Ethiopian Journal of Development Research, Vol.19 No.2, October 1997

ENVIRONMENTAL AND SOCIOECONOMIC FACTORS ENCOURAGING AND DISCOURAGING *BELG* FARMING: THE CASE OF MUNESSA *WEREDA*

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ABSTRACT: *The main objective of the study was to investigate why the farmers in some Peasant Associations (PAs) of rain receiving dega agro-climatic zone of Munessa wereda have failed to practice belg farming. Data utilized for the study were generated through a sample survey of 220 households in eight PAs. The survey data have been tabulated and summarized by utilizing the Statistical Package for Social Scientists (SPSS). More specifically, the Point Score Analysis was adopted to identify the most important factors encouraging belg farming among belg growers, on the one hand, and the most discouraging factors for practice of belg crop production among non-belg growers, on the other. The results revealed that the availability of adequate belg rain, little water-logging problem during the belg growing season, a little incidence of crop damage by birds, and the absence of frost are the principal physical factors encouraging farmers to practice belg farming in Belemeda, Ego Dengago, Ego Yedolla and Ego Legedana PAs. Likewise, attaining household food and seed security, production of belg crops by other farmers in the community, increase of crop prices during belg harvest and holding adequate farmland are the main socioeconomic reasons for growing belg crops. Farmers in non-belg grower PAs, i.e., Choba, Koma Ano, Koji Kenchere and Neno Legedana have failed to take advantage of double cropping because of the interaction between the various physical and socioeconomic factors. Unreliability of belg rain for 96.6 per cent of the farmers, difficulty of land preparation under a little belg rain for 98.3 per cent of them and attack of crops by birds for 87.9 per cent of the same are found to be the most formidable physical hindrances to growing belg crops in Koji Kenchere and Neno Legedena PAs. Similarly, attack of belg crops by birds for all respondents (100%) and the damage of belg crops by excessive summer rain for 74 per cent of the respondent appeared as the most discouraging environmental factors to belg farming in Koma Ano and Choba PAs. Absence of cooperation among farmers, inadequate farmland and lack of capital to purchase farm inputs were identified as the principal socio-economic hindrances for 90.8, 72.5, and 60.5 per cent respectively of the non-belg grower farmers. It is concluded that belg farming can be carried out in all non-belg grower PAs under investigation by promoting cooperation and mutual understanding among the beneficiaries themselves.*

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The data used in this paper is based on author's field research for his M.A. Thesis in 1996.

BACKGROUND AND THE PROBLEM

Crop production can be increased by one or a combination of the following factors by: i) expanding the area planted; ii) raising the yield per unit area of individual crops; and iii) growing more crops per year (in time and/or space) (Beets, 1982:1). In the past, agricultural production has been mainly increased by cultivating more land, but now land is rapidly diminishing. In response to this, currently attempts to boost production are largely through increasing yield per unit area (in temperate developed countries), and through land use intensification, i.e. growing more crops per unit area which is generally termed as *multiple cropping* (in the developing countries of tropical region). Double cropping is one form of multiple cropping which refers to time-staggered cultivation of two crops in a year. Various authors in the literature such as Boserup (1965), Beets (1982), Glaner and Keil (1988) and Rejinties *et al.* (1992) identify multidimensional reasons for adopting double cropping by small holder farmers. The principal advantages include: i) better utilization of environmental resources (solar energy, soil nutrients and water) can be possible; ii) the risk of unpredictable environmental variability, for instance, erratic rainfall can be minimized; iii) crop leaves protect farmland from physical damage by rain and wind erosion; iv) planting and harvesting in phases can assure a regular and varied supply of food for households; v) the system can facilitate higher yields and greater gross return per unit area per annum; and vi) under situations of high population pressure, double cropping can feed a larger population thereby reducing unemployment.

Ethiopia's endowment with bimodal rainfall distribution, i.e. *meher* (major rains) between June and September; and *belg* (minor rains) between February and May, make possible the growing of short-maturing crops twice a year by the highland farmers, particularly those in Wello, Shewa, Bale, Gamo Gofa, Hararghe, Arssi, Illubabor, Keffa and Wellega regions. The research findings concerning double cropping systems in Ethiopia seem to be consistent with the advantages mentioned above by the various authors. Tamirie's (1989) empirical study in the Hararghe highlands came out with four principal benefits of harvesting crops twice a year under erratic rainfall conditions; i) two rain-fed crops are possible from the same area of land, thus increasing

annual crop yield per unit area; ii) in the case of drought in one of the growing seasons, a farmer will still have one of the two possible harvests, *belg* or *meher* thus safeguarding his family's food supply; iii) *belg* crops provide dense soil cover that reduces erosion caused by torrential rainfall in April and May, and iv) the farmers obtain additional crop residue for livestock feed.

Belg crop production plays a vital role in overcoming seasonal food insecurity, particularly in the period before *meher* harvests among *belg* grower households and even among non-*belg* grower households. Moreover, *belg* harvest stabilizes the market prices of grains and livestock at local, regional, and national markets (Alemayehu, 1990 and 1991; Degefa, 1996).

In Ethiopia, the existing potential for double cropping under rain-fed condition remains underutilized since farmers in some *belg* rain areas confine themselves to the production of crops only during the *meher* season. Arssi is one of the regions that receive adequate *belg* rain. Nevertheless, only a small proportion of farmers (about 16%) in the *belg* rain receiving highland areas take advantage of double cropping (Jonson, 1992). From an agricultural geographical point of view, adopting a farming system by farm households is a matter of decision-making, which is in turn, partly determined by the primary goal of production with respect to the process and outcome of farming. Concerning this issue, several authors argue that subsistence farmers are risk- averters rather than profit-maximizers (Lipton, 1968; Grigg, 1984; Ilbery, 1985 and Barlett, 1980). Their crop production is largely aimed at attaining a sustained household food supply. Farmers' decisions and choices of enterprise are also based on their past experiences with the social and physical environments. Underscoring the importance of past experience in decision-making in relation to agriculture, Oritz (1980) states that "... individuals decide on the basis of past experience rather than on the vision of the future. In light of this, an attempt has been made to relate various socio-economic and physical factors with farmers' decisions to grow or not to grow *belg* crops.

