ways, including family planning policies, market liberalisation, land policies, infrastructure investment (especially in roads and irrigation systems), agricultural research and extension policies, resource conservation programmes and policies, input and credit supply policies, education policies, and policies to promote decentralisation and development of local organisations.

The challenge for policy makers is to identify and implement appropriate combinations and sequences of policies and programmes to effectively address the problems and achieve the development potential of the Ethiopian highlands in a sustainable manner. It is unlikely that a ‘one size fits all’ set of policies will work in all circumstances. Although policies cannot be tailored to suit every possible situation, it may be useful to consider what ‘development pathways’ have comparative advantage in different types of
situations. The major factors determining comparative advantage of different development pathways likely include agricultural potential, market access and population density. For example, intensification of cereals production using high levels of external inputs and expansion of perishable cash crops are two development pathways that likely have strong potential in areas with high agricultural potential (or irrigation) and high market access; whereas in lower potential areas further from markets and with low population density an appropriate development pathway may be to increase the productivity of the mixed crop–livestock system by improved management of grazing lands and woodlots and integrated soil nutrient management on cultivated land. These development pathways may be interdependent (e.g. intensified and more productive cereal crop production may enable farmers to devote more land and resources to perishable cash crops). The policy requisites for different development pathways may differ (e.g. input supply and credit will be critical for high external input oriented pathways, while improved institutions for managing communal grazing lands and woodlots may be critical to increasing productivity of mixed crop–livestock systems in more remote areas).

The policies of the national and regional governments in Ethiopia have emphasised conservation based agriculture led industrialisation, through liberalisation of markets; decentralisation of planning and resource management; widespread investments in improved infrastructure, education, health facilities and other public services; an emphasis on community resource conservation and management through establishment of community woodlots and enclosed areas; promotion of private adoption of resource conservation measures; promotion of use of improved agricultural inputs, such as improved seeds and fertiliser and availability of short-term agricultural credit; and promotion of development of farmer organisations and other local organisations. Evidence on the impacts of these policies and other factors on land management and implications for agricultural productivity, natural resource conditions and poverty is still scarce, though some useful evidence was provided by the papers presented in the seminar, particularly for Tigray (where the research project is most advanced).

Based on analysis of the Tigray community survey, Pender et al. (in this working paper) found that there has been broad improvement in access to infrastructure and public services (e.g. roads, irrigation, schools, health facilities, extension services and credit) in the Tigray region since 1991, though many communities are still lacking in access. There has been widespread adoption of resource conservation measures by communities and households, as well as adoption of modern agricultural inputs (especially fertiliser, vaccines and improved seeds). These investments have contributed to perceived improvements in many measures of human welfare and natural resource conditions. However, commensurate improvements in yields were not observed in the community survey. This could be due to problems in obtaining reliable yield data in the community survey or poor yields in the particular year (1998) for which recent yield data were collected; however, it could also be an indication that uncertain rainfall and/or land degradation are limiting crop yield improvement, despite investments and adoption of new technologies. Consistent with the latter interpretation, the authors also found
that food availability was declining in many communities. Declining availability of grazing land and fuelwood are also important resource concerns in Tigray.

There are significant differences in land management practices and their implications across communities in Tigray and these were found to relate to differences in livelihood strategies, agricultural potential, access to infrastructure, technical assistance, population pressure, education and other factors. Cereal crop production is the dominant livelihood strategy in all communities surveyed in Tigray, but communities where non-farm employment was the secondary activity of men performed better than other communities in terms of several indicators of productivity, resource and welfare improvement. Perishable annual crop production was also associated with improvement in some resource conditions, compared with areas where livestock production was the secondary activity. These livelihood strategies thus offer potential as pathways of more sustainable development. Both of these strategies are strongly associated with the presence of irrigation and with proximity to Mekelle, the largest market in Tigray. Thus irrigation investment and market development may help to stimulate sustainable development pathways in the region.

Although irrigation development was found to contribute to some livelihood strategies, it did not lead to as much adoption of improved technologies, increases in yields or welfare indicators as might be expected (controlling for livelihood strategies). Many farmers continue to use traditional technologies even when irrigation is available, limiting the productivity impact of irrigation (Girmay Tesfaye et al. in this working paper). Some indicators of human welfare, including food availability and child mortality, were more likely to worsen where modern irrigation development was occurring, suggesting that irrigation may be promoting changes in crop production that are reducing food security. These results are not conclusive but suggest that more research on the impacts of irrigation investments in Tigray and possibly policy interventions, to increase the returns and ameliorate the negative impacts, are needed. Research and policies on the institutional requirements of irrigation projects (e.g. clarifying water rights and responsibilities for cost sharing and maintenance) are also needed (Girmay Tesfaye et al. in this working paper).

