

Chapter 5

Rural farm/non-farm income linkages in northern Ethiopia

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INTRODUCTION

Rural development policies often neglect the role of rural non-farm activities and their link with agriculture. This might be because the role of the rural non-farm sector is the least understood component of the rural economy; its role in the broader development process is not well known (Lanjouw and Lanjouw, 1997). This knowledge gap has been reflected in the policies of developing countries such as Ethiopia where there is no development policy that identifies and includes the rural non-farm sector. Agricultural ministries have instead focused on farming, and industry ministries have focused on manufacturing. There is a social cost to the failure to recognize the importance of the rural non-farm sector in decreasing rural-urban migration and its potential role in absorbing the growing rural labour force, thus contributing to the national economy and promoting a more equitable distribution of that income.

Despite the recent increase in the literature on farm/non-farm linkages, there has been no significant systematic study conducted on marginal areas in Ethiopia, particularly Tigray. Most studies concentrate on dynamic agriculture, where cash crops are widely grown. The main purpose of this chapter is to inform government agencies, NGOs and donors about the development and constraints of the rural non-farm sector, its link to the farm sector and its importance for rural development policy. This chapter addresses the following questions.

1. What are the patterns and determinants of rural households' non-farm income and participation in non-farm activities?
2. What types of linkages exist between farm and non-farm activities? What is the relative importance of the linkages? Are farm and non-farm income substitutes or complements? What is the influence of non-farm income on income inequality in rural communities?
3. What are the major policy, social, cultural and economic problems for the development of non-farm microenterprises and small enterprises? What kind

of policies, institutional support and technological developments are necessary to alleviate constraints to non-farm employment?

The rest of this chapter is organized as follows: the second section describes the data collected for this analysis and the method. The third section provides an overview of the study region, including the roles of the government and NGOs, the development and constraints of microenterprises in the region and the functioning of the labour market. The fourth section provides empirical evidence on the nature and relative strength of production and consumption linkages in the region, non-farm work participation and its impact, and household-level farm/non-farm income linkages; the roles of farm and non-farm activities in income inequality among rural households is explored. Policy and programme implications of this research are discussed in the fifth section.

DATA USE AND APPROACH

In order to analyse farm/non-farm linkages in Tigray, a survey of rural households was conducted and there were interviews with labour-market participants and major employers. Secondary data from national and regional statistics offices was also used.

The survey data were collected in two districts, or *woredas*: Enderta and Adigudom in the southern zone of Tigray. The survey consisted of 201 heads of rural households chosen randomly from a stratified sample area. The data include detailed information on the allocation of labour to home, farm and off-farm, income sources, purchase of farm inputs including hired labour, sale of farm outputs, consumption expenditures, credit and household composition. The data was collected for the years 1996 and 1997 for a total of 402 observations.

Data characterizing the surveyed households are given in Table 1. Family size ranges from 1 to 11 people. On average, family size is 5.6 members, which is slightly above the regional average of 4.8 and the national average of 5.2. The average dependency ratio is 58 percent. Most adults are illiterate; only 35 percent of household heads can read and write.

TABLE 1
Description of the household-level data set (n=402)

Variables	Mean
Family size	5.58
Number of dependents	3.26
Land cultivated (<i>tsimidi</i>)	7.06
Number of plots cultivated	3.65
Land owned (<i>tsimidi</i>)	5.88
Number of plots owned	3.06
Age of the household head	48.00

Note: A *tsimidi* is a local area-measurement unit; 1 ha = 4 *tsimidis*.

Source: Author's calculations from household survey.

Rural households participate in a variety of farm, off-farm and self-employment activities. Farming activities include crop production, accounting for 20 percent of rural households, livestock husbandry, accounting for 6 percent, and mixed farming of crops and livestock, accounting for 69 percent. Traditional farming technology – simple hand tools, ox-driven implements and labour – is the dominant farm input and comes mainly from the family. Only 5.7 percent of rural household use irrigation. Off-farm activities involve wage employment and self-employment. Wage employment includes paid community development work, often called food for work, farm work and manual work in construction, masonry and carpentry. Self-employment includes small trading, transporting goods by pack animal, selling fuelwood, making charcoal, selling fruit, making pottery and handicrafts and stone mining.

BACKGROUND ON THE TIGRAY REGION

Description of the study area

The study area is the Tigray region of northern Ethiopia, which is part of the African dryland zone often called the Sudano-Sahelian region (REST/NORAGRIC, 1995). The region has an area of 80 000 km² and a population of 3.1 million people in 598 004 households; 85 percent of the population reside in purely rural areas; the remaining 15 percent live either in the regional capital, district centres or rural centres.

Tigray ranges from flat lowland to rugged mountainous plateaux where altitudes range from 500 m in the eastern part, Erob, to 3 900 m in the southern zone near Kisd Kudo. Natural resources are under extreme stress because of the increasing population (REST/NORAGRIC, 1995). Many of the steep slopes have lost their protective cover and are seriously overused by cultivation and livestock grazing. Soil runoff from slopes has caused severe erosion (BPED, 1998). The natural forest of the region has been destroyed, mainly by encroachment of subsistence cultivation; only localized patches of woodland around churches and in remote places remain uncut. The crop production and animal-husbandry potential of the region has declined as a result of degradation of natural resources.

The region does not have well developed infrastructure (BPED, 1998); most areas of Tigray are difficult to reach by mechanized transport. Until 1997, towns in the region did not have a 24-hour supply of electricity; telephone lines and postal services are inadequate and of low quality. Rural radio call telephone

systems are found in remote towns in the southern, eastern, western and central zones. There are only seven postal branches in the region.

