THE SUPPLY RESPONSE OF SUBSISTENCE PEASANTS: THE CASE OF TEFE-GROWERS IN SOME DISTRICTS OF SHOA

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ABSTRACT

In an attempt to assess the supply behaviour of subsistence peasants, this study concentrated on some teff (Eragrostis teff) growing peasant associations within Shoa Adminstrative Region. The associations were selected on the basis of their open market teff price levels and the necessary information was obtained through a survey based on simple random sampling. Regression and covariance analyses were used for analyzing the data. The result of the production analysis showed that the peasants are efficient in utilizing the resources (traditional and non-traditional) at their command and hence, a superior alternative to increase production lies on measures intended to raise the consumption of non-tradional inputs. The analysis ofmarket behaviour also showed that market supply of teff is an increasing function of output. By and large, the solution to the present food problem seems to be best served by policies which increase investment and improve the incentive structure in favour of the peasant sector.

1. BACKGROUND AND JUSTIFICATION OF STUDY

It is a well established fact that the food situation in Africa is precarious. In the 1970s, the growth of food production was well below the increase in total population.[1] Between 1970 and 1980, cereal production increased at annual rate of a little over 1 percent while the population at nearly 3 percent per annum in Sub-Saharan Africa. Consequently, cereal imports steadily increased from 3.2 million tons in 1970 to 8.6 million tons in 1980.[2]

Food shortage is becoming a source of great concern for African countries. The Lagos Plan of Action (LPA) which was adopted by the African Heads of States and Governments, for instance, noted that "... at a time the African continent is facing rapid growth in population and urbanization, the food and agriculture situation in Africa has undergone a drastic deterioration; the food production and consumption per person has fallen below nutritional requirement."[3]

Agriculture is the single most important sector in the economy of African countries. The processing, transport and trade sectors depend on the porudction of agricultural commodities. Income earned in agriculture provides market for domestically produced goods and services. Export of agricultural raw materials are the major source of foreign

exchange in many countries. The sluggish record of agriculture in recent years is thus at the root of the retarded growth in the overall economy of many African countries.[4]

The experience of Ethiopia is not an exception. The average annual growth rate of agriculture was 2.2 percent in 1960 to 1970 and only 0.9 percent in 1970 to 1980. The average index of food production per capita was 85 in 1979-81 compared to 100 in 1969-71.[5] The incidence of hunger and malnutrition has increased. The average consumption of food grains was 357 grams per day in 1978 and about 350 grams in 1979.[6] This is well below the internationally recognized daily famine level of 400 grams per head per day. The country has also witnessed a growing dependence on import and aid to feed its population. The volume of cereal imports increased from 118 thousand metric tons in 1974 to 207 thousand in 1981 and food aid (in cereals) increased from 59 thousand to 228 thousand metric tons during the same period.[7]

A number of factors may account for the poor performance of agriculture. Production has been hampered by drought, erratic rainfall and war. The pressure on land has increased due to the fast population growth. However, these factors only partially explain the

recurrent and worsening problem. An important explanation may be found in the deficiency of government policies and strategies pursued in agriculture. T.W. Schultz[8] demonstrated that the level of agricultural production depends more on what the governments do to agriculture than technical considerations. The Lagos Plan of Action also noted that the food problem in African is caused by failure to accord the necessary priority to agriculture.[9]

In Ethiopia, either little has been done or much has been done but in the wrong direction to develop agriculture. In an effort to get some insight into the problem, a brief review of the strategies in agriculture and recent developments in marketing and distribution is given below.

1.1. Some Salient Features of Policies and Strategies in Agriculture

1.1.1. The Pre-1974 Period

Within the framework of capitalist-oriented policy of development, three five-year plans were adopted by the past regime prior to 1974. The plans which covered the period 1957-61 (First Plan), 1962-67 (Second Plan) and 1968-73 (Third Plan) were intended to bring about rapid modernization and high growth rates.

The Government policies in agriculture were not based on any clearly defined strategy particularly during the first two plans. But an industry-led policy of economic development, fashionable in the 1950s, seems to characterize the overall orientation. Steps to develop agriculture were characterstically limited, partial and uncoordinated. The share of agriculture in the total public monetary investment amounted only 6 and 8 percent in the First and Second Five Year Plans, respectively. Attempts to introduce innovations in the peasant sector were isolated and lacked institutional support.[10] Extension services were weak and absent in many parts of the country. Table 1 compares Ethiopia with some of her neighbours in terms of fertilizer consumption during the period of 1961-65.

It can be seen that the average fertilizer consumption per hectare of arable land and permanent crops in Ethiopia was only 100 grams, the lowest among her neighbours. This resulted in the lagging of food production behind the demand of the population and in the 1960s the country went through a change from one of exporting to a net-food importing nation (see Table 2).

Table 1

Consumption of Total Fertilizers per hectare of Arable and Permanent Crops (A), and per caput (B) (100 grams Nitrogen, Phosphorous and Potash)
(1961-65)

	A	B
World	287	119
Africa	60	30
Ethiopia	1	1
Kenya	96	19
Madagascar	15	6
Malawi	23	12
Somalia	8	3
Sudan	37	19
Tanzania	11	3
Uganda	7	4
Zambia	21	29

Source: FAO, Fertilizer Yearbook, 1979, Vol. 29, p. 44-47.

In response to the inadequate growth in agriculture, the Government accorded priority to agriculture in its Third Five Year Plan. The plan opted for a new approach to develop the peasant sector. It was thought that concentrating resources on the most promising regions using a "package" approach would yield better result than spreading resources over the whole country. This resulted in the initiation of the comprehensive projects such as the Chilalo Agricultural Development Unit (CADU) in 1967, the Wollamo Agricultural Development Unit (WADU) in 1970, and the Ada District Development Project (ADDP) in 1972.

Table 2

Import and Export of Wheat Flour (in tons) during the period of 1953-1968

Year	Import	Export
1953-60	-	3,118.2
1961	-	2.0
1962	4,582.4	-
1963	3,532.9	-
1964	6,526.2	6.7
1965	20,467.7	0.2
1966	36,863.5	12.7
1967	21,000.4	14.0

Source: CSO, Statistical Abstract, 1964, 1965, 1967).

The projects were intended to provide the right type of technology and supplementary elements such as marketing, infrastructural and educational services. In order to reach a large number of farmers at less cost using few proven techniques developed and tested by the comprehensive projects, the Minimum Package Project was also organized in 1971 under the Ethiopian Project Implementation and Development (EPID) office.

Despite the new approaches in the peasant sector, the main thrust of the Third Plan was rather rapid development of commercial agriculture. A relatively quick increase in production was sought in the promotion of commercial farms. About 73 percent of the total productive public investment in agriculture was allocated to the capital-intensive commarcial farms

with only 12 percent to the development of the peasant sub-sector comprising well over 90 percent of the population. The commercial sector was expected to grow at a rate of about 12 percent to achieve the overall growth of 3 percent in agriculture.[11]

Not surprisingly, the strategy which was intended to promote peasant farming was impeded by the archaic land tenure system and the strenuous effort to expand the commercial sector. Motivated by the new inputs and attractive subsidy[12] for mechanized farming, the landlords commercialized their farms. A large number of peasants were evicted to give way to the large-scale tractorized farms. A study made in Chilalo Awaraja, where the main comprehensive project (CADU) was located, observed that the number of tenants evicted in 1969 and in 1970 in terms of tenant population of 1968 was between 13.2 and 14.6 percent in the Northern project areas and Lole Woreda. A considerable segment of the peasantry was expected to suffer from eviction unless the rate of mechanization in the region was curbed.[13] The development of mechanized farming also shifted the tenancy arrangements in favor of the landlords.

1.1.2. The Post-1974 Period

The period immediately after the overthrow of the old regime in 1974 is characterized by transformation towards a socialist-oriented development. All rural lands were made public property by Proclamation No. 31/1976 in March 1975. The Proclamation ended the threat of eviction and gave provisions for the organization of peasant associations entrusted with a wide range of responsibilities such as administering public property, establishing cooperatives and undertaking villagization programmes. New Ministries and a Commission were established and the old ones were reorganized to moniter agricultural and rural development of the country.

The reform has generally done much to ease life in the rural areas. But food problems have yet to be overcome. Soon after the 1974 Revolution, agricultural production rather tended to decline (see Table 3). This may have to do with the disruption in economic activities caused by change in ownership and by the War in Ogaden and Northern parts of the country. A substantial increase in retail price index of food (particularly in Addis Ababa) and import of food items was recorded (see Table 4). Between 1975 add 1982 the retail price index of food in Addis Ababa more than doubled. The expenditure on food and live

animals import increased by more than six-fold during the same period.

Table 3

Estimates of Area and Production of Major Crops-by Farming Sectors (Area in '000 ha and Production in '000 Quintals)

Sectors	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
1. Peasant Sector							
Area	5,485.5	5,214.4	5,392.3	5,594.1	6,057.4	5,409.4	5,118.3
Prod.	52,018.9	49,740.7	44,822.3	45,108.8	54,467.4	62,368.4	57,349.0
2. State Farm							
Area	45.5	45.9	54.9	146.1	230.9	224.2	231.0
Prod.	965.8	1,019.3	1,345.4	2,417.3	3,365.8	3,542.9	3,824.0
3. Co-operative							
Area	61.6	45.4	42.7	46.0	7.7	82.7	118.5
Prod.	443.7	277.0	311.8	330.2	197.4	688.4	794.4
4. Settlement							
Area	-	-	-	-	41.9	n.a.	n.a.
Prod.	-	-	-	-	447.1	n.a.	n.a.
5. Total							
Area	5,592.6	5,305.7	5,489.9	5,786.2	6,337.8	5,716.3	5,467.8
Prod.	53,428.4	51,037.0	46,479.5	47,856.3	58,477.7	66,599.8	61,967.4

Source: National Bank of Ethiopia, Annual Report (1979, 1982).

1.1.2.1. The Annual Campaign

The establishment of the National Revolutionary Development Campaign and Central Planning Supreme Council

(NRDC & CPSC) in October 1978 was to a large extent a response to counteract the food shortage. The Council was empowered with the task of formulating, elaborating and follow-up of short, medium and long-term national plans. To date, six annual development campaigns (more or less similar to annual plans) have been launched with major emphasis on agriculture.