Munessa receives about 300 mm of *belg* rain and yet about 63 per cent of the farm households never grow *belg* crops. In fact, PAs which are situated on

the escarpment and floor of the Rift Valley in the west as well as in those largely occupied by the ranges of high mountains in the southeast have a limited potential for growing crops during the *belg* season under rain-fed situations. However, there are some PAs in the central plateau of the *dega* zone which receive the *belg* rain and yet the farmers rely fully upon the production of crops during *meher* season, while others in neighbouring PAs harvest crops twice a year. The present study is therefore intended to explore why farmers in PAs where it is possible to produce *belg* crops fail to take the advantage of double cropping.

STUDY OBJECTIVE AND SIGNIFICANCE

The Objective of this study is twofold, viz. :

i. to assess the environmental and socioeconomic factors that encourage farmers to practice *belg* farming in *belg* growing PAs, and

ii. to investigate why farmers in some *belg* rain receiving PAs of the *dega* agro-climatic zone of Munessa *wereda* have failed to practice *belg* farming.

Despite the availability of extensive literature on Ethiopian agriculture, ***belg*** farming as a sub-sector has received little attention in research activities. Thus, the researcher investigated *belg* farming with the view that the study would contribute a little to bridging the gap in the literature on the subject.

One way of attaining our country's food self-sufficiency in the short-run would be through effective utilization of *belg* rains. This micro-level study has, therefore, identified some salient features and the main constraints of *belg* crop production. The study also suggests some policy implications and ways in which the sub-sector can be promoted.

MATERIALS AND METHODS

The household survey was the main source of data for the study. For this purpose, a questionnaire was designed and pretested by interviewing 20 households (ten *belg* and ten non-*belg* growers) during a pilot survey in January 1995. The final field survey was carried out in September and October, 1995. Discussions were also held with groups of farmers so as to assess how *belg* farming and some agricultural problems are conceived at the community level. Moreover, observations of the area during both the pilot and the main survey have enabled the researcher to generate data on various physical and socio-economic features.

The sampling of the PAs and households to be interviewed was undertaken through three steps. Firstly, 17 *belg*-grower PAs and 12 non-*belg* grower PAs which have the potential of growing *belg crops* were identified through field observation. Secondly, 8 PAs, four from each strata were selected through purposive sampling. The PAs were selected for two paramount reasons: to keep the contiguity and for the purpose of accessibility for the survey. In order to attain proportional representation, territorial extent (area) was considered seasonal in terms of mere number of PAs. Finally, households were selected by systematic random sampling. Accordingly, 220 household heads, which made up about 10 per cent of the total registered PA members, have been interviewed from 8 PAs. The data has been analyzed using the SPSS software programme.

Farmer's perceptions toward factors encouraging and discouraging *belg* farming were assessed by Point Score Analysis. *Belg* grower farmers were requested to rate various physical and socio-economic factors encouraging *belg* farming as either most encouraging, less encouraging or not encouraging. Conversely, non-*belg* grower farmers rated various factors as either most discouraging, less discouraging or not discouraging to practice *belg* farming. Total scores were computed for all factors at PA and overall levels to identify the most encouraging and discouraging factors. Then, a Chi-square test was applied to see whether the variations of the total point scores of the factors among PAs were significant or not.