Table 2 presents data on the level and growth of regional GDP disaggregated by economic activity. At 2 817.66 million *Birr*, the GDP of Tigray constituted 22 percent of the national GDP in 1994/95. Agriculture is the dominant sector at national and regional level. Based on 1995–1996 estimates, agriculture, forestry and fishing account for 64 percent of the regional GDP and 90 percent of employment; industry accounts for 23 percent of regional GDP, services account for 4 percent and other services account for 9 percent. In 1995/96, the overall regional GDP grew by 7.3 percent in real terms. The service sector is the sector with the highest growth in the region at 16.2 percent, followed by the industrial sector at 6.9 percent. The growth of the industrial sector is largely driven by the 124 percent growth in large and medium-scale industry.

Agriculture in Tigray consists of crop husbandry, livestock husbandry and mixed farming, which is the dominant type of farming system. In 1996, for example, the proportion of farm households that were engaged in crop husbandry

TABLE 2

Regional (Tigray) gross domestic product by economic activity at constant factor cost in 1994/95 and 1995/96 (million *Birr* except per capita GDP)

Economic activity	Real gross value		Growth rate (%)
	1994/95	1995/96	
Agriculture, forestry and fishing	1 797.6	1 917.5	6.7
Industry	648.7	693.7	6.9
Mining and quarrying	155.0	175.7	13.4
Manufacturing	73.1	92.3	26.3
large and medium-scale manufacturing	13.2	29.6	124.2
small-scale industry and handicraft	59.9	62.7	4.7
Electricity and water	23.9	25.8	7.7
Construction	396.7	399.8	0.8
Services	371.3	412.5	11.0
Trade, hotel and restaurant	88.0	102.1	16.0
Transport and communication	35.4	41.4	16.7
Other services	247.9	269.1	8.5
Total regional GDP	2 817.7	3 023.7	7.3
Population (million)	3.114	3.193	2.5
Regional per capita GDP (<i>Birr</i>)	904.7	946.9	4.7

Source: Regional Bureau of Planning and Economic Development of Tigray Region.

was 19 percent, in livestock husbandry 3 percent and in mixed farming 78 percent. The growing population has decreased the average farm size in the region to only 0.97 ha; 70 percent of farm households own less than 1 ha. Agricultural output is mainly for domestic consumption, although some production is for export, including sesame oil, horse beans, field peas and animal skins and hides.

Farming systems in Tigray are characterized by traditional technology based entirely on animal traction and rainfed land. A variety of crops such as cereals, pulses and oil crops grow in the region. Cereals are the dominant crop; pulses are of secondary importance. The major crops are sorghum, teff, barley and wheat. Vegetables are cultivated in limited amounts in areas where irrigation water is permanent or semi-permanent, and in areas closer to rural centres and urban areas. In Enderta and Adigudom districts, for example, 6 percent of farm households grow vegetables, but 78 percent of them live near towns. Scarcity of arable land leads to extremely intensive land use. Farmlands are owned and run by small farms that are divided into minor plots scattered over large areas. Production is family based, with little hired labour. Livestock except for plough oxen play an important but secondary role. The livestock component increases in the lowland areas, especially in the southern and western zones (REST/NORAGRIC, 1995).

The Tigray region is marginal compared with the southern and central part of the country. Agricultural production in the region is below the national average. In a good year such as 1996, average yield is 1 167 kg/ha nationally but only 1 096 kg/ha in Tigray; in bad years of drought, the yield gap is even greater. The most basic constraints for agricultural development, especially crop production, are unreliable rainfall, lack of oxen, low soil fertility and outbreaks of crop pests. In the central zone, for example, unreliable rainfall is seen by farm households to be the most significant problem, followed by crop pests and lack of oxen (REST/NORAGRIC, 1995). Lack of pasture and fodder are the main constraints in animal production. Scarcity of veterinary clinics is a significant constraint in livestock development. The revival of livestock farming after a drought is very difficult, because a great number of cattle die during droughts.

It will, in short, be very difficult to increase employment in agriculture. Agricultural productivity is very low because of low soil fertility and unreliable rainfall. Livestock husbandry in Tigray is constrained by a shortage of grazing land. Animal dung is used as fuel for cooking, not for enriching the soil; expansion into marginal and steeper slopes is a widespread practice. The result has been widespread degradation of highland soils as a result of erosion. Labour absorption in agriculture is only possible through intensification of agricultural production

and the use of irrigation, which is unlikely in the near future. The non-farm sector has not yet sufficiently developed to absorb the growing population; its contribution to the overall employment and income generation remains low.

The role of government and NGOs

The 1974 revolution resulted in a series of policy measures aimed at expanding collective and state-owned farm and non-farm enterprises and managing the economy through central planning. The government restricted individuals to a single type of occupation. Farmers were not allowed to engage in off-farm activities, hire of labour was restricted and farmers were forced to be members of producer and service cooperatives. These cooperatives were given priority for most of the financial-assistance and extension services. Industrial products were distributed through the service cooperatives; private traders in rural areas did not officially exist.

Monopolized public institutions were given the responsibility for promoting the non-farm sector. The Rural Technology Promotion Department (RTPD) was entrusted with the task of developing and promoting improved farm and non-farm technologies and food processing. The Handicraft and Small Industrial Development Agency (HASIDA) was in charge of issuing licenses, organizing cooperatives and assisting in the marketing of products. Ministry of Education adult training centres attempted to teach various handicrafts, construction and farming skills in urban and rural areas. Their efforts were, however, constrained by policy and institutional factors from the very beginning. All promotional activities were directed towards cooperatives. Individuals trained in crafts were unable to establish themselves, because they lacked credit, tools, raw materials and business skills.