Table 4

Retail Price Index (for Addis Ababa) and Value of Food Import (1963 = 100)

Year	Retail Price Index of Addis Ababa		Imported Food and Live Animals Value ('000 Brs.)
	General Index	Food	
1975	170.1	175.1	19.749
1976	218.7	248.4	31.565
1977	255.1	290.0	29.677
1978	291.6	339.5	41.486
1979	338.4	400.7	61,114
1980	353.3	421.6	92,358
1981	375,2	441.2	111,850
1982	396.1	467.6	124,454

Source: National Bank of Ethiopia, Annual Report, (1979, 1981).

In the agricultural sector, the Annual Campaigns focused on raising food production. Public exenditure in the sector was increased from Birr 209.65 million in 1977/78 to 696.90 million in 1980/81[14] The acreage of land under state farms was significantly increased.

Attempts were made to increase production in the peasant and cooperative sectors through increasing the consumption of fertilizer and improved seeds in addition to the cultivation of idle land. However, a notable feature of the Annual Campaigns is a disproportionate allocation of resources in favour of the capital-intensive state farms. The share of state farms in the total public monetary investment in agriculture, for example, amounted about 70 percent in the Second (1979/80) and Third (1980/81) Annual Campaigns.[15] The expenditure was hardly justified by the extent of the state farms' contribution in the total production nor by their prpductivity per unit cost. Note that state farms accounted for about 5.3 percent of the total cereal production in 1980/81 (see Table 3). The state farm sector also absorbed the largest share of fertilizer and improved seedsconsumed in the country (see Table 5). In 1981/82, over 54 percent of the total fertilizer distributed and about 80 percent of the improved seeds were used in state farms. In the same manner, the credit service of the Agricultural and Industrial Development Bank (AIDB), the only state credit institution in the agricultural sector, has been restricted to the state farms and a few coffee growing producers' cooperatives.[16] It seems that the NRDC & CPSC has well responded to the stagnation in agriculture, but with undue emphasis on large-scale state farms.

Table 5

Distribution of Improved Seeds and Fertilizer (1977/78-1981/82) (in Qt.)

Year	State Farms		Settlement Farms		Peasant Assoc.		Producers' Co-op.		Total	
	Imp. Seeds	Fert.	Imp. Seeds	Fert.	Imp. Seeds	Fert.	Imp. Seeds	Fert.	Imp. Seeds	Fert.*
1977/78	20,522	-	4,258	1,277	34,010	319,000	-	-	58,790	320,277
1978/79	24,067	105,100	5,930	8,190	23,161	335,000	-	-	53,158	448,640
1979/80	63,608	234,500	7,866	41,900	26,844	412,000	-	-	98,318	688,780
1980/81	156,478	355,300	8,308	29,046	32,834	292,777	1,180	1,461	198,800	674,984
1981/82	176,256	382,700	9,000	11,152	31,700	291,284	3,468	10,832	220,024	696,440

Source: NRDC and CPSC as cited by Tegene Teka and Tennassie Nichola, Rural Poverty Alleviation: The case of Ethiopia (AAU, JDR, Jan. 1983) p. 89-90

*The total amount of fertilizer distributed includes the amount consumed by agricultural research stations.

1.1.2.2. Recent Changes in Marketing and Distribution Agricultural Products

Prior to the establishment of the NRDC & CPSC, measures were initiated to restructure the marketing and distribution of agricultural products. The Agricultural Marketing Corporation (AMC) was organized by Proclamation No. 105/1976 to excute the Government's policy affecting grain marketing, procurement and distribution of inputs. It has broad powers of buying and selling cereals, pulses and oilseeds.

Since its establishment, the AMC has rapidly expanded its grain purchase in the surplus-producing Administrative Regions of Gojam, Shoa and Arssi (where it obtains 84% of its peasant sector purchase). The quantity purchased by AMC increased from 1.5 million quintals in 1978/79 to 4.6 million in 1981/82. In addition AMC imports about 50,000 tons of wheat annually to supplement the local supply. The Corporation's sales of food grains is largely to consumers in Addis Ababa.[17]

The AMC purchases grain from peasant associations, service cooperatives and merchants. Its operation has been supported by measures which weaken the private traders and also lower purchase prices. Some of the steps taken include limitations and controls of the private trading system, regional administrative controls on the movement of

cereals and delivery quotas imposed on peasant associations. In many areas traders are made to deliver all their purchases to the AMC (although they are required to deliver only 50 percent of what they handle according to the grain purchase guideline) and they are not allowed to move grain from one district to another. As a result, the Corporation has been able to buy grains at low prices which are fixed centrally and are uniform throughout the country. The AMC wholesale purchase price of white teff was, for instance 49.53 Birr/quintal in 1979/80, 46 in 1980/81 and 1981/82, and 50 in 1982/83.[18] The rising price of cereals in the open market of Addis Ababa and other deficit areas has also located in and around these markets. In areas where the local supply exceeds the local demand, open market prices of grains are very low relative to the price in Addis Ababa (see Table 6). The retail price of white teff in Addis Ababa was, for example, 2.7 times the retail price at Bahr Dar (a town in a surplus producing Administrative Region of Gojam. in 1981). It should be noted that the price in Addis Ababa was only 1.3 times the price at Bahr Dar in 1975 (before the establishment of AMC). In view of the increasing price of fertilizer (Appendix II) and consumer goods, the price paid by the AMC seems to be dictated by the objective of supplying the urban areas with cheap food grains with little concern to the peasant sector.

Table 6

Retail Price of White Teff in Five Towns

(Birr per Qt.)

Towns	1975	1979	1981
Addis Ababa	45.00	97.00	112.00
Assella	42.00	67.00	66.00
Bahir Dar	35.00	59.00	42.00
Debre Markos	-	59.00	45.00
Shashemene	54.00	74.00	84.00

Source: Joint Government of Ethiopia / World Bank Mission to Ethiopia, op cit, p. 56

1.2. The Need for Reconsidering the Present Strategies in Agriculture

Leaving the effect of natural factors aside, at least three points may be worth mentioning in connection with the present unsatisfactory growth. Firstly, a sound and viable economic development in low-income agrarian countries with high rate of population growth and with high income elasticity of demand for food depends on the rate at which the agricultural and in particular the food production is growing. A plan which envisages a rapid growth in GDP but only a moderate growth in agriculture (which is often the experience in developing countries) is unrealistic and inconsistent. If the food demand implied by the national

income growth is added to the demand generated by fast population growth, food production should grow at a rate of not less than the GDP, if not more.[19] Mellor[20] also noted that a high growth rate of income in developing countries naturally fuels an extraordinary rise in demand for food. The food demand in some fast growing countries rose by well over 5 percent a year. As production could hardly keep pace with the enormous demand, a sizeable amount of food had to be imported to supplement domestic production. It appears that the share of agriculture in the total public investment must be significantly increased to resolve the prevalent food shortage.

Secondly, the present emphasis on state farms need to be reconsidered in favour of the smallholders which account for over 90 percent of the food production in Ethiopia. The long-term objectives of growth and formation of producers' cooperatives depned on the surplus generated by the peasant sub-sector. State farms are also unable to bring about a broad-based increase in the rural purchasing power that is necessary to establish a dynamic interaction between industry and agriculture.[21]

Lastly, prices of agricultural commodities should be viewed in their broader perspective. If peasants are positively responding to prices, failure to take account

of the disincentive effect of fixing prices at low levels may have a damaging effect on production. It must be understood that the need to provide food at low prices to the urban residents and the need to give price incentive to the producers may not be conflicting particularly in the long-run. Price incentives may encourage the adoption of new technologies and thereby increase production to bring down prices. Low price of grains, on the other hand, may frustrate the diffusion of new innovations, promote subsistence production and aggravate food shortage in the urban areas.[22]

1.3. Objectives

The foregoing discussion has tried to show the nature and intent of the past and the newly emerging strategies in agriculture. In general, there is an element of reluctance to develop the peasant sector. Investment resources have been largely directed to the development of commercial (private) farms before 1974 and state farms since 1974. Not surprisingly, achievements are unsatisfactory and at a time when food supply failed to keep pace with the growing urban demand, state marketing institution have been organized to purchase grains at relatively low prices with little allowance to the possible disincentive effect (of this measure) on increasing production. It has

also been shown that the present strategies in agriculture are unable to bring about the desired growth in agriculture and increase in rural purchasing power necessary for revitalizing the agricultural sector and therefore the whole economy. A solution to the present food problem in addition to creation of dynamic development impulse and structural transformation appears to be best served by concentrating resources & policies in favour of peasant agriculture. It is against this background that this study endeavours to make an empirical analysis of the supply response of the peasant producer. In particular the study addresses itself to the following objectives:

(1) To assess the significance of labor, draught animals, land, fertilizer, asset position and educational level in the output of a peasant household and to assess the degree of efficiency at which some of these resources are utilized;

(2) To examine the nature and factors affecting the market supply of a near-subsistence peasant;

(3) To assess the response of production and market supply to price;

(4) To draw some policy implications that may prove useful in the formulation of the right kind of

investment and incentive structure to overcome the bottlenecks of production in the peasant sector.

The focus of the study is on small peasants growing mainly Teff (Eragrostis teff). Teff is a small cereal grain cultivated for food only in the highlands of Ethiopia. It is of high economic value to the country. It occupies the largest share of the land under cereals. Teff can grow under fairly waterlogging conditions where other cereals like wheat and barley cannot grow. The grain can be kept for many years without being seriously damaged by insect pests. To many Ethiopians, particularly in urban areas, teff is a staple food and its demand is high relative to other cereals.[23]

2. LITERATURE REVIEW AND THEORETICAL FRAME OF REFERENCE

Despite the general agreement on the need to increase production authors and policy makers seldom agree over the strategies that need to be pursued to increase peasant production. At the root of the disagreement is the efficiency of resource utilization and response to economic incentives in a near-subsistence peasant sector.

2.1. Production Behaviour

Theoretically, the economic behavior of a subsistence peasant may be explained by the income and substitution effect of output price changes on the intensity of resource utilization. The family may decide on the reallocation of total labor time between agricultural activities and leisure in response to price changes or incentives. Similarly, the decision whether to use non-traditional inputs may be affected by the prevailing input-output price relationship.