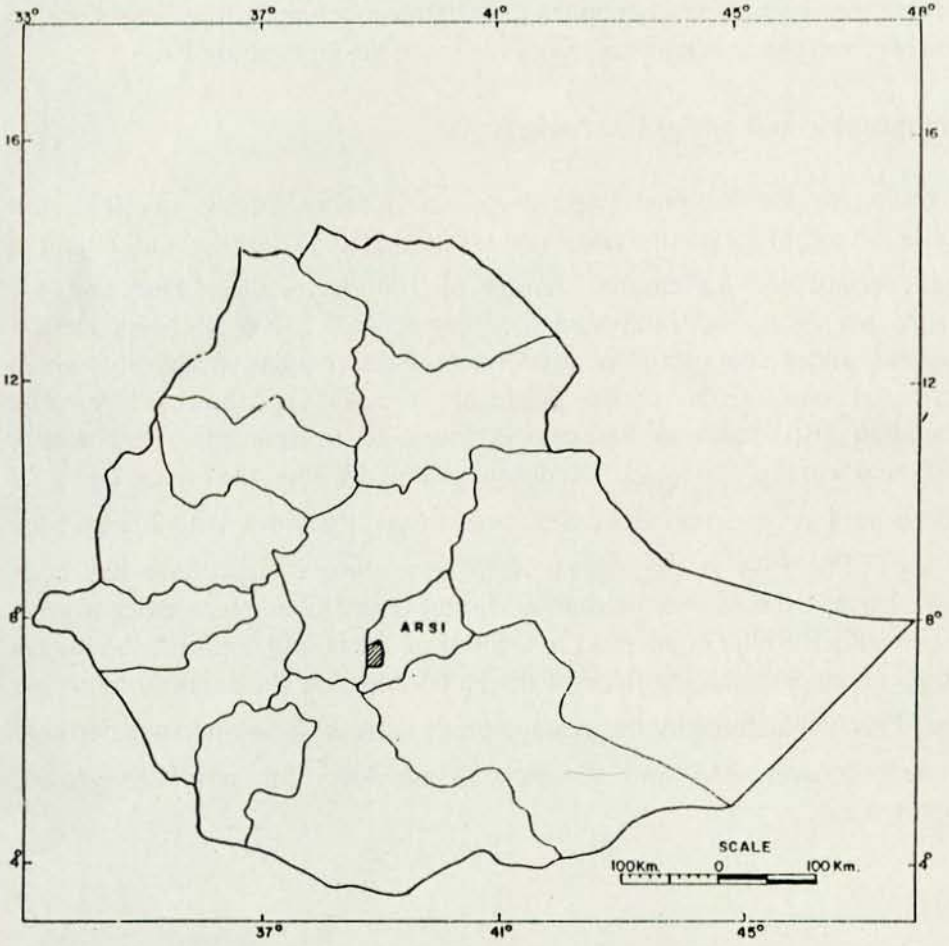
PHYSICAL AND SOCIO-ECONOMIC SETTING

Physical Setting

Munessa *wereda* is situated in the southwestern part of Arssi Zonal administration. The *wereda* has a total area of 1419 km^2, accounting for 6 per cent of the zone (CSA, 1986). By the time of the survey, the *wereda* comprised 68 PAs. Munessa is characterized by a great contrast of elevation, with ranges under 1600 m.a.s.l and over 4000 m.a.s.l. Its surface configuration can be grouped into three distinct relief regions, i.e. the Rift Valley Lowlands in the west, the Central Plateau, and the Ranges of High Mountains in the southeastern part. In terms of agro-climatic zones, the former represents the *kolla* and the *weyna dega* zones while the latter two constitute the *dega* zone.

Long-term rainfall data at *Keressa* (2720 m.a.s.l), Ego (2580 m.a.s.l) and *Lole* (2550 m.a.s.l), the meteorological stations distributed in the central plateau of the *dega* zone, demonstrate a bimodal pattern of rain distribution in Munessa. The maximum rain, of course, occurs during the rainy season (*meher* - the major growing season) between the months of June and September. The rainfall amount during this season made up about 61, 56 and 45 per cent of the annual rainfall at respective stations. The areas also receive a considerable proportion of their annual rainfall during spring (*belg* - the minor growing season). Owing to its considerable altitudinal contrast, Munessa consists of about five thermal (temperature) zones (MOA/FAO, 1984). In this respect, the *wereda* is advantageous as the great spatial variation of temperature favoured the growing of various types of crops ranging from cool-weather crops (barley, wheat and beans) to warm-weather crops (maize and sorghum).

Fig.I: Location Map of Munessa *Wereda*

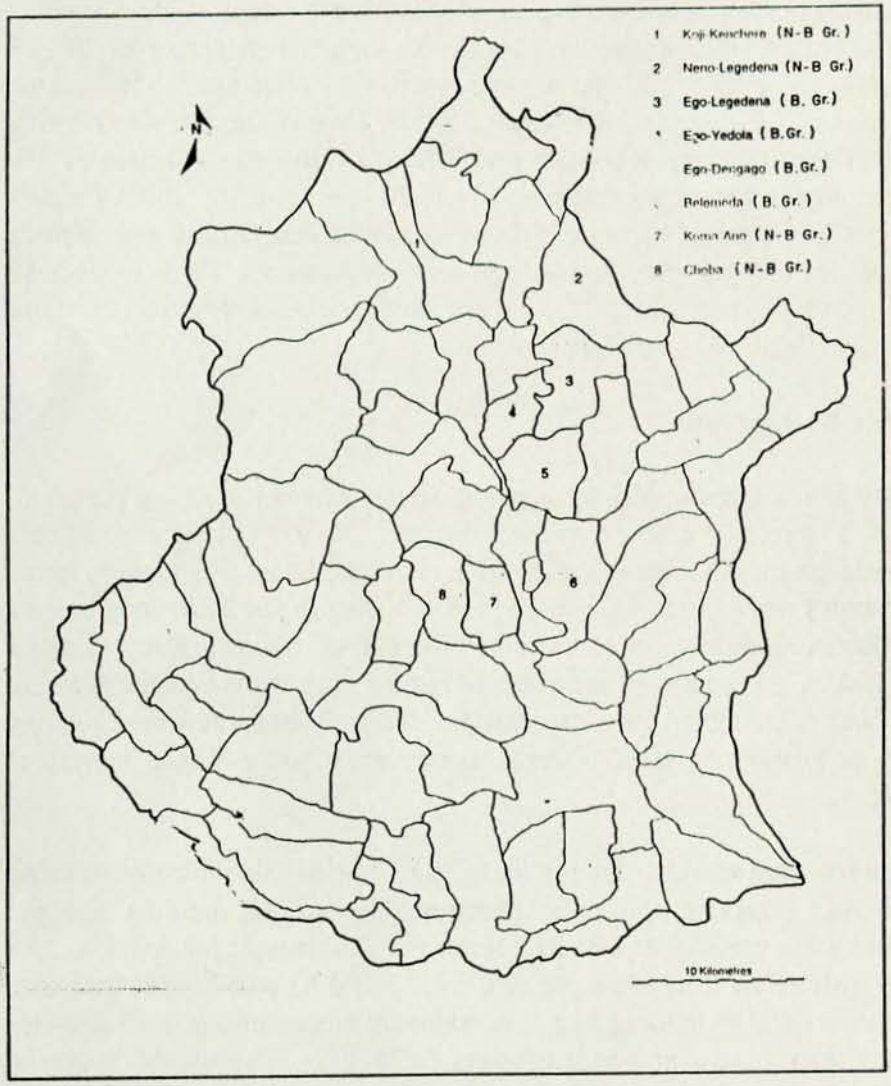


Five dominant soil types were identified in Munessa viz.: Lithosols, Vertisols (both Chromic and Pellic), Eutric Nitosols, Luvisols (both Chromic and Orthic) and Mollic Andosols (MOA/FAO, 1983). All of them have developed on volcanic landform of various landscape units ranging from high mountains to plains and low plateaus. The fact that the soils largely originated from volcanic materials generally implies their better inherent fertility levels. Pellic vertisols form the dominant soil types for six of the eight study PAs.