When the military government collapsed in 1991, a market-based economy replaced the centrally planned economy. After the formulation of the Federal Democratic Republic of Ethiopia in 1995, the government decided to liberalize the economy and promote investment in the agricultural and industrial sectors. Current government policy emphasizes both sectors, but is less precise with regard to the rural non-farm sector. The focus of the recent economic reform is on structural adjustment aimed at strengthening producers' supply response, developing the private sector, promoting growth of financial intermediation and creating a market for privatization of financial assets.

The main objective of government agricultural policy is to ensure adequate food security through increased agricultural production and employment. A broad

based Agricultural Development-led Industrialization (ADLI) strategy has been formulated that concentrates on three priority areas: accelerating growth through the supply of fertilizer, improved seeds and other inputs, expanding small-scale industries to interact with agriculture and increasing exports to pay for the import of capital goods. Under ADLI, a new system of agricultural extension called a participatory demonstration and training extension system was launched in 1994–1995. It provides agricultural inputs in package form with extension advice.

The reform process, particularly structural adjustment, has affected the earlier institutions that were in charge of promoting non-farm activities. RTPD, for instance, was brought under the regional Bureau of Agriculture but has been limited by budget and manpower constraints. HASIDA offers technical and managerial services to small-scale industry and handicrafts, but its operations are financed through the revenue generated by charging for services; it is still being reformed and its services cover only selected urban areas.

With the reform of state institutions, a number of international, national and regional NGOs have become directly involved in farming and non-farming communities. They provide farmers with a variety of services mainly focused on agricultural development, reforestation, soil and water conservation and rural water supply, and credit for income-generating activities, including small-scale trade and handicrafts. The emphasis on rural non-farm activities is minimal. The exceptions are the regional NGOs Relief Society of Tigray (REST) and the Tigray Development Agency (TDA), which are actively engaged in a more diversified set of activities than the international and national NGOs.

REST's involvement in the rural non-farm sector is mainly through its rural credit and saving programme, which operates through 12 branches and 103 sub-branches across the region. It provides loans for cottage and small agro-industries, artisans engaged in rural arts, crafts, horticulture, growing cash crops and rearing pigs. The activities for which loans are provided are:

- crafts such as embroidery, pottery, basket making, spinning, weaving, carpentry and metal work, especially for agricultural implements;
- small-scale trade such as buying and selling at open markets, retailing, hairdressing, tailoring and preparing local food and drugs;
- agriculture such as livestock rearing, bee keeping, horticulture and cereal production.

A loan is provided on a group basis at 12.5 percent interest. The maximum loan is 5 000 *Birr*; the minimum is 50 *Birr*. The duration of the loan is one year,

depending on the repayment capacity of the borrower and the nature of the activities. The REST credit programme has improved farmers' access to the financial market, but cannot completely satisfy farm households' demand for credit; loan duration is short and is not coupled with sufficient business advice.

TDA is primarily involved in providing basic education and technical training. It was initially involved in an integrated rural development programme, but since 1996 its focus has been on urban and rural education. TDA runs four technical training centres, two in the central zone in Shire and Axum and two in Mekelle. School dropouts, ex-soldiers, farmers, women and the jobless are allowed to join. Training is provided in basic construction skills such as masonry and carpentry, metalwork, woodwork, electrical systems, motor mechanics and handicrafts such as carpet making. Graduates are provided with the tools and credit to start their own businesses, but their capacity is very limited because of financial and accommodation problems.

In short, it has been and still is unclear which government organization is responsible for the promotion of non-farm activities in rural areas. The minimal promotion of non-farm activities coordinated by the Bureau of Agriculture through RTPD is not suited to rural areas. HASIDA activities are not targeted to rural non-farm activities in general or to rural non-farm activities carried out by farm households. Substantial promotional work on farm and rural non-farm activities has been done by regional NGOs, especially REST and TDA; they seem to be better than the Government at targeting the rural poor and rural non-farm activities, but their activities still require more coordination with government organizations to improve efficiency and avoid duplication.

Micro and small-scale enterprises: developments and constraints

Statistics from 1998 published by the Tigray Regional State Bureau of Industry, Trade and Transport (ITTb) show that small-scale manufacturing enterprises have flourished during the last seven years. In 1991, small-scale industry barely existed except for cottage industries, of which there were 206 in 1994, reflecting remarkable growth. In 1997 they totalled 599, providing employment for approximately five people per establishment. Average capital investment per establishment is 153 000 *Birr*. Grain mills are the most common type of small-scale industry. About 20 percent of small-scale manufacturing enterprises are found in Mekelle, the capital of the region; the remaining 80 percent are found in other zones and *woreda* towns (Table 3). Most of the raw materials used for production are locally produced; imports constitute about 14 percent of total raw materials.

TABLE 3

Distribution of small-scale manufacturing enterprises in Tigray

	Tigray	Mekelle	Southern	East	Central	Western
Number	599	117	117	93	105	168
Investment (<i>Birr</i>)	91 651 331	34 252 604	15 550 533	20 872 695	9 369 499	11 983
Employment	2 957	842	765	521	373	558

Source: ITTB Statistical Bulletin No. 1, 1998.