The manner in which family labor is allocated between leisure and agricultural activities depends on whether leisure is valued as an inferior or a normal good by the family. If it is an inferior good, an increase in the price of the producer's output (i.e. an increase in the price of agricultural labor) will decrease the demand for leisure. The working time thus increases on account of the income effect. The substitution effect also works in the same direction. An increase in the price of output may induce a substitution of leisure time by agricultural activities. The production response to price is [illegible] hence positive in as far as leisure remains to be an inferior commodity. Alternatively, leisure may be considered as a normal good and an increase in output price

may increase the demand for leisure. The objective of the peasant could be fixed income and any improvement in the price of grains may give him the opportunity of enjoying more leisure time since less production is required to achieve the desired income. The result is therefore a negative response (decrease in production) to price if leisure is a normal good to the peasant. However, the substitution effect works in the reverse direction. The increase in price may encourage the household to increase its production. The net outcome hence depends on whether the income or the substitution effect is greater. The theory is consistent with any inclination of the supply curve, including backward bending curves, provided family labor is assumed to be the only variable input that the household can reallocate. The way in which a family farm adjusts its labor input is purely an empirical question.[24]

In areas where non-traditional inputs are accessible, the decision to apply these inputs and the level of consumption depends on the objective, risk and uncertainity involved and the extent of efficiency of the peasants.[25] If the family is content with what it used to produce (i.e. fixed income objective), the decision will be resistance to the new innovations and the explanation appears no less than inefficiency or irrationality. On the other hand, if peasants do maximize their income, modern inputs are utilized

up to a level justified by the efficiency criteria. The situation gets more complex, however, where risk and uncertainity are involved. The objective of the peasants may shift to maximizing the family's chance of survival instead of income. To the risk-avoiding peasant, it might be preferable to use traditional technology of food production which combines a low "mean" yield per acre with low 'variance' (less risk) rather than the new technology which may promise a higher 'mean' yield but with the risk of higher 'variance'. The benefit promised may appear too little to overcome the expected risk and uncertainity. The response of near subsistence peasants to modern inputs is again an empirical question. Anything can happen in theory.

Lack of conclusive theoretical evidence on peasant response has led to controversial arguments among authors.[26] Near one end of the spectrum of viewpoints are those who maintain that the social and institutional set-ups in a pre-industrial community inhibit rational responses to economic forces. The poverty in the subsistence sector is related to the absence of normal economic behavior of a western society such as unlimited needs or profit-seeking. A pre-requisite to economic progress is a transformation in the social, cultural, psychological, etc. attitudes prior to the use of economic means of motivation. If this viewpoint is correct, attempts to increase food production

the introduction of off-farm inputs and/or incentives are bound to be ineffectual. A substantial opportunity to increase agricultural production exists only in extension and education services aimed at improving reallocation of traditional inputs.[27]

Near the other end of the spectrum are those who postulate that traditional peasants are efficient and responsive to economic incentives. Scholars of this persuasion believe that peasants are hard-working, efficient, frugal and thrifty. If peasants appear conservative, it is only because of unwanted leisure imposed by the limitations of land, capital or non-rewarding environment. A considerable scope for increasing production is also said to lie in the provision of incentives which may take the form of better output prices and productive inputs. The introduction of non-traditional inputs is believed to yield better results than attempts to educate the farmers to be efficient.[28]

Most of the empirical studies made relate to producers' response to change in the price of a single agricultural commodity.[29] The results generally indicate that relative improvement in the price of a given crop significantly alters the composition of agricultural output in favor of that particular crop.[30] A typical example is the substitution of food crops by cash crops whose price is relatively more

more attractive. It is also held that traditional peasants are more responsive because of the greater flexibility of capital and managment know-how than commercialized farms.[31] However, a major complexity arises with respect to the aggregate responses of agricultural commodities. It is not unlikely for the supply of any individual crop to be price elastic, and yet the total agricultural output to be inelastic or even negative.[32] However, it should be noted that an acreage shift from lower to higher valued crops results in an increase in the value of aggregate production.

The production behavior of subsistence peasants has also been studied from the point of view of relavtive economic efficiency in resource utilization. The majority of such studies are based on the estimation of production functions from which the average marginal value product (MVP) is derived for comparison with the relevant marginal factor cost (MFC). The results of many case studies seem to prove the efficiency hypothesis of Schultz.[33] But there are also studies which do not subscribe to the contention that peasants allocate resources efficiently.[34]

For various reasons, government intervention in agricultural price-making mechanism is very common in developing countries. Although the need for setting and regulating food grain prices may originate from the need to

provide adequate incentives to the producers, the objective of ensuring a regular supply of food products at low prices to consumers have been the dominant criterion in practice.[35] The inspiration for intervention may also be found in the theory of economic development which contends that resources in agriculture should be tapped to finance manufacturing investment since productivity is said to be higher in the latter. The basic assumption underlying this theory is that the price elasticity of production is inelastic. Peasants are considered to be irresponsive to price and therefore, they can be taxed without adverse effect on total production or the composition of output.[36]

The effect of government intervention in the marketing of agricultural products has increasingly attracted a number of researchers and international organizations such as the World Bank and the United Nations. In general, the studies made indicate that measures intended to keep prices of food products at low levels are inconsistent with the badly needed increase in production. For instance, Willis Peterson,[37] concluded that with more favorable farm prices, agricultural output could have been 40 to 80 percent greater than its actual level in his sample of 27 developing countries. Insufficient price incentives are also considered to be an important factor behind the disappointing growth of the African Agriculture.[38]

Some studies have also underscored the role of a well-balanced system of incentives in collective agriculture.[39] Case studies in the Soviet Union, China, Vietnam and Tanzania demonstrate that failure to provide economic incentives has negatively affected production. The most visible feature of the gradual revision of the traditional policies and planning procedures in these countries is therefore improvement in price ratios in favor of agriculture.

2.2. Market Supply Behavior of Food Crops

Measures to increase production are incomplete without steps to increase the market supply of a subsistence sector. The cash necessary to purchase off-farm inputs depends on the income earned from grain sales. An increasing volume of food supply must also be secured to satisfy the demand of the fast growing market dependent population.

Food crop production of a peasant household is allocated between home consumption and market sales, although the former is obviously the primary concern. The allocation decision which is affected by various factors such as price and level of output has been the focus of numerous studies. According to some authors,[40] subsistence peasants have a fixed demand for money and therefore sell only as much production as is necessary to obtain the desired money income.

At higher prices the peasants sell less and more at lower price to satisfy their fixed cash demand. It is assumed that both income elasticity of demand for non-agricultural commodities and the substitution effects are zero. The plausibility of this hypothesis, however, has been challenged on various grounds. Some authors contend that the cash demand of peasants is unlimited and at higher prices they sell more because their income elasticity of manufactured goods is elastic.[41]

Both positive and negative responses are documented in empirical studies of market supply of subsistence crops. Kirshana,[42] for example, showed that the likelihood of perverse market behavior is extremely small for the Indian peasants. A case-study in Sudan[43] also noted that small holders positively respond to price. Results to the contrary are not also rare. Krishinan,[44] Bardhan[45] concluded that peasants tend to sell less at higher prices and vice versa. Keeping prices at low levels is necessary to ensure adequate market supply of food if the latter result is correct.

2.3. Studies in Ethiopia

In spite of its considerable share in the GDP, research results pertaining to the subsistence sector are limited in

Ethiopia. Particularly studies on the response of peasants to economic incentives are highly limited. Some indirectly related works that may be worth mentioning are summarized below.

To begin with, Gooring et. al[46] estimated price response of some export crops prior to the Revolution in 1974. Among the crops included in this study were horsebeans and chickpeas which were grown largely by small farmers; other crops were mainly produced by commercial farmers. The estimated price elasticities of these crops were negative. It seems, albeit partially, that small holders responded negatively to price. In contrast, Bisrat[47] showed that the subsistence sector responded positively to price incentives. He maintained that at higher prices peasants increase their fertilizer consumption, provided that the risk factor and contact with extension agents are not limiting factors. Recently, a Mission from the Food and Agricultural Organization (FAO)[48] and the World Bank[49] has also reported that inadequate price incentive is among the major factors behind the sluggish performance of the country's agriculture. The report is based on the assumption that peasants' response to price is positive.

Evidently, there is a critical gap in our understanding of the peasant community. The present research is perhaps

a timely response. But it is, by no means, intended to provide conclusive evidence. It is the researcher's belief that further research is required to cast more light on the issue of supply response.

3. METHODOLOGY OF STUDY

3.1. Data Collection

The data for this study were obtained from a small-scale interview survey in three different areas of Shoa Administrative Region. The questionnaire shown in Appendix I was used to obtain the necessary information. A pre-test study and consulation with various experts have helped in developing the items of the questionnaire. In order to ensure better communication the Amharic version of the questionnare was used.

It is undeniable that peasants are suspicious in releasing information pertaining to their way of life. A detailed explanation of the purpose of the survey therefore has to precede the actual interview in order to obtain reliable data. To this end, a general meeting of the peasant association was called where representatives from the Woreda Peasant Association and the Ministry of Agriculture took part to convince the peasants that the objective of the study was purely academic and that individual household information would be kept confidential.

Four to five enumerators speaking the local language (Oromigna) and with high school level of education were used in each of the three survey areas. Sufficient training was given for about two days before they were sent to

interview the randomly selected respondent, i.e. the head of the household. The interview took place at the homestead or work place of the household. The field work was carried out during the month of October, 1983. The period concided not only with the relatively slack season of the year, but it was also the end of the cropping year (1982/83) to which this study refers and, therefore could rely on fresh memories about the year just approaching an end.

3.2. Sampling Design

The kind of sampling design to be used depends on the objective of the research, cost, method of analysis and the degree of precision desired.[50] Often cost considerations dictate the use of complex designs such as multi-stage sampling technique particularly in large-scale surveys. But the method has a disadvantage as it involves a greater problem of statistical analysis especially, if the method of analysis involves 'first-order statistics' (eg. regression or correlation coefficients) and 'second-order statistics' (eg. standard error). Where large samples are used the regression and correlation coefficients can approach their respective population values. The estimates of standard errors are, however, affected by the design. Positive intra-cluster correlation induced by the multi-stage design leads to the violation of the basic assumptions of Ordinary Least Squares (OLS), i.e. auto-correlation and

hetroskedasticity. This renders test of significance and hypothesis testing invalid.[51] Simple random sampling, on the other hand, provides a safe alternative as far as the method of analysis involves complex analytical statistics (eg. regression). But it is extremely costly to use simple random sampling in a survey covering a large population. Its validity is restricted to small scale surveys covering a small pupulation.

The objective of this research was also taken into account when palnning the appropriate sampling design. Among the different objectives of this study is to compare three groups of peasants taken from areas representing high, medium and low price levels according to the open market price of the region. The question was whether to represent each group by a peasant association or a Woreda. However, representing each group by a Woreda distorts the assumption that the group mainly grows teff since a Woreda covers a large area with different ecological conditions (different cropping patterns).[52] Furthermore, a Woreda could hardly be used as a sampling population if simple random sampling is the preferred design from the point of view of analysis. It is very costly to pick individuals randomly from such large area.

