Food Security Situation in Ethiopia : The Case of Amhara National Regional State[1)]

Teshome Temesgen Tilahun[2)]

Key words : food security, food production, food shortage vulnerability, Amhara Region

Abstract : *Amhara region is one of the nine regions of Ethiopia frequently suffer from food insecurity problem. This study has conducted with the view to assess the depth and extent of food insecurity problems ; and compare the food security situations of the nine districts in Amhara region, Ethiopia. The data obtained from the sample population of the nine districts within the Amhara Regional State have presented in average and percentage forms. Based on the proportions of dichotomous variables, this study has conducted to see whether each of the districts mean is significantly different from the average of the total situation using Z- statistic test. Accordingly, the result of the study showed that all the nine districts sample households were vulnerable to food shortage. They are unable to cover their annual food demand and hence suffered a lot from food shortage. Such food insecurity problems were especially severe in Quarit, East Estie, Mecha, and Sekela districts. Statistical tests conducted on food coverage, landholding, and extension service uses indicated that Quarit, East Estie, Mecha, and Sekela districts have significantly lower conditions than the total of the nine districts proportion of sample population situation.*

1. Definition of Food Security

Food security is defined in different ways by different international organizations and researchers with close to two hundred definitions. Since the World Food Conference of 1974, definitions evolved from diverse viewpoints ranging from national food security or an increase in supply side.

Definitions underwent another round of evolution after the 1996 World Food Summit. The definition was broadly set as achieving food security "at the individual, household, national, regional and global levels when all people, at all times, have physical and economic

1) This study has conducted in cooperation with the Amhara National Regional State, Food Security and Disaster Prevention Office, 2007.

2) The author of this study is Doctoral Student in the Graduate School of Economics, Ryukoku University, Kyoto, Japan. The author would like to address sincere thanks to Professor Yoshio Kawamura, Ryukoku University, Graduate School of Economics for his invaluable constructive criticism on this paper.

access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). Currently, a synthesis of these definitions with the main emphasis on availability, accessibility, and utilization, serves as working definition in the projects of international organizations.

Furthermore, the definition of food security has evolved over time, mirroring the paradigm shifts in the conceptualization of food security (Maxwell, 1996). Initially, the focus of food security was on the supply of food at national and international levels. However, famines in the Sahel and East Africa in the 1970s revealed that adequate national and international supplies do not necessarily prevent widespread food insecurity. This highlighted the importance of the demand side in the food security equation. The seminal work of Amartya Sen (1981) captured the demand side of food security through his entitlement theory. He defined entitlement failures of two types : endowment failures when crops fail due to drought in subsistence agriculture, and trade entitlement failures when market rules change suddenly, an example being a rapid increase in prices. In both cases, the access to food by some segments of society is diminished. Thus, it is no longer credible to talk of food security as being a problem of food supply only. Nevertheless, adequate national or local food availability remains a necessary condition for household food security.

Though food security as a problem at the national level was first felt in Ethiopia in the 1960s, it only started influencing policy in the 1980s, when food self-sufficiency became one of the objectives of the Ten-Years Perspective Plan in the early 1980s. This took place after the 1983/4 drought and famine, which claimed millions of lives (Alemu, *et al*, 2002). While efforts to ensure adequate food supplies at the national level have done well, these efforts on their own cannot ensure food availability for households and individuals. As Sen (1981) argues, ensuring access to food, not merely increasing food supplies, should regarded as the major pillar of food security. This assertion is borne out by empirical evidence that suggests even in times when countries experience famine, food supplies have been generally available, even in regions where large numbers of people died of starvation. The problem is that those who needed the food do not have the means to acquire it.