The Central Statistics Authority (CSA) estimates that there are 25 012 cottage and handicraft enterprises, of which 9 percent are found in Mekelle; the remaining 91 percent are in other towns of the region. Cottage industries are known to use more locally produced raw material than small-scale manufacturing industries. Cottage industry in the region covers a variety of industrial groups, including the following major products: food and beverages, textiles and non-metallic mineral goods, which constitute 90 percent of regional cottage industries. Average initial capital invested per establishment for rural areas is 376 *Birr*, and 276 *Birr* for urban areas. Most of the finance for initial investment – 44 percent – comes from people's own savings and from friends and relatives.

Trade, the most common non-farm activity, has grown rapidly over the last seven years. In 1995, the growth rate of this sector was 16 percent. If unlicensed trade by farmer households is included – it is often underestimated in GDP calculations – the growth rate would have been much higher: 234 wholesale businesses, 11 765 retail enterprises and 2 799 service providers have been established in the region, about 16 percent of which are in Mekelle and the rest in zone and *woreda* centres. The initial capital required for the retail trade is lower than for wholesale and service businesses (Table 4). Average initial capital per establishment is 31 301 *Birr* for wholesale, 4 326 *Birr* for retail and 14 992 *Birr* for services. Women own most of the service establishments such as bars and beauty salons, where value-added per unit of investment is the lowest; most wholesale and retail establishments are owned by men. The educational status of the owners of wholesale and retail establishments is comparable; people with elementary education are the owners of most of the trade establishments. The dominant type of ownership is sole proprietorship. In Mekelle, for example, all of the wholesale trade, 98 percent of the retail trade and 99.8 percent of the service trade are under individual proprietorship. A possible reason for the dominance of sole proprietorship is the fear of friction among partners and the transaction costs associated with resolving a dispute.

TABLE 4

Characteristics of commerce in Tigray

Type of trade	Initial capital per establishment (<i>Birr</i>)	Female owners (%)	Owner illiterate (%)	Owners grade 1–6 (%)
Wholesale	31 301	11	16	56
Retail	4 326	25	22	61
Service rendering	14 922	71	34	42

Source: Calculated from data provided by ITTB.

TABLE 5

Value-added and employment potential of non-farm activities in Tigray

Type of non-farm activity	Initial capital investment (<i>Birr</i>) per unit of employment provided	Value added per unit of investment	Value added per person
Cottage industry	269	2.21	595
Small-scale industry	3 508	1.42	4 966
Total commerce	202 075	0.004	804
Wholesale	156 941	0.04	6 023
Retail	18 000	–	–
Services	426 406	0.004	1 828

Source: Calculated from CSA Statistical Bulletin No. 182.

Cottage industry and small-scale manufacturing industry have a greater role than commerce in providing employment and generating income (Table 5). In Tigray, cottage industries require 269 *Birr* of capital investment to employ one person; the figure for small-scale manufacturing industry is 3 509 *Birr*. Value-added per unit of investment is lower for commerce, generating 0.004 *Birr* per unit of initial investment. Cottage industry generates 2.21 *Birr* per unit of initial investment; the figure for small-scale industry is 1.42 *Birr*.

Constraints to the development of small enterprises and microenterprises fall into two categories: insufficient infrastructure and firm-specific limitations. The infrastructure problem relates to the low quality and insufficient supply of roads, electrical power and telephone lines; the main road connecting other regions and the Government is not well maintained. There was no supply of electricity that could provide power to a manufacturing industry until May 1998 in most urban areas. Since May 1998, most towns have received electricity, but

it can still take several months to get electrical power connected because of shortages of electrical equipment. The capacity of the government office responsible for the service is limited. Business people have to spend an enormous amount of time ordering and receiving raw materials and other commodities.

CSA statistical abstracts have documented the firm-specific problems in cottage and small-scale manufacturing industries and trade; these are summarized in Table 6. In cottage handicrafts and small-scale manufacturing enterprises, the major problem is lack of sufficient initial capital, which affects 48 percent of cottage industries 36 percent of small-scale manufacturers. Other problems are lack of adequate start-up skills in cottage industries and lack of raw materials and premises in small-scale enterprises. A few small-scale and cottage industries are not working at full capacity, for which the main reasons are absence of market demand for products, shortages of raw materials and lack of working capital:

TABLE 6
Problems faced by small and microenterprises in Tigray

Business type	Problems in starting business (% of responses)		Operational difficulties (% of responses)	
Cottage/handicraft enterprises	Lack of sufficient initial capital	36	Lack of sufficient initial capital	48
	Lack of continuous supply of raw materials	15	Lack of adequate skill	11
			Absence of market demand	42
	Lack of working premises	12		
Small-scale enterprises	Lack of sufficient initial capital	36	Lack of working capital	16
	Lack of continuous supply of raw materials	15	Shortage of supply of raw materials	11
	Lack of working premises	12		
Wholesale	Lack of sufficient own capital	21	Limited market	29
	Lack of working premises	19	Shortage of working capital	19
	No problem	45	Lack of workplace	9
			No problem	16
Retail	Lack of sufficient own capital	36	Shortage of working capital	38
	Lack of working premises	17	Limited market	31
	Government regulations	6	Lack of workplace	6
Service trade	Lack of working premises	17	Lack of working premises	37
	Lack of sufficient own capital	9	Shortage of working capital	24
	Access to raw materials	7	State harassment	9
	Government regulations	4		

Source: CSA Statistical Bulletin Nos. 172, 179 and 182.

the main problems in trade enterprises are similar. About 6 percent of retail establishments and 4.2 percent of service providers reported that government regulations are a problem in starting businesses; 9 percent of service providers in Tigray report government harassment while operating a business. These problems appear less acute for wholesale traders: about 46 percent of establishments reported no problems in starting up.