Demographic and Social Characteristics

According to the National Population and Housing Census of 1994, the population of Munessa *wereda* was 148,030 (CSA, 1996), resulting in a crude density and agricultural density of 104 persons per km^2 and 4.8 persons per hectare of cultivated land respectively. Thus Munessa can be classified under the group of moderately high population density which considered one of the cereal producing *weredas* of the country. The population distribution in Munessa is found to be uneven. There was a substantial variation of population density among 68 PAs, the lowest being 20 persons per km^2 in *Chufa* and the highest in *Ego Legedana*, with 293 persons per km^2. The PAs in the central *dega* zone, where agriculture has been intensified and the harvest of short-maturing crops takes place twice a year, are generally the high population concentration areas. By contrast, the ranges of high mountains and the floor of the Rift Valley are the sparsely inhabited areas. This is illustrated by the average crude density of 145 persons per km^2 for *belg* grower PAs and 95 persons per km^2 for non-*belg* grower counterparts.

Fig.II: Location of Study PAs in *Munessa Wereda*



In the 220 households studied in the sample, there are 1,784 people. This gives an average of 8.1 persons per household. There is a slight predominance of males (50.9%) over females (49.1%). With regard to age distribution, the investigated population is found to be predominantly young, with a median age of 14.6 years which was reflected in the high age dependency ratio of 119 dependents to every 100 productive (active) population. The ethnic composition of Munessa includes Oromo (Arssi Oromo and Shewa Oromo), Amhara, Tigre, Gurage, Kembeta and Wolayta. However, Oromo is the dominant ethnic group representing over 90 per cent of the *wereda*'s population. In the actual survey of PAs, it was found that Oromo and Amhara accounted for 94 per cent and 6 per cent respectively. With respect to religion, some 70 per cent of the investigated households were Orthodox Christians while 30 per cent were Muslims.

Economic Background

Sedentary mixed farming forms the predominant occupation of the people in Munessa. The role of crop production through extensive ploughing appears to be predominant in farmers' livelihood in *dega* and upper *weyna dega* agro-climatic zones while farmers down in the Rift Valley of the *kolla* zone heavily rely on livestock raising. In some central *dega* PAs, bimodal distribution of rainfall makes it possible to grow crops during both *meher* (main growing season) and *belg* (minor growing season). Nevertheless, the overwhelming majority of farmers (over 60%) exclusively depend on a single harvest of *meher* season in Munessa.

The studied households' land-holding size varied significantly ranging between half a hectare and seven hectares. The average holding size per household was estimated at 2.36 ha. Out of the 220 sample households, 20.9 per cent own below 2 ha, 76.8 per cent own 2 to 4 ha and 2.3 per cent own more than 4 ha. The holding size was relatively larger among *belg* growers (2.43 ha) than among non-*belg* growers (2.28 ha). The overall cropping pattern of the study area reveals that barley is the first ranking crop followed by wheat, and these two crops constitute the major staple food grains of the people. Both crops together made up nearly nine-tenths of the cropland and

the size of the output. Other crops grown in the area include horse beans, peas, maize, linseed and lentils. Barley is the single most important crop during the *belg* growing season. The crop output per household of *belg* grower farmers was far better than their non-*belg* grower counterparts. For instance, their per-household production was 3566 kg and 2842 kg respectively in 1995. Among *belg* grower households, about one-fifth of the output was accounted for by *belg* crops.

Livestock raising appeared as the secondary and alternative source of income and food security for the studied households. The respondent households had on average 20.4 heads of livestock, which is equivalent to 13.3 Tropical Livestock Units (TLU), suggesting that the area is characterized by a high stocking density. The overall average number of oxen per household was 3.06 ranging between 0 and 8. About 11 per cent of the respondents possessed less than a pair of oxen. Households possessing less than a pair of oxen among *belg* grower and non-*belg* grower farmers were 7 and 14.7 per cent respectively. Thus, the shortage of draught power as an agricultural problem tends to be more serious among non-*belg* grower farmers.

RESULTS AND DISCUSSIONS

FACTORS ENCOURAGING THE PRODUCTION OF *BELG* CROPS

Physical Factors

Availability of Adequate *Belg* Rain

Since *belg* farming is carried out under rain-fed condition, rainfall amount and distribution throughout the growing season appear to be essential. Both a delayed commencement and earlier termination than the normal time of *belg* rain could greatly hamper the production of *belg* crops. With regard to rainfall amount, Tamirie (1986) recommends a minimum of 148 mm of rain during *belg* season to grow *belg* barley. Concerning the study area the average rainfall recorded at three meteorological stations, i.e. *Kerssa*, *Ego* and *Lole* is 366.6 mm, 274.1 mm and 258 mm respectively, which are favourable for the production of short-maturing highland crops such as barley

and wheat. Farmers response was in line with the expectations as they rated rainfall adequacy and dependability to be the first among all the physical factors encouraging *belg* farming.

Less Water-Logging Problem During *Belg* Season

The field observations indicated that a considerable proportion of the area of *belg* grower PAs is characterized by level surfaces (with the angle of the slope less than 5 per cent) and is occupied largely by Pellic Vertisols (soils with high clay content and poor drainage), which results in water-logging especially during the main rainy season. From a crop production point of view, flat land and Pellic Vertisols cannot be avoided, while the influence of the excessive rain could be minimized by shifting the utilization of farmland to a growing season with lesser but adequate rain, i.e. *belg* season in case of the area under study. This is already taken care of by the farmers in the study area as a result of the lesson they picked up from their own long experiences. They allot part of their farm plots that are highly affected by water-logging to the production of *belg* crops when the amount of rainfall is relatively lower resulting in less water-logging. Therefore, reduced water logging problem during *belg* season has appeared to be the second most important physical factor that encourages *belg* farming in the studied PAs. Some 73 per cent of the farmers practice *belg* farming partly to avoid a risk of crop failure or yield decline due to water-logging during the rainy season on their farmlands situated in flat areas.