It was in the light of the above considerations that we decided to use simple random sampling and to designate

each group by a peasant association.[53] This is the only alternative consistent with the method of analysis used in this study (regression and covariance analysis) within costs that could be met. Accordingly, a single peasant association was selected from each of the three Woredas, Akaki, Becho , and Werojarso within Shoa Administrative Region. Akaki is in Menagesha Awraja about 10 to 15 kms south-east of Addis Ababa. The peasants in this Woreda have a direct access to the open market of Addis Ababa and in this study, Akaki represents a high open market price level. Becho , is in Chebo and Guraghe Awraja about 90 kms south-west of Addis Ababa. It represents a middle-level open market grain price. Werejaso is in Selale Awraja about 180 kms north of Addis Ababa and it represents a low price level in this study. Each Woreda has an all-weather road and the selected associations are 10 to 12 kms from the market place of their respective Woredas. The retail price of mixed teff was about 95 Birr in A, 78 in B and 52 in C at the time of the pre-test study.

The restriction of the study to Shoa is based on the need to retain a certain degree of uniformity in cultural, ecological, institutional and infrastructural patterns which may otherwise distort the results of the price response analysis. It should be noted that it is mainly the ban on inter-regional grain movement that has caused significant

price variability between districts (see for example, Appendix I).

Once the sampling design and the sample areas have been decided, the question about how large a sample to take was determined by our financial means. The largest samle financially possible was thus to take a 20 percent sample from each peasant association. More than 50 households were interviewed in each ease. For case of reference the associations are referred to as Group A, B and C representing the associations by the name of Koye (in Akaki), Awash Bune (in 'Bocho and Daye Tuti (in , respectively.

3.3. Description of the Sample Areas

Some of the major characteristics of the sample areas are summarized in Table 7. The average holding size under cultivation is 1.97 hectares in A, 1.91 in B and 2.54 in C. The size of holding varies between 0.44 and 4.62 hectares in A, 0.27 and 3.60 in B and 1.20 to 4.20 in C. The proportion of teff field in the total cultivated area is 53.5% in A, 58.7% in B and 66.7% in C. Other crops of relative importance are chickpeas, grasspeas, wheat and 'noug' (oil seed).

Labor is one of the major inputs in a traditional peasant economy. The amount of labor force that a household

can mobilize primarily depends on the family size. The average family size is 4.9, 5.2 and 5.8 in A, B and C, respectively. The reported labor (man-years) engaged in production is estimated as 2.3, 2.4 and 2.8 in A, B and C, respectively (the method used for estimation is given in Notes 54.

A pair of oxen constitute the draught animals in the highlands of Ethiopia without which grain production is inconceivable. The mean oxen number (per household) is 1.6 in A, 1.2 in B and 1.8 in C. The propertion of households without a pair of oxen (only one or no ox) is 43.6% in B and 38.9% in C. The number of non-draught livestock was estimated as 3.1 heads of cattle in A, 2.1 in B and 4.9 in C based on the conversion ratio used in Ethiopia (see Notes 55.

Fertilizer is virtually the only off-farm input used in the survey areas. The average consumption per hectare of teff land is 121.0 kgs in A 3.4 in B and 27.0 in C. The low level of fertilizer consumption in B is explained by the fact that only five of the sixty household interviewed used fertilizer.

The mean teff output (per household) is 6.9 quintals in A, 4.7 in B and 7.2 in C. The proportion of sales in the total teff output is 42.7% in A, 36.6% in B and 19.6% in C. Some other characterstics of the study areas are given in Appendix

Table 7

Main Characteristics of the Sample Areas

		Peasant Association		
		A	B	C
1.	Land under cultivation (ha.)			
	Mean Area Per Household	1.97 (1.03)	1.91 (0.61)	2.54 (0.62)
	Share of teff in the total cultivated area (%)	53.50	58.70	66.70
2.	Family Characterstics Average family size	4.90 (2.69)	5.17 (0.32)	5.80 (1.92)
	Average number of economically active members	3.95 (2.01)	3.95 (0.46)	4.22 (1.62)
	Estimated labor size (man-years)[54]	2.34 (0.79)	2.43 (0.87)	2.79 (0.78)
3.	Number of oxen owned			
	Mean oxen number per household	1.60 (1.10)	1.30 (0.77)	1.80 (0.98)
	Proportion of Households with no or only one ox (%)	42.9	50.8	26.0
4.	Mean Number of Livestock (non-draught) owned (head of cattle)[55]	3.17 (3.11)	2.10 (2.31)	4.94 (4.12)
	Average consumption per household (Qt.)	1.81 (1.13)	0.03 (0.13)	0.46 (0.33)
	Proportion allocated to teff land (%)	69.60	100.00	100.00

Table 7 continued .....

	Peasant Association		
	A	B	C
6. Teff output			
Mean output per household (Qt.)	6.91 (2.97)	4.66 (2.19)	7.16 (2.60)
Yield per hectare	6.58 (2.05)	4.20 (1.25)	4.34 (1.37)
7. Proportion of households reporting crop damage (%)	21.80	43.0	31.2
8. Market supply of teff per household	2.95 (1.78)	1.72 (0.93)	1.41 (0.98)
9. Average cash income from 56 alternative source (Birr)	97.04 (103.25)	74.53 110.36	136.94 (120.77)

[54] Individuale reported to work permanently and temporarily on the field. The weight given to those working temporarily is 0.5 of permanently working individuals (see chapter 4.1).

[55] The livestock numbers were converted into heads of cattle based on the ratio which is determined for each type of animal for Ethiopia (1 standard animal unit (SAU) = 0.7979 converted in to head of cattle based on this ratio (1 head of cattle is equivalent to 9 sheep or 11 goats). See Tegegne Teka and Tennassie Nichola, Rural Poverty Alleviation: The case of Ethiopia, (AAU, IDR, Research Report No. 17, Jan. 1983) p. 97.

[56] It refers to cash income earned from the sale of livestock, labor, firewood, etc. and to income remitted by persons who have migrated out of the household.

Figures in parenthesis are standard deviations.

3.4. Method of Analysis.

3.4.1. Multiple Regression

Production and market supply function are titled to each group using multiple regression models. The specific form of the models used for the estimation is given below:

Linear Model

$$Y = b_o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + U \quad \ldots \quad (1)$$

Cobb-Douglas Models

$$Y = b_o X_1^{b_1} X_1^{b_2} X_2^{b_3} X_3^{b_4} X_4^{b_5} X_5^{b_6} X_6^{b_7} e^{u} \quad \ldots \quad (2)$$

For estimation purpose equation 2 is transformed into:

$$\log Y = b_o + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 \quad \ldots$$
$$+ b_7 \log X_7 + U \quad \ldots \quad (3)$$

Where X_1 = land ; X_2 = fertilizer; X_3 = labor

X_4 = livestock; X_5 = oxen; X_6 = Crop damage

X_7 = education

U = error term

e = constant term which assumes the value 2.718 (the base of the natural logarithms) or 10 (the base of logrithms to the base 10) depending on whether natural or base-ten logarithms are used.

Similarly the market supply functions are estimated as:

Linear Model

$$Y = a_o + a_1 X_1 + a_2 X_2 + a_3 X_3 + u \quad \ldots(4)$$

Cobb-Doglas Model

$$Y = a_o X_1^{a_1} X_2^{a_2} X_3^{a_3} e^u \quad \ldots(5)$$

which is transformed into

$$\log Y = a_o + a_1 \log X_1 + a_2 \log X_2 + a_3 \log X_3 + u \ldots(6)$$

where X_1 = Teff output per adult unit

X_2 = Cash income from alternative sources

X_3 = Education

u and e = as defined above

Both linear and Cobb-Douglas Models have been tried to reduce misspecification errors arising from incorrect mathematical form of the regression. The analysis has been based on the model which gives the best fit. As many variables as economic theory and our field observation allow have been included in the functions estimated since errors

due to inclusion of irrelevant variables are less severe than omitting the relevant ones.[57]

Errors in the measurement of variables can result in a biased estimate of the coefficient of the incorrectly measured variable. This may understimate the importance of the variable in the regression.[58] Variables most liable to measurement error are labor and oxen. The stock of these inputs may not be highly correlated with the actual flow their service due to mutual cooperation. The regression coefficient of labor and oxen may be underestimated in this case.

3.4.2. Coveriance Analysis

One of the objectives of this paper is to see whether production and market supply are significantly altered as we go from Akaki (Group A) to Bechó . (Group C) following the change in the price level of the open market. Mathematically, this is the same thing as testing whether coefficients of the explanatory variables are significantly different between the groups, i.e. covariance analysis.

The procedure of analysis used can be summarized as:[59]

(i) Fit a regression to the combined (all groups) data matrix to obtain the combined residual sum of squares (SSE_c)

(ii) Fit a separate regression to each of the Group and sum the residal sum of squares to get

SSE_s (summed residual sum of squares).

The F-test is thus:

$$F_{(c)} = \frac{(SSE_c - SSE_s) / K}{SSE_s / (T - 2K)} \quad \ldots\ldots\ldots\ldots \quad (7)$$

distributed as $F^k_{(t)}$ T-2k at a certain level of significance

where T = Total observation

K = The number of parameters estimated.

If $F_{(c)}$ $F_{(6)}$ the hypothesis that the groups are homogeneous is rejected.

If the groups are found to be different on the basis of the above test, it is of interest to know which variables have made a greater contribution to the overall difference than others. This is done by formulating a regression in which dummy variables are included for each of the variables suspected of having different coefficients and a dummy interecept for each group. For two groups the model may be formulated as:

$$Y = a_o + a_1 X_1 + a_2 X_2 + \ldots a_m X_m + \ldots a_k X_k + a_1^* Z + a_2^* Z X_2 + \ldots a_m^* Z X_m + U \quad \ldots (8)$$

where Z = 1, for the first group

0, for the second group

$X_2 \ldots X_m$ are the variables being tested for difference

$X_{m+1} \ldots X_k$ are the variables suspected to be the same for both groups.

The t-statistic of the estimated coefficients $a^*_1 \ldots 0_m$ test that the intercept and the variables $X_2 \ldots X_m$, taken separately are the same in each group.

3.5. Limitations of the Study

The research is based on a single-contact, interview based cross-sectional survey. All the production functions are thus estimated using inputs measured in stocks rather than in flows. It is to be admitted that results would have been better had repeated visits been made during the whole year to get the actual flow of services from the respective sources.