Labour markets

Detailed analysis of the labour market is beyond the scope of this paper. This section summarizes the results of an analysis of the labour market conducted using the data collected for the present study (Woldehanna, 1998).

Farm households are not entirely self-sufficient and are partially integrated into the labour market as employers and labourers. The demand for hired labour among smallholders occurs in peak agricultural seasons such as harvesting and weeding and in slack seasons, implying that some farm households are labour constrained even in slack seasons. This shows that public programmes scheduled for slack seasons are not without opportunity costs. The non-farm wage rate for farm households is influenced by location, type of wage employment and year; the rate varies with location, implying that there is a lack of labour mobility, which requires further investigation. Age and education affect the wage rate received by the main woman in the household, but not others. This may be due to the fact that most jobs do not require education (Rosenzweig 1978, 1984 and 1988). The wage rate varies with season and activity, implying that wage rates reflect demand and supply of labour and the amount of effort required to carry out a job. The relevance of subsistence or nutritional determination of wage is thus very low. Wage determination is better explained by the forces of supply and demand and effort required. Farm households in the farm-labour market and other employers in the non-farm labour market rely on

TABLE 7

Forward and backward production linkages in Enderta and Adigudom districts (household-level data)

Linkages	Birr/household
Backward production linkages	64.27
Expenditure on fertilizer	61.78
Expenditure on insecticide	0.62
Expenditure on herbicide	0.01
Expenditure on veterinary medicine	1.87
Labour market linkages	
Expenditure on hired farm labour	89.85
Forward production linkages	
Sale of crop output	252.64
Sale of livestock product sold	72.94
Sale of livestock	176.99

Source: Author's calculations from household survey data.

relatives and friends to search for labourers to hire. Most workers rely on relatives and friends to get information about jobs. Labour-market limitations have considerably increased transaction costs associated with hiring labour and searching for jobs. Most of the people working as masons and carpenters acquire their skill after a long apprenticeship, which is slow and unproductive. This has led to a shortage of skilled masons and carpenters for construction and other investment activities.

FARM/NON-FARM INCOME LINKAGES, SURVIVAL STRATEGIES AND INCOME INEQUALITY

Production linkages

Backward and forward production linkages in the region are limited (see Table 7). Farmers purchase few farm inputs such as fertilizer and pesticides. The average value of fertilizer used per household in the southern part of the region is 62 *Birr*, which is a very small percentage of farm output. There is little use of pesticides and veterinary medicine. Households consume most of their farm produce; sales of crop and livestock output are still at a low level. A farm household sells on average only 13 percent of its crop and 15 percent of its production from animal husbandry. Agriculture is in general unable to support major processing industries; there is only one food-processing industry and one tannery in the region.

Table 8 shows the correlation between non-farm activities and a number of variables. The results indicate that district-level non-farm activities are positively related to population density, but its correlation with farm income is very weak. This is because agriculture has limited backward and forward production linkages. The correlation of wholesale and retail trade with agricultural income is much higher than with service trades and small manufacturing industries, which indicates that consumption linkages are higher than production linkages, and that farmers are significant users of wholesale and retail trades. Service trades, small enterprises and microenterprises are negatively correlated with farm output, probably because farmers are forced to participate in non-farm activities when agriculture is unable to support the growing population. This supports the residual sector hypothesis that non-farm activities absorb workers who cannot be readily absorbed into agriculture. Rural centres are an important stimulus for the performance of microenterprises and small-scale enterprises. Districts closer to Mekelle have access to some of the services needed to run small-scale manufacturing industries, such as roads, electricity and telephone lines; the further

TABLE 8

District level correlation between farm income, population density and capital invested in non-farm income in Tigray

	Non-farm activities	Retail trade	Wholesale trade	Service trade	Small manuf. industry
Population density	0.4695	0.5660	0.2614	0.6150	0.2626
Actual farm output (100 kg)	0.0164	0.0904	0.2711	-0.1012	-0.1292
Farm output per capita	0.0430	0.0848	0.3115	-0.0852	-0.1057
Potential farm production	0.0930	0.1345	0.3618	-0.0445	-0.0784
Distance from Mekelle	-0.0931	0.0301	0.1152	-0.1578	-0.1954
Distance from zonal town	-0.1880	-0.1873	-0.0460	-0.2332	-0.1570

Source: Author's calculations.

districts are from Mekelle and rural towns, the lower the amount of capital invested in service trades and small-scale manufacturing.

Consumption linkages

Consumption linkages are the strongest type of linkage in Tigray. Demand for consumption goods increases as agricultural income increases, but the commodity composition of that demand will change as some commodities and services increase in importance while others diminish. Household consumption demands are more complex, with varying income elasticity of demand for individual commodities. Analysis of consumption demand of the farming population therefore deserves special attention.

To analyse the relative importance of different commodity groups in demand linkages, marginal budget shares and expenditure elasticity are derived from Engel functions, estimated using ordinary least squares, which have a nonlinear relationship between consumption and income.

Table 9 summarizes the expenditure behaviour of the average farm household. The results are obtained by evaluating average budget share, marginal budget shares and expenditure elasticity at the sample mean. The commodities consumed are categorized into food and non-food items and into locational groups. The food items include cereals, pulses, oil crops, vegetables and animal products such as milk, butter and cheese, and sugar, tea and salt. The non-food items are grouped into social expenses such as services and ceremonial expenditure, contributions for local organizations and taxes and industrial products such as household durables, clothing and footwear.