Little Incidence of Crop Attack by Birds

Agricultural crops provide food for big animals, birds and insects (Grigg, 1984:109). As such, field crops are damaged by various wild life beginning from germination until harvesting period. Cereals (barley and wheat) in the *dega* zone of Munessa *wereda* are attacked by wild life specifically by a variety of birds. The fact that birds have their habitats largely on big trees and in shrubs implies that the degree of crop attack varies from one locality to another depending on the magnitude of vegetation cover. Here the *belg* grower PAs covered in the study, with the exception of *Belemeda* (in its part

where *belg* is not grown), are devoid of natural vegetation cover. Consequently, there exists little incidence of crop damage by birds. The interviewed farmers rated this aspect as the third important environmental factor encouraging *belg* farming. For about 67.6 per cent of the farmers, little risk of crop losses to birds has been encouraging the production of *belg* crops.

Table 1
Summary of Point Score Analysis for the Physical Factors Encouraging the Production of *Belg* Crops

Factor	Peasant Associations[3]								Overall Total		
	Belemeda		Ego Dengago		Ego Yedolla		Ego Legedana		Total Score	Rank	Percent of Applicability
	Total score	Rank	Total score	Rank	Total score	Rank	Total score	Rank			
Adequate *Belg* rain	55	1	45	1	46	1	49	1	195	1	99.1
Absence of frost	29	3	16	4	24	4	19	3	88	4	63.9
Lesser water logging problem	34	2	28	2	29	2	30	2	121	2	73.0
Little incidence of crop attack by birds	25	4	24	3	25	3	19	3	93	3	67.6

Note:

1. Score values given to responses were: 2 for very important; 1 for less important and 0 for not important.
   - Response values were then multiplied by the number of respondents and summed up to get total scores
2. Percent of Applicability refers to the proportion of the farmers that reported the factor which encouraged their engagement in *belg* farming. It is the sum of the percent for the farmers who responded 'very important' and 'less important'.
3. Difference between the total score of PAs with Chi-square 2.84 is insignificant at 95 per cent confidence limit (9 degree of freedom).

Absence of Frost

As is the case in most of the highlands of the country, occurrence of frost appears as an important climatic factor that sets limits for the cultivation of crops on the upper *dega* agro-climatic zone (over 3500 m.a.s.l) of Munessa. Although the influence of frost seems to be predominant on the sides of the high mountains, it also occurs seasonally on the high plateau part of the *dega* and even in the lower elevation zones. October and November are the probable months for the occurrence of frost in the study area resulting in a significant decline in the yield of *meher* crops in certain cases. However, the meteorological data of the study area indicates that the *belg* growing season is the hottest period of the year and free of risk from frost-induced crop failure.

Socio-Economic Factors

Food Security

As stated earlier, a subsistence farmers' crop production is geared chiefly towards meeting food consumption demands of the household. This holds true in the case of *belg* farming because of the fact that the production of food grains minimizes the risk of seasonal food insecurity. The survey results indicated that *belg* crop production, which is aimed at meeting household food demand, has been the principal goal and by far the most important factor among all the socio-economic factors considered. Farmers' rating of food security even over rainfall adequacy (impossible without *belg* farming), suggests a high degree-reliance of households on *belg* crops. All interviewed *belg* grower farmers reported that meeting household food consumption is the rationale behind growing *belg* crops.

Seed Security

The main season crop output of subsistence farmers hardly satisfies their households-seed requirements for the next *meher* growing season. *Belg* crop production is, therefore, a strategy by which farmers can secure their seed

requirement, particularly of barley for the *meher* growing season. For instance, about 40.5 per cent of the respondents utilized their *belg* barley for seeds during the *meher* cropping season in 1995 which represented about one-quarter of barley seed requirements for *belg* grower farmers during *meher*. The point score analysis has shown seed security to be the second most important one among the socio-economic reasons for *belg* crop production. Over nine-tenths of the sample farmers grow *belg* crops partly to secure their seed needs. The proportion of farmers growing *belg* crops partly to meet seed requirements in Ego Yedolla, Ego Legedana, Belemeda and Ego Dengago PAs are 100, 96.7, 85.7 and 82.1 per cent respectively.

Production of *Belg* crops by other Farmers in the Area

The "Decision-making environment includes the decisions made by others" (Barlett, 1980:9). Unlike the case of the *meher* growing season when practically all farmers grow crops, *belg* farming is limited to some segment of the farmers and is grown on relatively smaller areas of land, which make them highly susceptible to damages by vermines and livestock in the field. Hence, the growing of *belg* crops along with other farmers in fields contiguous to each other would be advisable so that crop losses to vermines will be distributed between all farm plots and crop protection from livestock damage can be endured jointly. The finding in this regard shows that some.83.8 per cent of the respondents grow *belg* crops taking advantage of *belg* farming. On a PA level, the proportion was highest in *Belemeda* (82.2%), where the incidence of attacks by birds seems to be high although it was the least in *Ego Dengago* PA (78.5%).

Table 2
Summary of Point Score Analysis for the Socio-Economic Factors Encouraging the Production of *Belg* Crops by PAs

Factor	Peasant Association[1]								Overall Total		Percent of applicability
	Belemeda		Ego Dengago		Ego Uedolla		Ego Legedina				
	Total score	Rank	Total score	Rank	Total score	Rank	Total score	Rank	Total score	Rank	
Production of *Belg* crops by other farmers	45	2	38	3	41	3	47	3	171	3	83.8
Food security	56	1	55	1	48	1	62	1	221	1	100.0
Seed Security	42	3	43	2	45	2	55	2	195	2	91.0
Increase of crop price at market	24	4	27	4	26	4	20	5	97	4	66.6
Adequate Farmland	12	5	19	5	25	5	24	4	70	5	53

Note: 1- Difference between the total score of PAs with Chi-square 8.95 is insignificant at 95% confidence limit (12 degree at freedom).