The study of the response of market supply to price using a cross-sectional data implies comparing group of peasants taken from areas reflecting different price levels. Factors such as urbanization and availability of consumer goods are assumed to be constant. However, this assumption may happen to be restrictive. In the survey areas of this study, the effect of these variable (if significant) is in

the same direction as the price (where prices are high urbanization effects and availability of consumer goods are also relatively high) and no attempt is made to sort out the effect of urbanization and availability of consumer goods from price on market supply.

4. PRODUCTION BEHAVIOR

4.1. The Variables

Factors that may directly or indirectly affect production have been included in the functions estimated using equation 1 and 3. The form in which each variable entered the functions is given below.

1. Labor

The members of the family reported to work permanently and temporarily on the farm have been taken as an indicator of labor stock owned by the family. The weight of occasional labor in the production activities depends on the kind crop cultivated and the task performed. For instance, teff is believed to require more woman and child labor than other cereals. The 1973 EPID survey[60] of the area around Debre Zeit (Teff growing region) showed that wives spend about 60 percent as much time on 'farm work' as their husbands. Massel[61] weighted children at 0.5 of adults in his Cobb-Douglas production. In this study it is assumed that individuals reported to work occasionally on the farm contribute the equivalen of 0.5 of permanently working individuals. The weight used is partly subjective and partly based on the fact that women and children play an important role in teff production.

2. Capital

A number of items comprise the stock of capital goods in peasant production. A broader classification may include.[62]

(i) Non-monetary capital investment created with non-wage labor.

(ii) biological and chemical inputs, and,

(iii) labor substituting capital which may consist of draught animals and mechanized power.

In the functions estimated, the number of oxen and non-draught animals owned, and the amount of fertilizer consumed have been used. Plows, oxen yoke, harvesting and threshing equipments are not used because they showed no significant variability between households.

3. Land

The size of land under cultivation (in hectares)

4. Crop damage

Frequently production is affected by pests, disease, waterlogging, frost, hail storm, etc. Households reporting crop damage of these kinds have been differentiated from those not reporting using a dummy variable to assess the significance of the problem. The variable assumed the value

one for households reporting and zero for those not reporting crop damage.

5. Education

The number of years in school is commonly taken as a proxy measure for management skill of peasants. The indicators used are zero for households who cannot read and write, one for those who can write and read and two for those with high school level of education. Since household heads with high school level of education are not common the education variable could be taken as a dummy variable showing the difference between literates and illiterates.

6. Output

The volume of teff output (in quintals) is used as a dependent variable.

4.2. Results

Table 8 shows the regression estimates which appeared best among the various functions attempted. The proportion of explained variation or goodness of fit (R^2) is satisfactory given the fact that no distinction is made between the quality of the soil used for production. It can also be seen that both linear and Cobb-Douglas models tend to point to the same result.

The coefficient of labor is not significantly different from zero. The number of oxen owned and education variables have similarly failed to be significant (see Appendix IV). The size of land under cultivation is the most pwerful explanatory variable. Its standardized regression coefficient is nearly 3 times the next important non-dummy variable in A. The fertilizer variable could not be included in the functions estimated for B as only five of the sixty households in our sample reported that they used this input. In A and C the coefficient of fertilizer is, however highly significant and positive. Another significant variable is the livestock variable. The higher the number of livestock owned the higher is the level of crop production. And, throughout all the groups the crop damage variable is significant and it has a negative coefficient. There is a significant decrease in output as a result of pests, disease, waterlogging, frost, etc.

A test for homogeneity was made to see whether production behavior is different between the sample groups. No test is required to show that the production fucntion of B differes from A and C, for the former does not include a variable (i.e. fertilizer) which is significant in the latter two groups. The test was thus made for A and C and the result obtained was (using equation 7):

Table 8

Regression Estimates of Production

(Dependent Variable Teff Output (Qt.)

(Using Equation 1)

Variables	Coefficients (Marginal Productivities)		
	A	B.	C
Land (ha) (X_1	4.600*** (10.156)	3.114*** (7.256)	1.119** (2.128)
Fertilizer (Qt.) (X_2)	2.315*** (3.182)	---	2.827*** (3.501)
Labor (X_3)	0.077 (-0.838)	0.165 (0.757)	0.525 (1.228)
Livestock (X_4)	0.020 (1.342)	0.192** (2.124)	0.207*** (3.148)
Crop Damage (X_5)	-1.713*** (-4.026)	-1.161*** (-3.345)	-3.252*** (-4.604)
Intercept	1.259	1.836	1.443
R^2 (Adjusted coafficient of determimation)	80.7%	67.9%	52.2%
Sample size (n)	55.	60	54

*** Significant at 1% level of significance
** Significant at 5% level of significance
* Significant at 10% level of significance

Figures in parenthesis are completed t-values.

Table 8 cont'd. ...

(Using Equation 3)

Variables	Coefficients (Elasticities)		
	A	B	C
Land (ha) (X_1)	0.543*** (5.813)	0.510*** (6.399)	0.847*** (5.545)
Fertilizer (Qt.)(X_2)	0.115*** (4.834)	---	0.059*** (4.414)
Labor (X_3)	-0.066 (-0.930)	0.098 (0.926)	0.077 (1.103)
Livestock (X_4)	0.022* (1.718)	0.034*** (3.189	0.011 (1.120)
Crop Damage (X_5)	-0.160*** (-4.625	-0.132*** (-3.984)	-0.165*** (-4.360)
Intercept	0.831	0.666	0.760
$\bar{R}^2$ (Adjusted coaffi-cient of determina-tion)	77.2%	64.0%	55.3%
Sample size (n)	55	60	54

*** Significant at 1% level of significance
** Significant at 5% level of significance
* Significant at 10% level of significance

Figures in parenthesis are computed t-values

SSE_c (combined residual sum of squares) = 343.47

SSE_s (summed residual sum of squares) = 235.38

n (number of observation) = 109

K (number of paramaters estimated) = 6

Hence, $F_c = \frac{(343.47 - 235.38)/6}{(235.38) / (109-12)} = 7.43$

The tabulated F-value (with 6 and 97 degrees of freedom) at 1% level of significance is about 3.0. Thus, the hypothesis that the two groups are the same was rejected. This was followed by an analysis to determine whether the marginal productivity of fertilizer and land are significantly different for the two groups. The result using equation 8 was:

$$Y = 0.64933 - 0.00513X_1 + 2.94640X_2 + 0.23966X_3$$
$$(-0.06083) \qquad (4.88322)^{***} \quad (4.47173)^{***}$$

$$+2.63225X_4 - 2.00815X_5 + 0.45237\,Z$$
$$(4.70435)^{***} \quad (-5.76564)^{***} \quad (0.43524)$$

$$-1.64427ZX_2 - 0.28069ZX_3 + 2.01284ZX_4$$
$$(-3.34810)^{***} \quad (-3.23286)^{***} \quad (2.63763)^{***}$$

where Y = teff output, X_1 = labor, X_2 = fertilizer,

X_3 = livestock owned, X_4 = land size (teff)

X_5 = crop damage (dummy variable)

$Z = \begin{cases} 1, & \text{if the observation is from A} \\ 0, & \text{otherwise} \end{cases}$

*** significant at 1% level of significance,

** at 5% and

* at 10%.

The result shows that the marginal productivity of fertilizer and land is significantly different between A and C (see the coefficient of ZX_2 and ZX_4). The marginal productivity of fertilizer is higher in C than A while the marginal productivity of land is higher in A than in C. It can also be seen that the marginal contribution of livestock is significantly different (ZX_3) and the difference in terms of intercept (Z) is insignificant. If the values 0 and 1 are substituted for the above equation, the result approximates the equation of A and C given in Table 8.

4.3. Discussion and Efficiency Implications

The result shows that the marginal productivity of labor and oxen is not significantly different from zero. Two alternative explanations may be advanced to account for the insignificance of these traditional inputs. Firstly, the regression coefficient may be underestimated because the stock of labor possessed by the family could be a poor proxy measure of the actual labor used or the variability in the amount of labor used between the households could be undermined by mutual cooparation. Secondly, these inpute

particularly labor may not be a limiting factor in production. The households may possess surplus labor and the result probably attests to the conception that the marginal productivity of labor is zero in peasant agriculture. The most likely explanation could, however, be found in observation related to the pattern of labor and oxen utilization. The majority of the peasants indicated that they had critical labor shortage during the peak seasons (see Table 9). The shortage is also said to be exacerbated by the need to work for the families of militia, cooperatives and by the need to participate in some social obligations (e.g. meetings). To cope with the enormous demand, mutual help organizations are used by most of the households.

The most commonly used cooperative arrangements are "Debbo" and "Wonfel". While the latter arrangment involves a formal obligation of reciprocal labor exchange, the former does not necessarily involve this. Only some cost is incurred as food and drinks have to be prepared when organizing "Debbo". This is not only a cheap way of getting extra labor compared to hiring casual labor, but it also enables the peasants to cope with the tight cropping seasons by mobilizing substantial labor force at a time. Such arrangments are also easily operated and non-monetized to avoid financial and administrative

complications. It is also interesting to note that in areas where grain prices are relatively high (A) the peasants tend to hire casual labor relatively more often than others. It appears that the marginal productivity of labor cannot be zero at least during the peak seasons and if it had not been for the mutual cooperation labor constraint would have been an important hurdle to many peasants. Similar mutual cooperative arrangements are used to overcome the oxen shortage as 42.9% in A, 50.8% in B and 26.0% of the households interviewed in C reported to be lacking a pair of oxen (either no ox or only one).

Table 9

The Response of the Peasants to Labor Demand

	A	B	C
Peasants reporting labor shortage (%)	72.7	68.3	79.6
Measures reported to overcome the shortage			
1. Mutual cooperation (%)	70.0	87.8	86.0
2. Hiring casual labor (%)	30.0	4.8	11.6

The significance of the livestock variable is not surprising, given the fact that mixed farming is an important means through which peasants finance crop production and overcome the risk and uncertainity involved.

Farm animals provide a convenient source of cash to buy seeds, fertilzer and other inputs wherever formal credit sources are lacking and where output levels are generally low. Although grazing land may compete with farm land, especially where land is limited, the peasants need to keep some animals to restore the crop reproduction cycle which is constantly threatened by crop damage as well as to raise oxen necssary for ploughing. This result is consistent with a research report[63] which noted a significant correlation between livestock numbers and cereal output.