Ethiopia is classified into nine administrative regions and two chartered cities. One of the nine regions, highly prone to food insecurity problem, is Amhara region. In this region some of the districts, which were regarded as surplus food producing areas have risen frequent complains on being excluded from food security programs. The official letters written by each of the districts under study indicated that food shortage is prevalence since the beginning of 2000s. Therefore, the major purposes of this study are to assess the depth and extent of food security problems ; and compare the food security situations of the nine

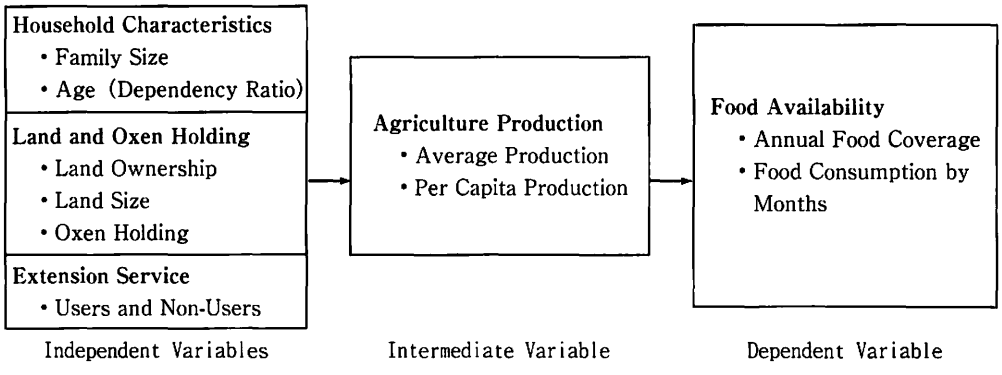
districts in Amhara region, Ethiopia.

2. Theoretical Framework Construction

Theoretical framework has been constructed to show the theoretical impact of independent variables on the dependent variable, (see Figure 1). In the left side of the framework ; household characteristics, land and oxen holding, and extension service users are cascaded as independent variables. Theoretically, it is hypothesized that these independent variables bear direct impact on agriculture production and then indirectly affecting the availability of food in the farming societies.

Household characteristics as independent variable are affecting agricultural production directly and food availability indirectly via the reduction of agricultural production. Households having larger family size would have low production per capita, especially when the majority of the family members are children who are ready to eat but physically immature to earn economic benefit. Consequently, this will bring high dependency ratio and hence would have negative influence on the availability of food production. Similarly, land and oxen holding conditions are directly affecting agriculture production and indirectly affecting food availability. More specifically, those farmers who have land with ample size and pair of oxen to plough the land they have would bear positive influence on agricultural production and food availability too. In the same analogy, farmers who are participating in extension service would have better production and productivity and hence better food availability.

Figure 1 : TheoreticalFramework



Source : Developed by the Author.

Agriculture production, which is the main livelihood of the rural society, has been put in the core of the framework as intermediate variable. It is the backbone of Ethiopian economy[3] making multifaceted contributions to the livelihoods of the population. The

3) Responsible for about 50% of Gross Domestic Product, and over 90% of foreign exchange /

performance of agriculture, however, in terms of feeding the country's population, which is growing at about 2.9% per annum, is poor (CSA, 2004). According to reports, over 50% of the Ethiopian population, of whom the majority reside in rural areas, is food insecure in relation to the medically recommended daily intake of 2100 calories per person per day (FAO, 1998).

Over the last forty years, Ethiopia has been in the news for widespread and persistent food insecurity. Erratic rainfall and drought are often cited as the major causes of extreme variability in food production and, other factors included in this study are left behind though they would bear strong impact on the food security conditions of the society in reality. In the last half a century, the governments that have been in power in the country have experimented with different land tenure and agricultural policies but have failed to make Ethiopia food secure.

Thus, the country has suffered a lot from frequent chronic and transitory food insecurity problems. According to UNDP's report (2005), there were 5 million people live under chronic food insecurity in nationwide and 2 million people in Amhara region. In addition, 10 and 2.5 million people lived under transitory food insecure condition in the nation and Amhara region, respectively.