Source: Field survey, 1995

Increase of Crop Price at market During *Belg* Harvest

This factor may encourage farmers to grow *belg* crops in two regards. First and foremost is the fact that farmers possess limited cash capital, and hence lower purchasing power, to meet both household food consumption demand during seasons of short supply and seed requirements. So they are tempted to grow *belg* crops. Secondly, farmers may have the ambition to generate some cash income by selling part of their *belg* crop output. In this regard, it is observed that the studied farmers have marketed about one-tenth of their *belg* crop output in 1995. About 66.6 per cent of the farmers grow *belg* crops partly to take advantage of the increase in crop prices. The proportion varied significantly among the studied PAs where the highest increase was in *Ego Yedolla* (100%) and the lowest was in *Ego Legedana* (48.4%).

Adequate Holding Size

Size of farmland greatly influences farmers' plans to grow varieties of crops in a season and the degree of intensification. Farmers are aware that utilizing the same plot of land for double cropping during *meher* and *belg* growing seasons will bring about a considerable depletion of soil nutrients. It is found out that a little over three-quarters (76.6%) of the farmers grow crops during a single growing season, either in *meher* or *belg*, out of which about 65 per cent of them avoid double cropping on the same pieces of land in order to restore the fertility of their farmland through seasonal fallowing. This would rightly imply that a large holding-size is one of the pre-conditions for *belg* farming so that sufficient land will be separately allotted for *belg* and *meher* growing seasons. Related to this issue, it was identified that the average holding size of *belg* grower farmers was slightly greater than that of non-*belg* grower farmers.

FACTORS DISCOURAGING THE PRODUCTION OF *BELG* CROPS

Environmental Hindrances

Attack of *Belg* crops by birds

As stated above, birds are the predominant pests damaging farmers' crops in the fields. Survey results revealed that *belg* crop damage by birds was the most formidable factor deterring *belg* farming, and hence farmers rated it to be more significant than all physical and socio-economic hindrances shown in tables 3 and 4. About 93.6 per cent of the respondents did not grow *belg* crop due to fear of damage by birds. It is apparent that differences were found, depending on variations in vegetation cover, among the studied non-*belg* grower PAs. All the interviewed farmers in *Koma Ano* and *Choba* PAs, where the natural vegetation cover is relatively large, do not practice *belg* farming so as to avoid the risk of crop losses due to birds. The proportion of farmers blaming birds as hindrance to *belg* farming was slightly low in *Koji Kenchere* (92.6%) and *Neno Legedana* (83.9%).

Unreliability of *Belg* Rain

With regard to unreliability of *Belg* rain as a constraint to *belg* farming, two divergent pictures emerged in relation to the studied PAs. It was found to be negligible in *Choba* and *Koma Ano* PAs, where only 3.8 and 12 per cent of the respondents respectively rated it as the most important constraint. Conversely, the failure to practice *belg* farming by 96.3 per cent of the farmers in Koji Kenchere and 96.8 per cent of the farmers in *Neno Legedana* was partly attributable to the unreliability of *belg* rain. A discussion with the group of farmers in the latter two PAs indicated that *belg* rain occurrence is not dependable in their areas. It starts late in some years while in other years its onset may be timely but terminates before the fruiting of *belg* crops. The farmers further disclosed that there were even worse years when the *belg* rain was entirely lacking in their areas. Thus, farmers decided not to grow *belg* crops so as to avoid the risk of crop failure. Farmers' perceptions towards such erratic *belg* rain condition was in accordance with the general spatial aspect of rainfall, where the dependability of rainfall increases with altitude. For instance, variability of *belg* rain at *Lole* (meteorological station near *Neno Legedana* and *Koji Kenchere* PAs) was higher than that of *Kerssa* (Meteorological station near *Choba* and *Koma Ano* PAs). The Coefficients of variation at the respective stations for *belg* season were 27 and 37 per cent.

Difficulty of Land Preparation Under Little *Belg* Rain

Characteristics (amount and reliability) and water-holding capacity of the soils greatly influence land preparation for the appropriate planting of *belg* crops. As a consequence of less reliable *belg* rain in their areas, all farmers in *Neno Legedana* and the great majority of farmers in *Koji Kenchere* (96.3%) cannot prepare land for *belg* crops. Conversely, it has not been the inhibiting factor to produce *belg* crops for 88 and 80.8 per cent of the interviewed farmers in *Komo Ano* and *Choba* PAs respectively.

Damage of *Belg* Crops by Excessive Summer Moisture

In the study area, the maximum rainfall occurs during summer season, which coincides with the ripening and harvesting of *belg* crops. Excessive and torrential rainfall could, therefore, result in the falling down of crops and the decomposition of grains before harvest, which will, in turn, lead to a sharp decline in yields or even in a complete failure of crop production. Farmers were asked whether they avoid *belg* farming so as to avoid the risk of crop failure caused by excessive summer rain. The findings reveal that some 48.6 per cent of the farmers who failed to grow *belg* crops were partly discouraged by excessive summer rains. However, variations were observed among the studied PAs. For example, the farmers in *Koma Ano, Choba, Neno Legedana* and *Koji Kenchere* rated this factor as an obstacle to *belg* farming as second, third, fourth and fifth respectively. The proportion of farmers blaming excessive rains as a hindrance to *belg* farming in the respective PAs was 84, 65.4, 38.7 and 11.1 per cent.