TABLE 9

Demand linkages in Enderta and Adigudom districts, southern zone, Tigray

	Average budget share	Marginal budget share	Expenditure elasticity
Total food expenditure	0.79	0.69	0.87
Cereals	0.49	0.20	0.41
Pulses	0.05	0.06	1.20
Oil crops	0.004	0.01	2.79
Vegetables	0.001	0.001	1.00
Animal products	0.11	0.25	2.27
Coffee, sugar, tea, salt, spices	0.14	0.17	1.21
Total non-food	0.21	0.31	1.48
Service, ceremonial and other social expenses	0.05	0.11	2.20
Industrial products	0.16	0.20	1.25
Household goods	0.01	0.02	2.00
Clothes, shoes and cosmetics	0.15	0.19	1.27
Locational group			
Own produced food	0.52	0.49	0.94
Purchased food, local	0.13	0.02	0.15
Purchased food, non-local	0.14	0.17	1.21
Industrial products, non-food (not locally produced)	0.16	0.20	1.25
Purchased locally, non-food	0.05	0.11	2.20

Source: Author's calculations from household survey data.

Food accounts for 79 percent of total expenditures, leaving a small share of the budget for non-food items. The marginal budget share of food items is 65 percent, which is less than the average budget share. Expenditure elasticity is 0.87, implying that the budget share of food items will decline when total income rises. The result is comparable to the 0.88 reported by Hazel and Hojjati (1995) for Zambia and the 0.81 reported by Hazel and Roell (1983) for the Gusau region of Northern Nigeria.

Among food items, cereals account for 0.49 percent of the budget, but their importance declines as income rises. Expenditure elasticity is 0.41, and the marginal budget share is 0.20, less than half the average budget share. For higher-value food items including pulses, oil crops, vegetables, animal products, and coffee, sugar, tea, salt and spices, expenditure elasticities are very high, which

implies that their budget share will increase if household income increases; their average budget shares are currently very low.

All non-food items have high expenditure elasticities, implying that their importance in the budget share will increase as farm-household income rises. The relative increase will be greatest for expenditures in service, ceremonial and other social expenses, and expenditure on clothes and footwear. This clearly shows that agriculture has the potential to strengthen local demand for non-food items in Tigray.

The locational linkage results in Table 9 show that about 86 percent of total expenditure is on regionally produced food and non-food items; the remaining 14 percent are regionally imported non-food items. Expenditure elasticities of imported items, however, are higher than those of local items, which indicates that there are strong household demand linkages to the local economy that are predominantly benefiting the agricultural sector in the short term but that these will diminish when farm-household incomes rise. The average budget share of local products of the non-farm service sector is 0.05; expenditure elasticity is 2.2. Household demand linkages that go to the local non-farm sector such as services and ceremonial expenditures are currently very low, but will increase dramatically when farm-household income rises. Food items imported from outside the region are also potentially important.

Off-farm work participation and its impact on farm income

Rural households in Tigray participate in various off-farm activities such as wage employment and non-farm own business. A summary of rural households' participation in off-farm activities for two districts is shown in Table 10; 81 percent participate in some off-farm activities. Most off-farm work is temporary and does not require skilled labour except for masonry and carpentry. The proportion of households that participate in wage employment is 72 percent; for own business activities the figure is 28 percent. The participation rate in non-farm wage employment is 22 percent. When food for work is excluded, the off-farm work participation rate of farm households is high at 43 percent.

Rural household income can be divided by activity source. On average, farm production accounts for 57 percent of total income; livestock accounts for 16 percent and crop production for 41 percent. Off-farm labour income accounts for 35 percent and non-labour income accounts for 8 percent of total income. The amount of non-labour transfer income for households is very small compared to their farm and off-farm income. The types of transfer income are remittances,

TABLE 10

Farm household participation in off-farm activities in Enderta and Adigudom districts

Type of off-farm activities	Participation rate (%)
Own off-farm business	27.9
Total wage employment	71.5
Non-farm wage employment	21.6
Manual non-farm wage employment	19.2
Masonry and carpentry	3.5
Food for work	57.7
Off-farm work participation excluding food for work	43.0
Overall off-farm work participation	81.0

Source: Author's calculations from household survey data.

47 percent, food aid, 20 percent and gifts and inheritances from relatives, 19 percent.

An economic analysis of the impact of off-farm activities on agricultural productivity and output was conducted in an earlier paper (Woldehanna, 1998). Results showed that income diversification results in higher agricultural output per unit of land. On average, when off-farm income increases by 1 percent, agricultural productivity increases by 0.34 percent. This could be because households learn managerial skills through experience in various activities, reduce soil mining and initiate better farming practices.

Apart from the diversification effect of off-farm activities, off-farm work brings additional income to households that can be used to purchase farm inputs. Results indicate that demand for hired farm labour is highly influenced by farm and off-farm income controlling for other factors such as family size, number of dependents, soil quality, year and location dummies. When farm output increases by 1 percent, expenditure on hired farm labour increases by 0.66 percent; the figure in relation to off-farm output is 0.55 percent. The demand for other variable inputs is also highly influenced by farm output and off-farm income. When farm output increases by 1 percent, expenditure on the variable input increases by 0.94; the figure in relation to off-farm output is 0.43 percent. To sum up the effect of off-farm income on farm productivity through purchase of farm inputs and income diversification, the total elasticity of farm productivity with respect to off-farm income is calculated to be 0.39.