The Ethiopian Ministry of Agriculture and Rural Development is trying to combat such food insecurity problems in the national and regional levels. These include identification of households under chronic and transitory food insecurity problems ; and designation of food security programs ; like - supply of agricultural inputs to enhance agricultural production ; and infrastructural fulfillments to enhance disaster prevention and resilience capacities ; capacity building for income diversification in non-agricultural activities ; participation in productive safety net programs ; and voluntarily based resettlement programs. Nonetheless, the problem of food insecurity condition is still persistent in many of the districts.

3. Methodology of the Study

3.1 Data Sources and Analysis

Both primary and secondary sources of data have used as sources of data. Primary data obtained through structured questionnaire interviewed to sample households' in the

---

earnings, and employing over 85% of the labor force as explained by the Ministry of Finance and Economic Development, 2005.

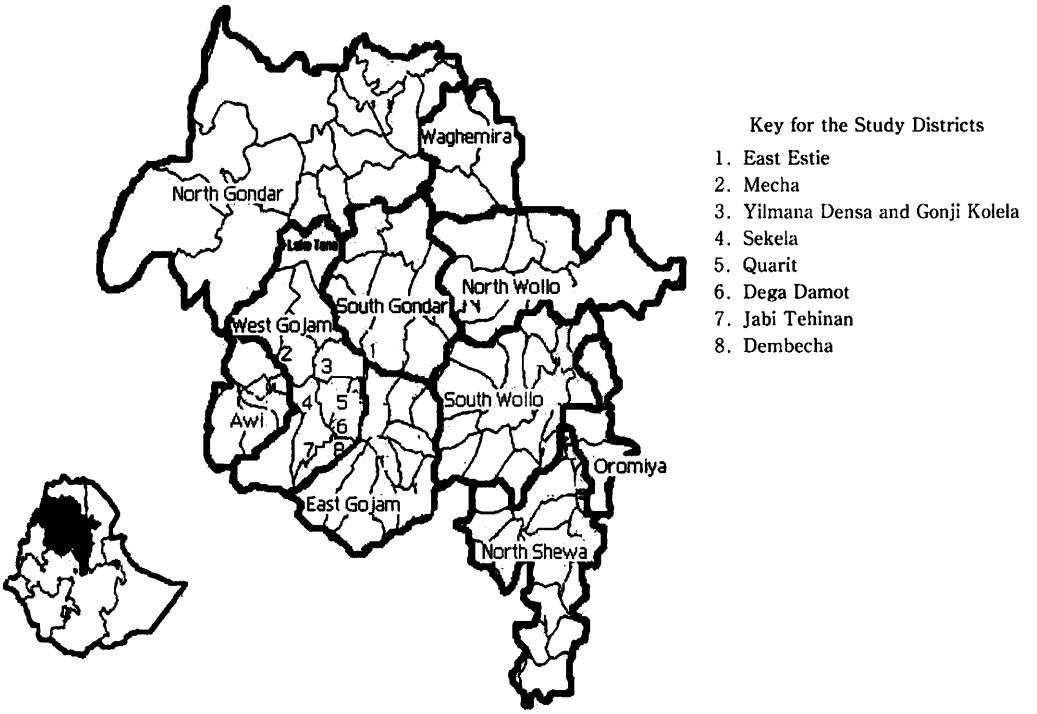
twenty food shortage vulnerable peasant administrations[4]. Development agents and elementary school teachers conducted households' interview. Secondary data obtained from the districts report 2005-2007. Except Gonji Kolela district which has separated from Yilmana Densa district in 2006, all districts have comprehensive yearly reports to the next zonal administrative level. Thus, secondary data has taken from such report in each of the districts.

After the required data has collected from sample households and district reports, it has entered to Microsoft Excel Program to compute the data in descriptive form and frequency tables. In addition, Z- statistic test has computed using SPSS software program.

3.2 Research Site and Sample Selection

The sample peasant administrations have been selected based on the official letters and requests of each districts and peasant administration administrators to be included under safety net programs. There were 106 peasant administrations reported as vulnerable to food insecurity problems within 9 districts, of which 20 of them have taken as sample peasant administrations. Each sample peasant administration has selected from the three Agro-ecological zones (highlands, plains and lowlands) from the 9 districts. In each of the

Figure 2 : Zonal and District Map of Amhara Region, Ethiopia



Source : Ethiopian Mapping Agency, 2004.