Table 3
Summary of Point Score Analysis for Physical Factors Hindering the Production of *Belg* Crops by PAs

Factor	Peasant Association[2]								Overall Total		Percent of applicability
	Choba		Koma Ano		Koji Kenchere		Neno Legedana				
	Total score	Rank	Total score	Rank	Total score	Rank	Total score	Rank	Total score	Rank	
Unreliability of *belg* rain	5	5	8	5	51	1	60	1	124	2	59.6
Difficulty of land preparation	5	5	3	6	51	1	49	2	108	3	59.6
Low farmland quality	17	4	15	4	19	3	13	6	64	5	44.1
Damage of *belg* crops by high summer rain	27	2	32	2	5	5	9	4	83	4	48.6
Longer maturing time of *meher* crops	19	3	16	3	6	4	16	5	57	6	38.5
Attack of *belg* crops by birds	51	1	49	1	46	2	46	3	192	1	93.6

Note: 1- Score values given to responses of farmers were: 2 for very discouraging, 1 for less discouraging and 0 for not discouraging.
- Response values were then multiplied by the number of respondents and summed up to get the total score.
2 - Difference between the scores of PAs with Chi-square 162.2 is significant at 95 per cent and above confidence limit (15 degree of freedom)

Source: Field survey, 1995

Low Quality of Land

Under a low degree of modern farm input application and little soil conservation practices, growing crops on the same plots during two growing seasons could result in considerable depletion of soil nutrients within a short period of time, which would be reflected in low yields (Beets, 1982). The

respondents were asked to indicate how much the poor quality of their farmland has discouraged the practice of *belg* farming. The results show that some 44 per cent of the farmers' intention to grow *belg* crops has partly been constrained by the poor quality of their farmland. In addition, the proportion of farmers preferring to devote all of their farmland to the production of *meher* crops in *Choba, Koma Ano, Koji Kenchere* and *Neno Legedana* PAs represented 50, 48, 44 and 35.5 per cent respectively.

Longer Maturing Time of *Meher* Crops

Both soil and atmospheric temperatures may retard or accelerate the ripening of crops. Mavi (1986) underlines that soil temperature would be more crucial, and that this is determined, among others, by the amount of solar radiation reaching a farmland and the physical properties of soils. When we relate this issue to the case study of the non-*belg* grower PAs, the relatively high vegetation cover in *Koma Ano* and *Choba* generally acts as a shadow and reduces the amount of solar energy expected to reach the farmlands. Consequently, the maturing period of crops during *meher* (the main season) is relatively longer in the areas of these PAs. The impact of this factor on the farmers' plan to grow *belg* crops was assessed in both PAs as well as in other non-*belg* grower PAs, i.e. *Neno Legedana* and *Koji Kenchere*. Compared with other physical constraints, the overall effects of this variable were found to be quite less but still significant since this had adversely influenced 38.5 per cent of the farmers' plans to grow *belg* crops. As expected, of course, its impact was rather strong among farmers in *Koma Ano* and *Choba* PAs.

Socio-Economic Hindrances

Absence of Cooperation Among Farmers

Growing *belg* crops requires, among others, an understanding and cooperation among farmers living in the same community and possessing farmlands neighbouring on each other. An attempt by a few farmers to produce *belg* crops may not be successful as the crop will be considerably

damaged, being eaten by birds and by livestock which are left free to graze communally in the post-*meher* harvest periods.

As such, the interviewed farmers identified the absence of cooperation to growing *belg* crops and the limited follow-up of livestock by households in their areas to be the most formidable social hindrances to *belg* farming. About nine-tenths of the interviewed households' failure to practice *belg* farming was partly attributable to this factor. A point score analysis indicates the absence of cooperation among farmers to be ranking first in all PAs in terms of discouraging the growing of *belg* crops. All farmers, (100%), 96, 88 and 80.6 per cent in *Choba, Koma Ano, Koji Kenchere* and *Neno Legedana* respectively, have failed to grow *belg* crops partly because of the absence of cooperation among farmers in their community.

Inadequate Farmland

Inadequate farmland was assumed to preclude farmers involvement in *belg* farming because a farmer, with small holdings in most cases, would prefer to devote his land for the main season when all other factors are relatively favourable to obtain better yields. Farmers' responses put inadequacy of farmland as the second most important socio-economic constraint to the adoption of *belg* farming. Some 72.5 per cent of the respondents failed to grow *belg* crops partly due to their small holdings. A great deal of difference was, however, observed among the investigated PAs in that 88.5, 84, 70.3 and 51.7 per cent of the farmers in *Choba, Koma Ano, Koji Kenchere* and *Neno Legedana* respectively complained about shortage of farmland.

Lack of Cash Capital

Subsistence farmers' applications of modern farm inputs, particularly artificial fertilizers and herbicides tend to be limited by the lack of surplus cash income. Unlike the case of *meher* season, no short-term credit is offered during *belg* season for the purchase of farm inputs in the study area. The survey result identified this aspect as the third most important hindrance. About 69.3, 64.5, 59.2 and 48 per cent of the interviewed farmers in *Choba, Neno Legedana,*

Koji Kenchere and *Koma An* .s respectively, were unable to produce *belg* crops partly because of the shortage of cash capital.

Sufficient Food Grain Production During *Meher* Season

Farmers were asked if food grain production during the main season has discouraged them from growing *belg* crops. However, the results showed its influence to be weak as compared to other factors. Less than one-third of the farmers claimed that the output of food crops during the main season could satisfy their household food demand. The variations across PAs in this regard were insignificant. Some 33.3, 32.3, 28 and 26.9 per cent of the interviewed farmers are, in *Koji Kenchere. Neno Legedana, Koma Ano and Choba* PAs respectively, discouraged not to produce *belg* crops due to the size of crop output during *meher* season.

Overlapping of *Meher* and *Belg* Season Agricultural Operations

Crop calendar of *belg* grower farmers revealed that farm operations of *belg* and *meher* seasons overlap to some extent allowing no rest between the two growing seasons. It is, therefore, possible to assume that farmers might have been interested in having adequate leisure time by avoiding the additional burden of engagement in agricultural activities during the *belg* season. The result of the survey indicated that the impact of this factor has been relatively weak since only 33.9 per cent of the interviewed farmers' decisions to grow *belg* crops were negatively affected.