Off-farm income, entry barriers and income inequality

In order to evaluate the relationship between off-farm income and inequality, a Gini decomposition by income source was calculated (Table 11). Crop income has the highest contribution to overall income inequality as measured by the Gini coefficient, followed by wage employment and income from livestock. Crop income, livestock income and wage income decrease income inequality. The results are mixed, however, when wage income is broken down into categories. Paid food-for-work programmes are the only type of off-farm income that decreases income inequality. Non-farm wage and self-employment income increase inequality, as does income from unskilled manual and skilled manual non-farm work. Non-labour income such as gifts, remittances and property rents also increase income inequality.

A possible reason why non-farm income has an unequalizing effect is that there is an entry barrier for the poor. Non-farm wage employment and self-employment require skill and capital to start. In the absence of a perfect credit market, only wealthier households can afford to enter into self-employment. This implies that if rural non-farm activity programmes do not particularly target the poor, wealthy farm households will dominate the most lucrative non-farm activities such as masonry, carpentry and trade. The inequality effect of non-

TABLE 11

Gini decomposition by income sources

Household income components	Mean	S_k	R_k	G_k	$G_k * R_k$	$S_k * R_k * G_k$	$(S_k * R_k * G_k) / G$	% elasticity of Gini index
Off-farm self-employment	262	0.068	0.598	0.836	0.500	0.034	0.103	3.5
Off-farm wage	858	0.280	0.489	0.628	0.308	0.086	0.261	-1.9
Food for work	437	0.174	0.183	0.664	0.122	0.021	0.064	-11.0
Manual non-farm wage	284	0.085	0.406	0.883	0.358	0.030	0.092	0.7
Skilled non-farm wage	136	0.022	0.794	0.978	0.777	0.017	0.053	3.0
Non-labour income	194	0.039	0.707	0.951	0.672	0.026	0.080	4.1
Net farm crop income	1 339	0.448	0.698	0.442	0.308	0.138	0.419	-2.9
Livestock income	497	0.164	0.425	0.643	0.273	0.045	0.136	-2.8
Total household income	3 152					0.330		

Note: S_k is the average share of income source k in total income; G_k is the Gini index of inequality for income source k ; R_k is the Gini correlation with total income ranking; G is the Gini index of total income inequality; $(S_k * R_k * G_k) / G$ is the percentage contribution of income source k to the Gini index of total income inequality.

Source: Author's calculations from household survey data.

farm income has serious policy implications. If the objective of policy makers is to reduce income inequality, poverty-focused rural non-farm investment has to focus on the type of non-farm activities in which the poor can participate. If this is not possible, the underlying factors that hinder rural households' participation in non-farm activities must be addressed. This requires the establishment of training centres and provision of credit that focus on the rural poor.

DISCUSSION OF POLICY AND PROGRAMME IMPLICATIONS

The need for alternative employment opportunities

It is becoming very difficult to increase regional employment in agriculture. A growing population has decreased farm size, leading to expansion into marginal and steeply sloping land; the result has been widespread degradation of the highlands. Crop residue and animal dung are used as fuel for cooking, not for enriching the soil. Scarcity of land and malaria in lowland areas such as the western zone limit the amount of land under cultivation in the region. Livestock production is not promising either, because forage supplies come from unimproved and overgrazed pasture and crop residue. Poverty is pushing farmers to search for alternative sources of income, particularly wage employment. To reduce the pressure on land, rural non-farm activities have to be expanded. Waiting for non-farm activities to expand until poverty pushes people off the land will further degrade natural resources and eventually increase the cost of rehabilitation. Employing rural people through rural non-farm activities has two advantages: it keeps farmers in the rural areas and reduces rural urban migration, and it provides farmers with additional income and reduces the pressure on land, hence reducing land degradation.

Development of complementary policies and organized promotional activities

Off-farm income is important for the rural economy in Tigray. Rural households with diversified sources of income have higher agricultural productivity. Expenditure on farm inputs is dependent on off-farm income, which helps to finance farming activities, as well as agricultural production. Farmers employed in higher-wage activities such as masonry and carpentry have a greater capacity to hire farm labour. The positive link between farm and off-farm income implies that increasing agricultural output and raising agricultural productivity cannot be done in isolation. Narrowly focused sectoral approaches with the sole target of raising agricultural output and productivity are less likely to achieve significant

advances unless considerable attention is given to the importance of non-farm income in the rural economy. Current agricultural extension programmes should include farm and non-farm activities, encourage growth of small-scale business and create non-farm employment opportunities in rural areas. Complementary policies and programmes must be developed to strengthen the link between farm and non-farm activities.

There are attempts in the region to promote rural non-farm activities in order to provide farm households with alternative income sources. Public employment schemes such as food for work, for example, have increased farm households' access to off-farm income to about 35 percent. Efforts to promote off-farm activities are disorganized and insufficient, however, and the links between farm and non-farm activities are not fully recognized. Most government organizations and NGOs have focused exclusively on agriculture, because the majority of the population is engaged in it. Non-farm activities should not be left to the industry and trade ministries; the agricultural ministries should be able to give special focus to rural non-farm activities in order to ensure sustainable farming.