4) Peasant administration is the smallest administrative unit in the government structure of Ethiopia.

Table 1 : Research Site and Population

No.	Districts	Zone	Total Households	Sample Households
1	Yilmana Densa	West Gojam	15,974	60
2	Gonji Kolela	West Gojam	11,457	60
3	Mecha	West Gojam	14,112	60
4	Dembecha	West Gojam	8,030	60
5	Quarit	West Gojam	15,988	60
6	Dega Damot	West Gojam	15,156	60
7	Sekela	West Gojam	22,002	60
8	Jabi Tehinan	West Gojam	9,559	90
9	East Estie	South Gondar	8,790	90
	Total		121,068	600

Source : Ethiopian Central Statistical Authority, 2004.

selected 20 peasant administrations (8 from highlands, 5 from the plains, and 7 from the lowlands), 30 households have selected by using systematic random sampling method from the master list of peasant administrations.

Of all the nine sample districts, the first 8 (Yilmana Densa, Gonji Kolela, Mecha, Dembecha, Quarit, Dega Damot, Sekela, and Jabi Tehinan) are in West Gojam Administrative zone ; and only East Estie is taken from South Gondar Administrative zone.

The number of sample peasant administrations selected in each districts has been determined by the particular agro-ecological zones they are experienced. Hence, 3 (three) sample peasant administrations having 90 (ninety) households in the 2 (two) districts of East Estie and Dega Damot have taken as sample population ; and only 2 peasant administrations with 60 (sixty) households have been taken in the other 7 (seven) districts. Thus, 600 (six hundred) households have been taken as total sample population. Out of the total sample population, 78.3% (470) are males and 21.7% (130) are females ; and the total numbers of sample household members are 3412. Of the total household members, 1729 (50.67%) are males and 1683 (49.33%) are females.

4. Food Security Situation in the Study Districts

Amhara region is one of the regions of Ethiopia suffered from food shortage every year. Most of the regions are incorporated under safety net program in order to rehabilitate the farmers' living standard and alleviate their food insecurity problems. However, there are some regions highly exposed to frequent food shortage but they are still regarded as food secured districts by the regional government and hence are not under the safety net program. Among these districts, the study districts have been listed as priority areas to be

incorporated under the program according to the result of this study. The result of the study in Table 2 has shown that only 12% of the sample households have covered their annual food demand. The remaining 88% are unable to cover their annual food consumption. Especially in Quarit district, all sample households are found unable to cover their annual food consumption. In all districts, there are such very small proportion of the sample households who can cover their annual food consumption, as Sekela (3.33%), East Estie (5.56%), and Mecha (5%). Furthermore, in terms of the distribution of sample population in reference to the total months of food consumption cover, the majority of them are able to cover only some months of the year as shown in Table 2 below. This witnesses that how food shortage is so immense in all of the districts that would gradually lead to food insecurity.

In those districts, namely, Quarit, East Estie, Sekela and Mecha, the food shortage situation is severe than the rest of the districts. These four districts have 5-20% of the population who could cover their food consumption only from 1-3 months and the proportion of their population who could cover food consumption from 10-12 months is smaller than the rest of the districts. However, it does not mean that the rest of the districts sample households are in a better situation to cover their annual food consumption. Still there are large segments of population who could not cover their annual food consumption as shown in Table 2 below.