In spite of its significance in production (from the functions estimated for A and C), fertilizer is not used by most of the peasants in B. The failure to use this input might appear to imply incompetence or lack of awareness. A closer look into the reasons, however, showed that the association was forbidden to purchase fertilizer since it failed to meet the repayment requirement on the previous debt. At least 95 percent of the association's previous debt needed to be repaid to obtain a new loan according to the requirements of fertilizer distribution in 1982/83. The peasants explained that their failure to comply with the regulation was due to the crop failure they had experienced during the previous cropping year, not lack of awareness or incompetence.

Farm animals provide a convenient source of cash to buy seeds, fertilzer and other inputs wherever formal credit sources are lacking and where output levels are generally low. Although grazing land may compete with farm land, especially where land is limited, the peasants need to keep some animals to restore the crop reproduction cycle which is constantly threatened by crop damage as well as to raise oxen necssary for ploughing. This result is consistent with a research report[63] which noted a significant correlation between livestock numbers and cereal output.

In spite of its significance in production (from the functions estimated for A and C), fertilizer is not used by most of the peasants in B. The failure to use this input might appear to imply incompetence or lack of awareness. A closer look into the reasons, however, showed that the association was forbidden to purchase fertilizer since it failed to meet the repayment requirement on the previous debt. At least 95 percent of the association's previous debt needed to be repaid to obtain a new loan according to the requirements of fertilizer distribution in 1982/83. The peasants explained that their failure to comply with the regulation was due to the crop failure they had experienced during the previous cropping year, not lack of awareness or incompetence.

Although the peasants in A and C applied fertilizer to their teff fields, there is a significant difference in the level of application between the two groups, 120kg per hectare of teff land in A and only 27 kg in C. The difference may imply different degree of efficiency in the two groups since the cost of fertilizer is the same for both. But teff prices are not the same. Accordingly, the marginal value product and marginal factor cost of fertilizer were compared for a sound test of efficiency.

The marginal productivity of fertilizer is about 1.3 quintal in A and 2.8 in C. The marginal value product calculated at the AMC and open market farm gate price of each district is shown in Table 10. The cost of fertilizer is 116.00 Birr per quintal (assuming that the peasants used only DAP) in 1981/82 (the year during which fertilizer was purchased for the 1982/83 crop year). This is the marginal cost of fertilizer for both A and C. Theoretically, an input is said to be efficiently allocated if the ratio of its marginal value product to its marginal cost is approximately equal to one. If the ratio is less than one, too much of the resource is said to be utilized and a ratio greater than one implies that too little of the resource is used.[64] The estimated ratio for A is well below one (0.39) at the AMC farm gate price. But it approaches one (0.90) at the open market price. In the case of C, the ratio is

slightly less than one (0.84) at the AMC price and nearly one (1.09) at the open market price. Viewed against the the respective open market price levels, it is hence economically justifiable for the peasants in A to consume more amount of fertilizer per hectare and for peasants in C to consume less amount of fertilizer per hectare. It seems that fertilizer consumption is rather guided by the open market price. If the peasants had to sell their grain at the AMC price only, the observed level of fertilizer consumption particularly in A would have been beyond what is economically optimum.

Table 10

Ratio of Marginal Value Product to Marginal Factor Cost for Fertilizer

Peas. Assoc.	Marginal Physical Product	Farm gate price		Marginal value Product calculated at Fact		Marginal Cost (MFC)[76]	Ratio of MVP to MTC	
		AMC[74]	Open mark.[75]	AMC	Open Mark.		AMC	Open mark.
A	1.3	35.00	80.00	45.50	104.00	116.00	0.39	0.90
B	2.8	35.00	45.00	98.00	126.00	116.00	0.84	1.09

Notes: [65]The AMC farm gate price of mixed teff in 1981/82

[66]The local farm gate price of mixed teff in 1981/81

[67]The purchase price of DAP fertilizer in 1981/82

That the input-output price is the single most important determinant of effective fertilizer adoption is evident if one considers the minimum benefit / cost ratio (i.e. the incremental gain due to adding one unit of fertilizer to the cost of one unit of' fertilizer) necessary for inducing peasants to use the input. In Ethiopia, this minimum ratio is estimated at 2:1.[68] The incremental teff yield per hectare as a result of adding one quintal of fertilizer is also estimated at 2.29 quintal for some areas within Shoa Administrative Region.[69] Given these estimates and the AMC price currently in force, not only will the ratio fall below 2:1 but the peasants will also make a net loss if they have to use fertilizer. At a price of 89 Birr per quintal (the acutal price of DAP in 1982/83), the critical threshold of 2:1 is attained only if the farm-gate price of teff is 77.70 Birr/ quintal. The farm-gate price needs to increase to 101.30 Birr per quintal if the price of fertilizer is 116 Birr / quintal, (the actual price of DAP in 1981/82). If the peasants fail to respond to fertilizer demonstration of extension agents in recent years or if they decide to use less than the rate recommended by the Ministry of Agriculture, the explanation seems to be that the peasants are more rational than their educators.

To summarize, factors that have significant positive impact on production include land and fertilizer. Production

can respond to increase in the size of land. However, the possibility of land expansion is limited due to the increasing population pressure on land in the areas of study.[70] Increasing the amount of fertilizer consumption may provide the alternative. But further increase in the application of this input is uneconomical until the prevailing fertilizer-output price relationship is improved. At the price offered by AMC fertilizer application is an unprofitable venture and at the open market prices optimum level of fetilizer has already been applied. It seems that there is also little sense in the assumption that production can increase by mobilizing unutilized labor and oxen resources in the short-run. Within the economic, natural, social and cultural environment in which they operate, the peasants have a general shortage of labor and oxen especially during the busy seasons. Without mutual cooperation and without hiring casual labor in some cases the peasants would have not been able to relax the imitations of these inputs.

The impact of crop damage is also significant. Pests, disease, frost, waterlogging, etc. threaten production and the peasants have to keep some farm animals in order to finance the uncertain crop reproduction. However, increasing the livestock number to raise production is unwarranted because of the limited land available for grazing.

5. MARKET SUPPLY FUNCTIONS

The variables used in the estimation of market supply functions were the level of teff output, the amount of cash income from alternative (non-crop) sources, the level of education and family size. Income from alternative sources refer to that earned from the sale of livestock (often the major source), labor, firewood, etc., and that remitted by persons who have migrated out of the household.

Regression Estimates and Discussion

Table 11 summarizes the regression results of the three groups. Expressing teff output (one of the independent variable) and market supply (the dependent variable) per "adult unit"[71] has generally improved the value of R^2. The coefficients that are statistically significant are teff output (per adult unit) and income from alternative sources (with the exception of B). The education variable is significant only for A.

The principal determinant of market supply of teff is the level of output. Its coefficient is positive and highly significant. An increase of teff output by 1 quintal (per adult unit) results in an increase of market supply by about 0.57 quintal in A, 0.48 in B and 0.26 in C. Income from alternative sources tend to influence market supply negatively.

The higher the cash income from alternative sources the lower is the market supply of teff.

A separate regression was also run to test whether the observed tendency (marginal propensity) to sell is significantly different between the three groups. The test was made by specifying a regression model in which two dummy variables (z_1 and z_2) were added to take account of the difference between the three groups. The result obtained (using equation 8) was:

$$Y = -0.07232 + 0.14758X_1 - 0.00012X_2 + 0.74444X_3$$
$$(1.939)^* \qquad (0.455) \qquad (11.997)^{***}$$

$$+0.03370Z_1 - 0.01162Z_2 - 0.00112Z_1X_2$$
$$(0.295) \qquad (-0.091) \qquad (-1.980)^*$$

$$+0.12344Z_1X_3 \quad -0.00036Z_2X_2 - 0.21190Z_2X_3$$
$$(2.647)^{**} \qquad (-1.856)^* \qquad (-3.450)^{***}$$

where Y = market supply of teff per adult unit (Qt.)

X_1 = education

X_2 = cash income from alternative sources

X_3 = teff output per adult unit (Qt.)

Z_1 = 1, if the observation is from A
0, otherwise

Z_2 = 1, if the observation is from C
0, otherwise

Fixgures in parenthesis are computed to-values.

Regression Result of Teff Market Supply

(per adult unit) using eg. 4 Linear Models

Variables	Coefficients			Elasticities of the arithmetic mean[1]		
	A	B	C			
Teff output per adult unit (Qt.) (x_1)	0.57071*** (17.010)	0.47574*** (13.537)	0.26142*** (9.920)	1.32%	1.27%	1.19%
Income from alternative sources (Birr) (x_2)	-0.00104* (-0.1754)	-0.00025 (-0.765)	-0.00045** (-2.331)	-0.11%	-	-.018%
Education (x_3)	0.37933** (2.275)	-03524 (-0.516)	-0.04904 (-0783)			
Intercept	0.081	-0.041	-0.078			
$\bar{R}^2$	89.4%	76.8%	69.3%			
(n) Sample size	55	60	54			

Note: Dependent variable - the volume of teff sales per adult unit (in quintals)

*** - significant at 1% level of significance

** - significant at 5% level of significance

* - calculated for the significant continuous variables

Figures in parenthesis are computed t-values

It can be seen that Z_1 and Z_2 have a coefficient which is not significantly different from zero. This shows that the three groups do not differ in their intercepts. The coefficient of $Z_1 X_3$ which is significant and positive indicates that group A and B differ in their sales behaviour, i.e. A has a greater propensity to sell than B. The coefficient of $Z_2 X_3$ is significant but negative. This means that group C has a lower marginal propensity to sell than B. The groups also differ with respect to the influence of income from alternative sources (see the coefficient of $Z_1 X_2$ and $Z_2 X_2$).

In general, the results above show that the market supply of teff is an increasing function of output. Any increase in output is reflected in an increase of the market supply. It is also shown that market supply is a decreasing function of cash income from alternative sources (at least in A and C). This shows that the market supply of a food crop is determined by cash requirement. If the cash earned from alternative sources such as livestock is high, the peasants in the survey areas tend to sell less. It seems that improvement in the price of livestock or livestock products relative to the price of output motivates more consumption or hoarding and less sales. The observed low level of output, however, does not seem to support the contention that the peasants are hoarding. Most of the peasants interviewed have also reprted that their annual output is below their consumption requirement (see Appendix III).

If the amount sold had been a true surplus, cash income from alternative sources would have no impact on sales.

The hypothesis that the marginal propensity to sell is higher in A than B or C is also accepted according to the above result. The relatively high price in the districts of Akaki and Kotcho may have encouraged more sales per unit of output. The peasants in A and B explained that they sell part of their teff output which fetches relatively high price to buy cheaper grains such as maize and sorghum. In B "Kotcho" (a product of Enset plant, Enset ventricosum) provides a convenient food source in the substitution of high-valued grain for a cheaper food item.