Road development has also contributed to changes in farming systems, shifting production away from cattle and towards cash crops (Pender et al. in this working paper). It is associated with reduced burning of dung fuel, increased yields and food availability, and improvement in the quality of grazing land and water. By contrast, proximity to towns had more negative impacts on several indicators of resource management and resource conditions, suggesting that priority should be given to addressing resource degradation problems in areas close to towns, where there are greater demands on resources. Proximity to town is also associated with less effective collective action in managing community woodlots (Berhanu Gebremedhin et al. paper on woodlots, in this working paper) but with mixed effects on collective action to manage grazing lands (Berhanu Gebremedhin et al. paper on grazing lands, in this working paper).

The extension and credit programme of the Tigray Bureau of Agriculture and Natural Resources appears to have effectively promoted adoption of more productive and soil conserving land management practices, contributing to higher crop yields, in-
creased food availability and household wealth. However, the programme is associated with degradation of grazing lands, probably because it has contributed to increased oxen ownership. Thus options to improve management of grazing lands should be considered as a priority by the bureau.

Population pressure has been associated with adoption of several measures of labour and capital intensification of agriculture in Tigray (Pender et al. in this working paper). However, it is not associated with increased crop yields (as one would expect), suggesting that cropland degradation has resulted from population pressure. Perceived decreases in the quality of grazing land are also associated with population pressure (Pender et al. in this working paper). This is consistent with the finding of Berhanu Gebremedhin et al. (grazing land paper, in this working paper) that violations of use restrictions on grazing land were more common at high (greater than 200 persons/km²) than at intermediate (between 100 and 200 persons/km²) population densities. Collective action in managing community woodlots was also found to be more effective at intermediate than high population densities (Berhanu Gebremedhin et al. woodlot paper, in this working paper).

Collective action to manage woodlots was found to be less effective for woodlots that were promoted by an external organisation (usually the Bureau of Agriculture), suggesting the potential for undermining collective action by external intervention and the need for greater local participation in decisions about community woodlots (Berhanu Gebremedhin et al. woodlot paper, in this working paper). Communities in Tigray generally believe that they are not yet allowed to harvest trees from their woodlots and this may undermine incentives of people to contribute to collective action to manage these woodlots, especially if the woodlot is viewed as having been promoted by an outside organisation. There appears to be a lack of clarity about the policies in Tigray regarding if and when communities are allowed to harvest trees from woodlots and how the benefits should be distributed (this point was acknowledged in the discussion by officials from Tigray, who indicated that the policies are being developed). Clarification of these policies by the Bureau of Agriculture and Natural Resources may increase the benefits received by communities from these resources and the incentive of communities to manage them effectively. It may be most effective to devolve these decisions to the tabia or village level (Jagger and Pender in this working paper).

Another current policy issue related to tree management in Tigray is whether to allow or promote private tree planting (or other conserving uses) on degraded lands. A policy on this issue has been enacted in the Amhara region (Lakew Desta et al. in this working paper) but this is still being studied in Tigray (though it is being pursued on a pilot-scale basis in Tigray). Evidence from the Tigray community survey, which shows high survival rates of trees on such private woodlots where this has been tried, suggests potentially very large economic returns from expansion of this approach (Jagger and Pender in this working paper). However, there are ecological concerns about increased private tree planting—particularly given the preference of households for eucalyptus—due to potential negative effects of eucalyptus on nearby crop production (via competition for water, nutrients, sunlight and allelopathic effects of eucalyptus leaves). Available evidence suggests that such negative impacts can be minimised by careful placement of private or
community woodlots and that there are numerous potential ecological benefits of tree planting as well (e.g. uptake of water run-off, reduced mass wasting of slopes, reduced wind erosion, reduced burning of dung and crop residues due to increased fuelwood availability). Given the potentially large benefits and limited alternative development opportunities in Tigray, serious consideration should be given to allowing/promoting expanded private tree planting on degraded lands.

Evidence on the impacts of policies and other factors on land management in the other regions (Amhara and Oromiya) are more limited at present, since the surveys have not been completed there yet. In much of Amhara (especially the lower rainfall areas in the north and east of the region), many conditions are similar to those in much of Tigray (e.g. low and uncertain rainfall, high population pressure, thin and degraded soils etc.) and most of the policies being pursued are similar to those in Tigray (Fitsum Hagos et al. 1999; Lakew Desta et al. in this working paper). Thus we expect similar responses and implications from these areas, though this hypothesis cannot be tested until the data from the Amhara survey are analysed.