In relative terms, Jabi Tehinan and Gonji Kolela districts sample households are better than other districts in terms of covering their annual food consumption from 10-12 months. In the nine districts, the percentage of sample households who could cover their food consumption from 10-12 months is only 29.6%, where as the majority (more than

Table 2 : Sample Households Annual and Monthly Food Consumption Coverage (%)

No.	Districts	Annual Food Coverage (%)		Months			
		Can Cover	Cannot Cover	1-3	4-6	7-9	10-12
1	Yilmana Densa	18.33	81.67	0.00	18.33	50.00	31.67
2	Gonji Kolela	30.00	70.00	1.67	3.33	33.33	61.67
3	Mecha	5.00	95.00	5.00	36.67	41.67	16.67
4	Dembecha	16.67	83.33	3.33	20.00	48.33	28.33
5	Quarit	0.00	100.00	20.00	33.33	35.00	11.67
6	Dega Damot	13.33	86.67	0.00	5.00	50.00	45.00
7	Sekela	3.33	96.67	10.00	25.00	46.67	16.67
8	Jabi Tehinan	16.67	83.33	2.22	10.00	35.55	52.22
9	East Estie	5.56	94.44	16.67	53.33	26.66	3.33
	All Districts	12.00	88.00	6.70	23.80	39.90	29.60

Source : Field Survey, 2007 (See Table 1 forsample size).

70%) of the sample households are unable to cover their food consumption even for 10-12 months.

4.1 Statistical Test for Annual Food Coverage

The mean of the sample population in each of the districts with respect to the ability of households to cover their annual food consumption is helpful to test whether the means of each of the districts food coverage capability is statistically different from the nine districts average food coverage situation. Setting $\alpha=0.05$, Z- test statistics has been taken as a method to test the significant difference between the districts and the nine regions mean. To compute the test statistics on the difference between the two means, the following formula has been adapted from Statistics for Social Data Analysis book[5].

$$Z_{P_1-P_2}=\frac{P_1-P_2}{\sqrt{\frac{P_1(1-P_1)}{N_1}+\frac{P_2(1-P_2)}{N_2}}}$$

Where ; P_1=the mean of sample population in a district able to cover their annual food consumption

P_2=the mean of all districts sample population able to cover annual food consumption

N_1=the sample population of a district

N_2=the total sample population of the nine regions

Variance of each districts sample mean is given by $P_1(1-P_1)$

$$\text{Standard Error}=\sqrt{\frac{P_1(1-P_1)}{N_1}}$$

Table 3 : Statistical Test for Annual Food Coverage

No.	Districts	Variance	Standard Error	Statistic Test (Z- Test)
1	Yilmana Densa	0.15	0.05	1.22
2	Gonji Kolela	0.21	0.06	2.95
3	Mecha	0.05	0.03	−2.26
4	Dembecha	0.14	0.05	0.93
5	Quarit	0.00	0.00	−9.23
6	Dega Damot	0.11	0.04	−0.29
7	Sekela	0.03	0.02	−3.25
8	Jabi Tehinan	0.14	0.04	1.13
9	East Estie	0.05	0.02	−2.34

Source : Computed by the Author.

As depicted in Table 3, the variance, standard error and test statistic results of the 9 (nine)

5) Statistics for Social Data Analysis, Fourth Edition, published by David Knoke, George W. Bohrnstedt and A. P Mee, New York, 2002, has used immense number of statistical significance test methods. Among them, Z- test statistics for dichotomous variables has been taken from this book and tried to fit according to the subject under study. The same formula has used for all Z- test statistic in subsequent parts of this paper.

districts have been computed. Each of the respective statistic tests have been computed in comparison with the mean of all districts. Thus, it would be possible to test each of the districts mean of food coverage whether they are significantly different from the overall districts average based on their proportions. Setting $\alpha=0.05$ and taking $|Z|$, then critical value is $+1.645$. Therefore, by taking $|Z|$ as reference of comparison for each of the districts and comparing the result with the given critical value, we can test whether each of the districts are significantly different from the average of the nine districts food coverage ability.