6. SUMMARY AND CONCLUSION

The focus of this study has been on the production and market supply behaviour of near-subsistence peasants growing mainly teff (food grain). The survey concentrated on a sample of 168 farmers taken from three Woredas (selected on the besis of their open market teff price levels) in the Shoa Administrative Region. The attempt was basically to explain the pattern of resource (traditional and non-traditional) utilization, to identify factors of production that are underutilized due to inefficiency, as well as those that are real constraints.

The result of the production analysis has shown that production is positively influenced by the amount of land cultivated, the level of fertilizer consumed and the number of livestock owned. Livestock provide a convenient source of cash to finance production. The result also indicates that the incidence of crop damage due to pests, disease, frost, waterlogging, etc. is significant. It has also been shown that shortage of labor poses serious limitations during the peak seasons and lack of oxen is a critical problem to a number of households.

The possibility of increasing production using the resources which the peasants command depends on the extent to which these resources are efficiently utilized. The result of the efficiency assessment shows that the likelihood of under-utilized input is low, given the existing level of technology,

institutional arrangements and market opportunities. The chance of increasing production through increasing the size of land under-cultivation is limited owing to the increasing population pressure on land.[72] Without mutual cooperation, the peasants would not have been able to cope with the enormous labor demand during the tight agricultural seasons. In the absence of some farm animals it would have been difficult to restore the crop reproduction process which is full of risks and uncertainties.

There is a direct relationship between fertilizer consumption and the price of teff in the local market. Where prices are high, the consumption of the input is relatively high and vice versa, consistent with the criterion of economic efficiency, i.e. the equivalence of marginal cost to marginal value product. A further increase in the consumption of fertilizer would be unremunerative as far as the present input-output price relationship remains in force. The result is generally in agreement with the hypothesis that peasants are efficient and behave rationally in exploiting traditional and non-traditional resources. Thus, a considerable increase in production lies more in measures intended to increase modern inputs rather than reallocation of traditional inputs.

The analysis of market behaviour has shown that the market supply of teff is an increasing fucntion of output and a decreasing function of cash income from alternative (non-crop)

sources. The market supply decreases as cash income from non-crop source (mainly livestock sales) increases. The study further attempt ' to test whether significant differences exist in the propensity to sell between the different groups, and the result subscribes to the contention that peasants respond to higher prices by selling more. The peasants in areas with relatively high open market prices tend to substitute their teff output, which fetches a high price, by cheaper food grains such as maize and sorghum.

Ploicy Implications

Although the scope of this study is rather limited in that it covers only a few areas, its policy implications seem to be important. The prospect of increasing production in the peasant sector depends, to a large extent, on raising the consumption of non-traditional inputs. This in turn depends on increased investment and improvement in the incentive structure.

Investment in the peasant sector may be directed to finance extension and/or research activities. The return from expenditure on research might be considerable for the potentials of improved seeds (eg. resistent varieties) have yet to be tapped. Improvement of the traditional implements can have a far-reaching influence on production. Notwithstanding that the role of research in traditional agriculture is immense, policy-makers in developing countries often tend to concentrate resources on developing an elaborate network of extension. Money spent on extension is much

greater than expenditure on research.[73] Several factors underlie this choice. But the most important explanation could be the belief that teaching peasants to become more efficient (since it is usually maintained that they are not efficient) is more productive. This is not to deny the importance of extension. Its role in promoting the diffusion of new technologies is evidently clear. But, the rationality of emphasis on extension activities which are not based on tested research results and where the peasants appear to be efficeint, is not so obvious.

The provision of adequate incentives implies improving the profitability of adopting fertilizer of new technology by lowering input prices (e.g. subsidy) or by raising output prices. The ability of governments to shoulder the cost of subsidizing programmes is less in poor countries. Raising producer prices may yield better results. But high food grain prices have a deleterious effect on the market dependent urban population. It may also prove to be unpopular politically as riots could break out following food price increases.[74] In any case, the price increase is unavoidable as long as the use of modern inputs especially fertilizer is made uneconomical by measures which artificially lower producer prices (resulting in production which increasingly falls far-short of the growing demand). It is ironic to note that unless the plant nutrients which are withdrawn from the soil due to production are added back to the soil in the form of fertilizer, the productivity of the land will progressively decline. Coupled with the pressure on land (a problem well felt in many areas)[75]

which shortens the following periods, failure to apply adequate amounts of fertilizer will undoubtedly result in stagnation of production and a gradual decline. If price incentives are reasonable, the peasants can increase their fertilizer consumption and thereby relax the land constraint. It should also be noted that measures which raise the consumption of new inputs favourably affect market supply through increasing production.

A relatively less painful way of increasing food production lies in an attempt which combines the provision of incentives with investment intended to reduce production costs. A package of inputs, instead of a single input can dramatically reduce costs of production.[76] Consequently, a moderate increase in output prices could be sufficient to induce new innovations in the peasant sector.

Finally, it is worthwhile to note that the expansion of credit services in the countryside, construction of irrigation projects and the like also provide a profitable alternative to government investment. This alternative can not only result in the improvement of the well-being of the farmer population, but can also generate local employment opportunities leading to a development process less affected by the problem of rural-urban migration and unemployment in the urban sector.

NOTES

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[4] World Bank, Op. cit., p. 45

[5] World Bank, World Development Report, (1983) p. 150-58.

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[7] World Bank, World Development Report, (1983) p. 150-153.

[8] T.W. Schultz, "On the Economics and Politics of Agricultural Incentives," Development Digest, V. XXI, No.1) p.10-21

[9] OAU, Op. cit., p. 11.

[10] Tesfai Tecle, The Evolution of Alternative Rural Development Strategies in Ethiopia: Implications for Employment and Income Distribution. (African Rural Employment Paper No. 12, Michigan, Dept. of Agr. Economics, Michigan State University, 1975) p. 1-3.

[11] Imperial Ethiopian Government, Third Five-Year Development Plan, 1963-1973, (Addis Ababa) p. 191-202.

[12] During this period a duty-free fuel provision provided an income benefit to tractor owners approximately Eth. $1,600 per year per tractor. See for example, T.J. Goaring; "Some thoughts on the strategies for Agricultural Development in G.J. Gill (ed.) Readings on the Ethiopian Economy. (Haile Selassie I University, IDR, Nov. 1974) p. 77.

[13] Henock Kifle, Investigations on Mechanized Farming and its Effects on Peasant Agriculture, (CADU, Publication No. 74, 1972) p. 53.

[14] Tegegne Teka and Tennasie Nichola, Op. cit., p. 85

[15]NRDC & CPSC, Second Annual Campaign, 1977/78 (trans.) p. 47-49, and Third Annual Campaign, 1980/81 (trans.) p. 116

[16]FAO, High-Level WCARRD Follow-up Mission to Ethiopia, Agrarian and Rural Development, (WCARRD Mission No. 7) p. 35.

[17]Joint Government of Ethiopia/World Bank Mission, Op cit., p. 43-50.

[18]Ibid. p. 56.

[19]The desirable growth rate in agriculture could be projected using a simple demand model:

$$A_r = E_{dd} Y_r + N_r + EX_k EX_r$$

where A_r - the desired rate of increase in agricultural production

E_{dd} - the income elasticity of demand for food

Y_r - the rate of increase in income

N_r - the rate of population growth

EX_k - the share of exproted agricultural products in the final output of agriculture

EX_r - the rate of increase of agricultural exports

According to this model a plan which has a target of increasing the national income by 7 percent may necessitate a growth rate of 6 percent in agriculture under the assumption that $N_r = 2.5\%$, $E_{dd} = 0.7$, $EX_r = 6\%$ and $EX_k = 20\%$ See for instance, E. Gorzelak and F. Tomcxak, Agrarian Policy and Agricultural Planning, (Central School of Planning and Statistics in Warsaw, Research Institute for Developing Countries, Vol. 24, 1977) p. 92-93.

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[22]Willis Peterson, "International Farm Prices and Social Cost of Cheap Food Policies," American Journal of Agricultural Economics, (Vol. 61, Feb., 1979) p. 12-21.

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52 A Woreda may be said to be predominantly teff growing. But this is true only on the average and not every association within the Woreda could be teff growing. A typical example is Becho (one of the study areas) generally known for its teff production. But the southern part of this Woreda is rather Enset growing and teff is cultivated only to a limited extent.

53 A peasant association is organized on about 800 ha and consists of, on the average, about 200 households. Land distribution takes place only within a peasant association and member of a given association has no right to claim land in another association. This has led to the development of uniformity within association but variation between associations in terms of land holdings.

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[71]In converting family members into adult units it was assumed that:

children below the age of 8 years = 0.5 adult unit
family members above 8 years = 1.0 adult unit

The method used is slightly different from the one used by Coale and Hoover in that the cut-off age is 10 years and females above 10 years are weighted as 0.9 adult unit. See A.J. Coale and E.M. Hoover, Population Growth and Economic Development in Low-income Countries, (Princeton, Princeton Univ. Press, 1958), p. 88 (footenote).

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APPENDIX I

HOUSEHOLD HEAD QUESTIONNAIRE

Awraja .....

Woreda .....

Peasant Association .....

Respondent ..... Age .....

Interviewer .....

I. Family Characteristics

1. The total members of your family ..... of which the numbers of :

   1.1. Males ..... Females.....

   1.2. The number of children below the age of eight .....: and very old people who cannot work as farmer or as herds-man .....

   1.3. The number of regular students in the family .....

2. Can you read or write? a. Yes b. No

   2.1. If Yes, what is your level of education (elementary, junior high school, secondary high school)?

   .....

II. Use of Labour

1. What was the number of family members working regularly as a farmer and herds-man last year?

.....

1.1. What about the number of those working sometimes only .....

2. Did you have labour shortage during the following cropping seasons last year? (mark X)

Cropping Seasons	Yes	No
Ploughing		
Planting		
Weeding		
Threshing		

2.1. How did you solve the problem if you had labour shortages?

a. Through mutual aid teams (Debbo, Wonfel)

b. Through hiring daily labourers

c. Using female and child labour (from my family)

d. Leaving the land uncultivated

e. Others (specify) .....

.....

3. If you are given the opportunity, do you feel that you or members of your family can be employed for wage during the following periods

Periods	Yes	No	It depends
1. After threshing	.....		
2. After ploughing	.....		
3. After planting	.....		
4. After weeding	.....		

3.1. If no, give your reasons .....
.....

3.2. Were employed for wage in one of these periods last year? a. Yes b. No.

4. On the average, how many days of the month (year) did you work for families of militia, disable (pensioned), cooperatives, etc. last year? ..... days in a month (or in a year)

III. Use of Farm Inpits

1. Did you use fertilizer (commercial) last year?

a. Yes b. No.