Data from one village in the lower potential part of south-eastern Amhara (Andit Tid, which represents a situation of high market access, high population density and low agricultural potential) indicate that a downward spiral of declining farm size, land degradation, reduced crop yields, and increasing poverty is occurring (Holden and Bekele Shiferaw in this working paper). This spiral is being driven by population growth, and is occurring despite the fact that this village has good access to roads and markets and that there has been a long-term effort to promote sustainable land management practices in this village through the Soil Conservation Research Project (SCRP). Thus reliance on market forces alone or heavy emphasis on soil conservation technologies appears insufficient to achieve sustainable land management in such a highly degraded area. Part of the problem is that the soil conservation technologies that have been promoted reduce farmers’ crop output and incomes for several years (since they reduce cropped area), making them unattractive, especially to poorer farmers who have access to very little land and may have a short-term perspective. The top-down approach to promoting soil conservation technologies in this village likely contributed to this problem, though it is not clear whether a participatory approach could have been more successful if more suitable technologies are not available. Other factors that also appear to contribute to the poor performance of agriculture in this village include imperfections in the markets for land and oxen, and land tenure insecurity caused by the expectation of land redistribution. Policies that attack the multiple constraints to more profitable and sustainable land management are needed, and may include approaches that interlink different constraints and policies. For example, increased tenure security could be linked to farmers’ soil and water conservation efforts on the land, giving them greater incentive to undertake and maintain such investments.

In much of western Amhara and Oromiya, agricultural potential is much higher and land is not as degraded as it is in Tigray and eastern Amhara (Lakew Desta et al. in this working paper; Bezauyehu Tefera et al. in this working paper). Detailed data collection and bio-economic modelling work completed in the Ginchi microwatershed in Oromiya (a community with high market access, high population density and relatively high agri-
cultural potential, though with problems associated with Vertisols in the valley and shallow soils on the steep slopes) indicate that substantial land degradation is occurring in this village (Okumu et al. in this working paper). Continuation of limited technological intervention in the village is predicted to result in continuing problems of soil erosion and nutrient mining, although incomes may increase modestly. Model simulations show that adoption of a package of available technologies (shifts to higher yielding varieties, increased adoption of manure and fertiliser, tree planting on steep slopes and community investments in drainage in the valley) can lead to large increases in incomes, increased food consumption and reduced soil erosion and nutrient depletion. The policies needed to achieve this potential include increased availability of credit, improved extension services (emphasising a more site-specific approach to land management recommendations) and land tenure security. Collective action to construct and maintain a communal drainage system would also be important. Preliminary results from a bio-economic model of farms in the Holetta area of Oromiya also indicate the importance of access to credit for increasing adoption of improved inputs and incomes (Ahmed and Ehui in this working paper).

Overall, the evidence provided by the papers provides cause for hope as well as concern. There has been improvement in many measures of land management, natural resource conditions and human welfare in Tigray, despite the harsh environmental circumstances and high population pressure there. Small-scale irrigation systems are being established, adoption of improved inputs and conservation practices is occurring, woodlots and enclosed areas are regenerating, and indicators of wealth, health, education and other aspects of welfare are improving. Nevertheless, improvements in crop productivity have not been as large as one would hope and the availability and quality of grazing lands and fuelwood remain serious concerns. In lower potential areas as in much of Tigray and eastern Amhara, emphasis is needed on increasing the overall production of useful biomass (for food, feed, fuel and soil fertility) and on the policies that will help to achieve this (e.g. allowing private tree planting on degraded lands, improved institutions for grazing land management, inter-linking tenure security with conservation investments on private land etc.). In higher potential areas as in western Amhara and much of Oromiya, there is greater potential for improved technologies relying on high levels of external inputs, especially in areas closer to roads. In these areas, policies relating to road development, supply of inputs and credit are likely to be very important in achieving the potential for more rapid and sustainable development.

Overview of discussions

The discussions of the papers and issues among seminar participants provided many important insights and identified several areas where further refinement of the research questions and methods is needed. We will not attempt to provide an exhaustive list of these comments, insights and suggestions here but will summarise some of the key points raised.
‘Sustainability’ is a multidimensional and dynamic concept, encompassing considerations of interrelated economic, social and environmental factors. In order to be sustainable, development must be socially and environmentally sustainable, as well as economically sustainable. Although economic, social and environmental factors are all incorporated into the conceptual framework of the project, their relationship to sustainability needs to be clarified.

The concepts of ‘agricultural potential’, ‘market access’ and ‘population pressure’ are also multidimensional and dynamic. Agricultural potential reflects differences in climate, soils, topography, access to water and other factors, and may vary over time in response to land degradation or improvement. Market access is more than access to roads or towns; it also depends on availability of transport services, purchasing power of consumers, access to international markets etc. Population pressure also means more than simple population density; it relates also to population growth, the density of people relative to arable land etc. These concepts also interact with one another; for example, the effect of increased market access may be different in high vs. low population density settings. These points are well taken and some of them are discussed in some of the papers presented, though they were not emphasised in the presentations. It is difficult to account for every dimension of such complex concepts in empirical analysis, though effort will be made to reflect these considerations to the extent possible.