Table 4
Summary of Point Score Analysis for the Socio-Economic Factors Discouraging the Production of *Belg* Crops by PAs

Factor	Peasant Association[1]								Overall Total		Percent of applicability
	Choba		Koma Ano		Koji Kenchere		Neno Legedana				
	Total score	Rank	Total score	Rank	Total score	Rank	Total score	Rank	Total score	Rank	
Sufficient food grain Production Dung *meher* season	9	7	12	6	11	5	16	4	48	4	30.3
Absence of awareness as to the possible contribution by *belg* crops	12	6	14	5	13	4	0	7	39	7	31.2
Absence of cooperation among farmers	46	1	46	1	32	1	37	1	161	1	90.8
Overlapping of *meher* and *belg* growing seasons farm operation	15	5	17	3	4	7	11	5	47	5	34.0
Inadequate farmland	30	2	30	2	29	2	22	3	119	2	72.5
Shortage of draught power	16	4	6	7	12	5	9	6	43	6	30.3
Lack of Capital	30	3	16	4	28	3	32	2	106	3	60.1

Note: 1- The difference between the total score of PAs with Chi-square 29 is insignificant at 95% confidence limit (18 degree of freedom)

Source: Field Survey, 1995

Shortage of Draught Power

Farm oxen possession appears to be more crucial during the *belg* season than during the *meher* season because of the short duration of the former. This

time constraint would not e...ie farmers to make various arrangements to overcome the shortage of oxen. The result of the survey revealed that some 30 per cent of the sampled farmers reported shortage of draught power as a partial discouraging factor in the engagement of *belg* farming. Nonetheless, the figure was found to be exaggerated when compared with the proportion of non-*belg* grower farmers who possessed less than a pair of oxen (14.7%).

Absence of Awareness about the Possible Contributions of *Belg* Crops

It would be difficult to argue that farmers are without knowledge of, at least, the role *belg* crops play in meeting households' food consumption demands. Even the non-*belg* grower farmers take advantage of *belg* production in the neighbouring PAs since they are indirect users of the *belg* output either by purchasing in the market or borrowing from their *belg* grower relatives. What farmers may not recognize is, however, the multiple advantages of double cropping, especially under farming condition of very limited surplus production. For farmers relying upon a single harvest in a year, an incidence of crops failure during that season caused by various hazards (drought, frost, hail, etc.) would result in food insecurity for a year or so, which could be a maximum of about half a year for farmers harvesting crops twice a year. It was from this perspective that the factor was presented to the respondents to indicate the degree of its hindrance in adopting *belg* farming. The results showed that about 31.2 per cent of the farmers were unaware of the several advantage that can be attained by growing *belg* crops. Disparities among PAs in this regard were significant. The factor was not applicable for any of the interviewed farmers in Neno Legedana. Absence of awareness as to the possible contribution of *belg* was rated as less important by 48.1, 38.5, and 24 per cent of the farmers in *Koji Kenchere*, *Koma Ano* and *Choba* PAs respectively. Likewise, only 16 per cent of the farmers in *Koma Ano* and 3.8 per cent in *Choba* rated this variable as the most important factor for the failure of *belg* crop. The point score analysis put the influence of this factor at the bottom rank of socio-economic variables described above.

CONCLUSION AND RECOMMENDATIONS

The study has attempted to find out why some farmers in *belg* rain receiving *dega* parts of *Munessa wereda* have faild to practice *belg* farming. The point score analysis of farmers' responses indicated that the interaction between the various environmental and socio-economic factors have discouraged them from producing *belg* crops. Unreliability of *belg* rain for 96.6 per cent of the farmers, the difficulty of land preparation under limited *belg* rain for 98.3% and attack of *belg* crops by birds for 87.9 per cent of the farmers are found to be the most formidable physical hindrances to growing *belg* crops in *Koji Kenchere* and *Neno Legedana* PAs. Similarly, attack of *belg* crops by birds for all respondents (100%) and damage of *belg* crops by excessive rainfall in the rainy season for 74.5 per cent of the respondents appeared to be as the most discouraging environmental factors to *belg* farming in *Koma Ano* and *Choba* PAs. Absence of cooperation among farmers, inadequate farmland and the lack of capital to purchase farm inputs were identified as the principal socio-economic hindrances for 90.8, 72.5 and 60.5 per cent of the non-*belg* grower farmers respectively.

An important conclusion to be drawn from the major findings is that *belg* farming can be carried out in all non-*belg* grower PAs under investigation. Like in other *belg* grower PAs studied, farmers in *Choba* and *Koma Ano* PAs can practice *belg* farming regularly. In order to promote their household-food security, farmers in these PAs should be strongly advised to practice *belg* farming cooperatively on farm plots contiguous to each other, as well as to plant similar varieties of crops that can mature at an equal pace. These are the strategies by which farmers could distribute the risk of crop losses to all farm plots and can ease the scarring away of birds jointly. In connection with this, mechanisms to minimize the attack of crop by birds should be sought by the Ministry of Agriculture and other concerned institutions.

Farmers in *Koji Kenchere* and *Neno Legedana* should be convinced to grow *belg* crops in "good years". In these PAs, if farmers cultivate their plots once or twice in September and October they can grow *belg* crops in years when *belg* rain occur in good conditions. Otherwise, prepared land can be devoted

to *meher* crops. In this regard, farmers should be supplied with improved seeds that can withstand drought. Moreover, offering the meteorological information disseminated from the National Meteorological Service Agency on a regular basis could be of much help to the farmers in utilizing *belg* rain effectively.

The land scarcity problem in the study area should be alleviated through various options such as promoting applications of modern farm inputs, improving traditional farm implements, encouraging off-farm activities and land-use intensification. Moreover, apart from already existing short-term credit programs for fertilizers and improved seeds only during the *meher* season, long-term credit provisions should be introduced to overcome farmers' shortage of cash to purchase farm oxen and modern farm inputs for both the *meher* and *belg* seasons.

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