1.1. If yes, please indicate the total amount of fertilizer you used last year)

..... (indicate the unit)

1.1.1. How much of this did you use on your teff fields.

.....

1.1.2. On how many of your fields did you use? .....

.....

1.1.3. How do you compare what you actually used with what you require?

a. Not enough b. Enough

If not enough, give your reasons

a. Not available b. High price of fertilizer

c. Not useful

d. Others (specify) .....

.....

2. Did you use manure in your fields (not garden) last year?

a. Yes b. No.

3. Did you use improved seeds of teff last year?

a. Yes b. No.

If yes, the amount was ..... (indicate the unit)

3.1. What other imporovdd seeds did you use (if any)

.....

4. Did you have enough seeds? a. Yes b. No.

5. Which of the following inputs did you use last year?

a. Weed killer (herbicides) b. Insecticides

IV. Use of Draught Animals

1. How many oxen did you own last year (1, 1 (a pair), 3, etc.)? .....

2. Did you have shortage of oxen? a. Yes b. No.

2.1. If Yes, how did you solve the problem?

a. Hiring oxen b. Hand digging

c. Cooperating with those who own oxen

d. Leaving the land uncultivated

e. Others (specify) .....

.....

2.1.1. Do you want to buy additional oxen?

a. Yes b. No.

If yes, how many .....

If no, your reasons are

a. lack of money b. problem of pasture

c. Others (specify) .....

.....

3. Did you have enough animals for threshing last year?

a. Yes b. No.

V. Use of Credit

1. Were you forced to take credit last year? a. Yes b. No

1.1. If yes, for what purpose

a. Production (may be to buy oxen, fertilizar)

b. Consumption (e.g. to buy food grains, clothings)

1.1.1. How was the interest rate when you take the credit?

a. High b. Average c. I have no idea

VI. Livestock Holding

1. The number of animals you own

cows ..... heifers ..... young oxen .....

calves ..... sheep ..... goats .....

pack animals .....

2. Do you feel you have enough animals? a. Yes b. No.

VII. Production tools & housing condition

1. How many of the following did you own last year?

ploughs ..... sickle ..... hoss .....

2. The kind of house you are living in is

a. tin-roofed b. straw-roofed

2.1. Do you keep some animals (at night) in the house you live? a. Yes b. No.

3. Do you have a radio? a. Yes b. No.

VIII. Land Use and Annual Production

1. Please indicate the size of land allocated for different crops and the amount of output last year (1974/75)

Crop	'Kert / timad '	Output	Specify (the Unit)
1. Teff			
2.			
3.			
4.			
5.			

1.1. The area of land under mixed-cropping .....

1.2. What was the total size of your holdings?

2. How did you decide which crop to grow on your fields?

   a. Depending on the need for crop rotation (soil condition)

   b. Depending on the price situation (profitability)

   c. Depending on the need for home consumption

   d. Depending on the local tradition

   e. Others (specify) .....

   .....

3. What was the number of fields under your cultivation last year? .....

3.1. The number of fields for <u>teff</u> .....

4. What is your opinion about your level of <u>teff</u> production (yield / ha.)? a. Good b. Average c. Bad

4.1. If Bad, what was the major cause of the low output? .....
.....

5. Did you grow Belg crops last year? a. Yes b. No

5.1. If Yes, what kind of crop? .....
.....

6. Do you feel that your holding is sufficient to satisfy the following needs?

Needs	Yes	No.
1. Home consumption		
2. Market supply		

6.1. If No (no fsufficient), which of the following activities did you perform to raise your income?

a. Selling labour b. Trading

b. Weaving d. Nothing

e. Others (specify) .....

.....

7. Do you wish to cultivate more land? a. Yes b. No.

8. What was the size of your grazing area? .... kert/timad

IX. Income from Livestock sales and non-farm activities beginning last year upto now.

1.

Livestock sold	Number	Value (Birr)
1. Cattles		
.....		
.....		
2. Sheep & Goat		
3. Pack animals		

2. Income from non-farm activities (in Birr) beginning last year upto now — Amount

i. Gift (from relatives/friends) .....

ii. Trading, weaving, etc. .....

iii. Selling labour .....

iv. Fire wood sales .....

v. Other (specify) .....

.....

X. Market Supply

1. The amount sold to Agricultural Marketing Corporation (AMC) and local market beginning last year upto now

	Crop	AMC	local market
1.	Teff		
2.	.....		
3.	.....		
4.	.....		
5.	.....		

2. Your opinion about the price paid by each (mark X)

	Low	Average	High	V! High	I do not know
AMC					
Local market					

3. When did you market the largest portion of your crop?

   a. Immediately after harvest

   b. During the summer (kirmt)

   c. No specific period

4. Was there clear price variation during the year in the local market? a. Yes b. No.

5. Would you have increased your sales if prices were higher?

a. Yes b. No. c. It depends d. I do not know.

XI. Expenditure

1. How much did you spend in buying the following items last year?

Item	Amount (Birr)	Item	No.	Amount (Birr
Fertilizer		Oxen (Young Oxen)		
Improved seeds		Cows		
Hiring (labour or oxen).....		Heifers		
Pasture		Building storage and house		

1.1. Can you mention some other major expenses of last year? e.g. contributions and clothings and shoes .....
.....
.....
.....

2. Did you buy food grains last year including this year upto now?

a. Yes b. No.

2.1. If yes, indicate the kind of food grains bought

2.1.1. The reason you bought the food grain was

a. because food crop produced on the family farm was not enough for my family consumption

b. because it was cheaper to consume the food grains bought (e.g. sorghum or kocho) than to consume what was produced.

c. Others (specify) .....

.....

3. Where did you buy consumer goods most of the time?

a. Cooperatives' shops b. marchants

c. Government shops

3.1. Why do you buy from there?

.....

.....

4. Can you remember of a case when you enter many shops and failed to get the goods you want?

a. Yes b. No.

4.1. If yes, how often was it?

a. Most often b. sometimes c. rarely

4.1.1. What were the goods that were not usually available?

.....

.....

.....

XII. Future Plan

1. Do you have any plan to improve your living conditions?

a. Yes b. No. C. It depends

1.1. If yes, Your plan is

a. to produce more using new inputs

b. to join producers' cooperative

c. to get aid from my educated son / daughter

d. to find job (e.g. trading) in the town

e. others (specify) .....

.....

.....

APPENDIX II

FERTILIZER PRICES AND FERTILIZER CONSUMPTION (1973/74 - 1981/82) BY THE PEASANT SECTOR

Year	Price Gr./Qt.)		Consumption (ooo tons)	
	DAP	UREA	DAP	UREA
1973/74	42	32	9	0.7
1974/75	44	40	12	0.7
1975/76	50	50	13	0.7
1976/77	48	40	34	1.6
1977/78	48	40	32	1.4
1978/79	55	55	30	1.7
1979/80	65	65	45	3.2
1980/81	85	85	40	2.5
1981/82	116	84	29	1.4

Source: Ministry of Agriculture, as cited by Joint Government of Ethiopia / World Bank Mission, Op. cit., p. 66.

It can be seen that fertilizer (DAP) increased by an average of 7.9% per annum between 1973/74 and 1979/80. During the same period the consumption of fertilizer increased by an average of 40.2% a year. A sharp increase in the price of fertilizer, however, took place after 1979/80 amounting 30.8% in 1980/81 and 36.7% in 1981/82. At about the same time AMC expanded its purchase

activities and its buying prices were fixed at relatively low levels (see section 1.1.2.2.) contrary to the escalating price of fertilizer. It seems that the unprecedented decline in fertilizer consumption in 1980/81 and 1981/82 (11.11 and 17.5%, respectively) is explained by the relative deterioration of output - fetilizer price ratios.

APPENDIX III

OTHER CHARACTERSTICS OF THE SAMPLE AREAS

	Households Reporting (%)	A	B	C
1.	Tin-rooted house	18	3	4
2.	Own radio	24	12	7
3.	Output below consumption need	73	92	65
	3.1. Different means used to supplement income (as proportion of those reporting shortage of output)			
	selling labor	13	11	11
	Trading weaving, etc.	27	40	17
	Remittance from relatives	13	5	-
	No other income	47	44	72
4.	Purchase foodgrains from the market	31	76	69
5.	Land holding below family requirement	73	82	83
6.	Shortage of consumer goods	34	33	52
7.	Have plans to improve living conditions	91	95	91

APPENDIX IV

REGRESSION ESTIMATES OF TEFF PRODUCTION

(LINEAR MODELS)

Variables							
Land (ha) (X_1)	4.605***	4.548***	3.125***	3.036***	3.171***	1.38080****	1.285*
	(19.194)	(18.332)	(7.164)	(7.174)	(7.122)	(2.461)	(1.855)
Fertilizer (Qt)(X_2)	1.306***	1.292***				2.600***	2.784***
	(3.048)	(3.035)				(3.009)	(3.718)
Labor (X_3)	-0.102	-0-0.088	0.151	0.147	0.164	0.369	0.281
	(-0.732)	(-1.021)	(0.682)	(0.776)	(0.726)	(1.421)	0.871)
Livestock (X_4)	0.016	0.025	0.170*	0.111		0.187***	0.239**
	(1.041)	(0.906)	(1.842)	(1.129)		(3.025)	(3.297)
Oxen (X_5)		0.018		0.500*	0.395	0.373	
		(0.098)		(1.823)	(1.540)	(1.241)	
Crop Damage (X_6)	-1.748***	-1.763***	-1.263***	-1.067***	-1.210***	-3.641***	-2.808***
	(-4.160)	(-4.286)	(-3.645)	(-3.183)	(-3.481)	-4.829)	(-3.252)
Education (X_7)	0.271		0.476		0.505		-1.270
	(0.802)		(1.255)		(1.254)		(-0.781)
Intercept	1.259	1.348	1.848	1.698	1.264	1.014	1.871
$\bar{R}^2$	81.2%	80.4%	69.1%	68.5%	67.8%	54.9%	52.6%
Sample size (n)	55	55	60	60	60	60	54

A certain degree of multicollinearity seems to exist between livestock and oxen. Note that the matrix gets singular whenever more than six explantory variables are used.

*** Significant at 1%
** Significant at 5%
* Significant at 10%

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D E C L A R A T I O N

I, the undersigned, declare that this thesis is my work and that all sources of material used for the thesis have been duly acknowledged.

Name Mulat Demeke

Signature

Place and date of submission

June 1984