Other development pathways should be considered in addition to those discussed in the papers. For example, there is little mention of forestry. Opportunities for income diversification and increasing the value added in Ethiopian agriculture should be considered. Some of these opportunities are discussed in the papers in considering non-farm activities and high-value products but were not emphasised in the presentations. One participant argued that the types and evolution of farming systems should be taken as an organising principle for the research, to help simplify and clarify the policy implications. This is in fact what is intended by the concept of development pathways, which includes the evolution of farming systems as well as non-farm livelihood strategies. Another participant argued that the framework for considering development pathways, based on population density, market access and agricultural potential is too static, whereas the pathways should be dynamic. The project leaders clarified that these underlying factors are dynamic, though in many cases they change only slowly over time. The static presentation of these factors is to simplify the presentation but dynamic aspects can be (and have been) taken into account in the empirical design and analysis. These issues should be presented more clearly in the future.

Many policy issues were raised and considered in the discussions. Land policies were of considerable interest. Differences in the land policies across regions of Ethiopia were noted, and the need for learning from the different experiences of the different regions was apparent. For example, Tigray has formally ended land redistributions, Amhara implemented a redistribution in 1997 and Oromiya is still considering whether to have one. The implications of these different approaches for farmers’ investments in soil and water conservation, tree planting etc. would be valuable to investigate. There are also differences among regions in policies towards land leasing, allocation of degraded lands, private tree planting and other issues that are worth exploring.
The problems of managing small-scale irrigation systems and the impacts of these systems were also of great interest. It was recognised that a lot of emphasis is being placed on investments in irrigation while the impacts have not been fully studied. Many participants were surprised by the limited impact of irrigation on adoption of inputs and yields found, and some did not believe these results. More information is needed to verify these results (some will be forthcoming from the household- and plot-level surveys but a more targeted survey of irrigated areas would also be very useful). The impacts of irrigation systems on downstream users and on health also need to be studied. One study of the impacts of micro-dams on malaria in Tigray was discussed; that study found a strong association between distance to a dam and malaria at lower elevations, and that farmers were willing to pay significant amounts for health and preventative measures to address malaria problems.

Policies relating to management of community woodlots and grazing areas were also discussed. To some participants, it is remarkable that communities are not allowed to cut trees from woodlots in Tigray. Policy makers from Tigray indicated that communities are supposed to have discretion in how to use woodlots but also stated that policies are being developed to clarify to communities their roles and responsibilities. Several participants mentioned problems due to the free grazing system and the need to consider alternatives was suggested. It was commented that more information is needed on the effectiveness of woodlot and grazing land management (i.e. to measure to what extent management of these resources is ‘optimal’).

The issue of eucalyptus planting was controversial. Many participants agreed that the economic returns to eucalyptus are high but argued that ecological risks are also high and that these trade-offs need to be clearly elucidated. The absence of information on long-term effects of eucalyptus planting and broader hydrological effects is problematic. The authors clarified that studies on these issues are limited and that those that are available indicate potential ecological benefits as well as risks. The impacts of large-scale planting of eucalyptus on pole prices and profitability was raised as a concern; the authors clarified that conservative (low) estimates of pole prices were used to evaluate large expansion of planting and that information on the price response to increased supply is not yet available. One participant clarified that the policy in Tigray of not allowing eucalyptus planting in farmlands was not enacted for environmental reasons but because of food security considerations. The authors agreed that tree planting on farmlands could reduce food security in the near term but pointed out that tree planting could be beneficial for food security in the long term, by giving farmers an alternative source of income in a drought year. Further research on these issues is needed (and is planned as part of a targeted survey of community and private woodlots).

The role of credit in promoting improved land management was discussed. It was argued that wealthier farmers might not demand credit because they do not need it, while poor farmers may avoid using credit for fear of losing their assets. The issue of how to obtain repayment when farmers suffer from a drought or other adverse event was raised: does it make sense to provide more credit to such farmers so that they may be able to repay? The effects of credit policy on land use, crop choice, conservation
investments, land management practices, resource conditions and poverty should be investigated.

Some participants stressed the importance of social organisation and social capital. Local land tenure institutions, organisations, religion, labour mobilisation campaigns and other factors may have a large impact on land management and its implications. The project leaders indicated that information on such factors has been/is being collected but has not yet been fully analysed. It will be easier to assess the impacts of some of these factors (such as religion and organisations) when data are available for all regions, since there is more heterogeneity in those factors across regions than in the Tigray region. These issues will be studied further as more information becomes available.

References


(All other references are papers included in this document.)