Institutional support might be necessary to create an enabling environment for rural non-farm enterprises. It is not at present clear which government organization is responsible for the promotion of non-farm activities in rural areas, despite efforts by a few NGOs such as REST and TDA. The Bureau of Agriculture concentrates on farming activities and the Industry and Commerce Bureau focuses on non-farm activities in urban centres. A government organization must therefore be established to coordinate promotion of rural non-farm activities; it should be responsible for formulating, upgrading, coordinating and implementing measures such as economic and financial policies to create an enabling environment, and should run assistance programmes to promote rural non-farm activities. The new institution could also lobby for policies that favour rural non-farm activities and development of assistance programmes, because rural non-farm enterprise owners do not have the capacity to organize themselves.

The fact that consumption linkages dominate production linkages signifies that commerce is the main non-farm activity in the short term and should be the focus of government policy. To exploit this potential, government regulations that hinder expansion of business must be avoided. Infrastructure such as roads, electricity and telephone connections must be improved; measures to improve the efficiency of the economy, such as improving the bureaucratic and judiciary systems, would also help. Improving the efficiency of commerce means creating favourable markets for industrial products, especially those of small-scale and cottage manufacturing industries.

Rural towns as a focal point in rural development

Rural towns act as a focal point in the development of the rural non-farm economy. It is essential to ensure adequate economic and social infrastructure to support emerging rural non-farm activities and to renovate and develop traditional ones. Physical infrastructure will undoubtedly play a significant part in strengthening farm/non-farm linkages. Road access to rural towns is essential to stimulate agricultural consumption linkages and provide farm inputs to farm households; the roads will be relatively easy to construct and maintain. Efficient rural credit and smooth labour markets are particularly important to promote rural non-farm activities; investment in human capital is essential to ensure that rural non-farm activities are reliable and able to cope with new technological developments. Most of these service institutions must be located in rural centres, because it would be difficult to establish them in widely scattered settlements.

Targeting of the vulnerable group

Care must be taken in planning programmes to combat rural poverty, because promoting rural non-farm activities will not necessarily target the poor. Wealthy farm households dominate the most lucrative non-farm activities, particularly masonry, carpentry and non-farm self-employment such as trade. Poverty-focused rural non-farm investment will need to target non-farm activities in which the poor can participate, or address the underlying factors that prevent poor rural households from participating. This calls for establishment of training centres, provision of credit for the poor, business extension, creation of favourable conditions and improvement of infrastructures.

Women participate to a considerable extent in non-farm activities. They are engaged in activities with lower value-added per unit of investment and low-wage non-farm activities, however, such as public work programmes and manual work in construction sites. Women need to be given training and provided with credit to start their own businesses in order to allow them to participate in well paid rural non-farm activities. To facilitate women's contribution to rural non-farm activities, assistance agencies must be involved and the Government must explicitly recognize the importance of women's roles.

The need to review and update existing policies and institutions

Government policies affect the magnitude of agricultural growth and the ability of rural non-farm enterprises to respond to agriculturally induced increases in demand. If rural non-farm enterprises are to achieve their full potential for income generation, policy makers need to review their agricultural, investment and

commercial and infrastructure development policies that work against small farmers and small rural non-farm enterprises. A policy that needs reform is the proclamation that provides investment incentives such as income-tax relief to local investors with over 250 000 *Birr* capital, which does not encourage rural non-farm activities that require smaller capital investment. Policies should be formulated to improve access by small rural non-farm enterprises to formal financial institutions such as commercial and development banks.

Searching for jobs and looking for employees are hindered by the fact that most households rely on friends and relatives for information. The transaction cost associated with hiring labour and searching for jobs is exceptionally high, which will retard investment activities and technological innovations in the farm and non-farm sectors. There should therefore be government assistance to help dealers emerge in the labour market in the long term. One way to achieve this would be to cancel the law that prohibits the establishment of dealers in the labour market and to publish in recognized places labour-market information such as wage rates, magnitude and type of labour demand and lists of job seekers by skill until the market supports the emergence of dealers.

Because of the time required to develop masonry and carpentry skills, there is a shortage of well qualified masons and carpenters for construction and other investment activities. Hands-on training of workers in building and construction sites should be organized to improve the performance of investment activities; it would probably be necessary to improve the capacity of government and NGO training institutions and to establish additional training programmes. TDA masonry and carpentry training for farmers should be developed to cover the whole region; vocational schools or local master craftsmen could give the training programme as well. The most important features of successful training programmes are those linked with the labour market: unless training establishments respond to changing labour-market conditions, their graduates will encounter difficulties in finding employment and the investment in training will be socially unproductive.

Choosing the means of intervention

The evidence suggests that programmes aiming to provide a complete package of financial, technical and management assistance are generally less effective than programmes that identify and provide a single missing ingredient such as a small credit programme (Haggblade, Hazell and Brown, 1989). Assistance to firms is usually costly, especially for developing countries, because the rural non-farm enterprises are normally small and geographically dispersed. Direct

assistance should focus on system-level opportunities and constraints that open up opportunities for large number of firms (Haggblade, 1995). This kind of highly leveraged intervention requires subsector analysis to identify locations or enterprises supplying inputs or marketing outputs that can expand the income potential for many small firms, upstream or downstream.

Continuous research is necessary to identify opportunities and constraints that hinder the development of rural non-farm activities. National agricultural research centres, universities, international research organizations and donor agencies should include rural non-farm activities in their programmes in order to enhance the effectiveness of the research and increase the familiarity of policy makers and practitioners with the nature and development of rural non-farm enterprises. Surveys by CSA and national and regional bureaux of industry, trade and transport should include rural non-farm activities by large and small firms in the formal and informal sectors.

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