Accordingly, the statistic test in Gonji Kolela, Mecha, Quarit, Sekela, and East Eastie showed that $|Z|$ is greater than the critical value ($+1.645$), and hence these districts mean are significantly different from the districts average food coverage situation. In these districts, the sample mean that can cover their annual food consumption have deviated to the left or right of the total mean. Referring back to the proportion/percentage of sample population presented in Table 2, these districts annual food coverage condition is found far less / greater than the nine districts' average food cover. On the other hand, for the remaining districts (Yilmana Densa, Dembecha, Dega Damot and Jabi Tehinan), the $|Z|$ is less than the critical value ($+1.645$). These indicates that there is no significant difference between these four districts annual food cover to the nine districts mean which can cover their annual food consumption. The districts that have no statistical significant difference with the total districts' proportion have found very similar situation in the frequency table. Therefore, it is viable to conclude that the difference and similarity between each districts' sample population food coverage to the total proportion food coverage is also supported by the test statistic. This implies that the incidence of food shortage problem has not uniformly distributed in all districts as some districts have better food coverage and some are not ; and showed significant statistical difference, while others are in moderate situation and showed no significant difference to the mean food coverage of all sample districts.

5. Agriculture Production

Agriculture production plays vital role on the lives of the population in the country in general and in the study districts in particular. This is because the livelihood of the society is relied on rain fed crop production and animal husbandry. If once production is fall below the level of the households' requirement, then the whole year until the next harvesting season would be disastrous for farmers. The amount of production a farmer produces in one harvesting season determines the fate of the whole families' food demand satisfaction at least for a year as the next production season would be after the next rain season. As

depicted in Table 4 below, the average production obtained from all districts sample household respondents is 8.26 quintal. The highest average production among the study districts sample households is observed in Jabi Tehinan (12.69 quintal) followed by Yilmana Densa (11.11 quintal). The lowest average production has observed in East Estie (3.04 quintal), Quarit (5.11 quintal), and Sekela (5.65 quintal).

The districts' report (2005-2007) indicated that the average per capita production is 3.91 quintal that is relatively greater than 1.45 quintal of the study sample households. This variation indicates that there is better food availability/food production in the districts as whole. However, in the study peasant administrations food access is limited despite it is available in the district level. The conditions are exactly shown by Amartaya Sen's Entitlement Approach (1981), where food production is available in the regional or national levels, while people are suffer from starvation due to lack of access to food.

The highest per capita production is recorded in Dembecha district (6.12 quintal) as indicated in the district's report from 2005-2007 ; but on the base of this survey, the highest per capita production is found in Jabi Tehinan (2.37 quintal). Except Jabi Tehinan and Yilmana Densa districts, all the remaining eight districts sample households indicated that their per capita production is less than two quintal. Such problem is severe in Sekela (0.98 quintal) and East Estie (0.55 quintal). In all the districts, the per capita production of the study areas sample households is much lower than the per capita production (3.91) indicated in the districts' report (2005-2007).

Table 4 : Average Production and Average Per Capita Production (n=600)

No.	Districts	Average Production (quintal)	Average Per Capita Production (quintal)
1	Yilmana Densa	11.11	2.06
2	Gonji Kolela	9.77	1.89
3	Mecha	7.61	1.25
4	Dembecha	8.41	1.42
5	Quarit	5.11	0.87
6	Dega Damot	10.99	1.79
7	Sekela	5.65	0.98
8	Jabi Tehinan	12.69	2.37
9	East Estie	3.04	0.55
	All Districts	8.26	1.45

Source : Field Survey, 2007.

On the other hand, according to the Regional Disaster Prevention and Food Security Coordination Office (2005), when a given household member would be regarded as food secured, he/she needs an annual expenditure of greater than or equal to 769.5 birr[6]. Of

6) The word birr refers to the current Ethiopian currency.

which, 537.00 birr for food, 74.88 birr for clothing, 53.00 birr for education and communication, 68.00 birr for medication, 8.50 birr for tax, and 28.12 birr for other non-food expenditures. However, this study indicates that except Gonji Kolela and Jabi Tehinan districts, all have shown that the birr value of per capita production is much lower than even to the minimum food expenditure alone (537.00 birr). This entails that how food insecurity problem is highly prevailed in all districts with different degree.

6. Household Characteristics

Household size is one of the factors influencing on the food security status of households. The majority of farm households in Ethiopia are small-scale semi-subsistence producers with limited participation in non-agricultural activities. Because land and finance are very limited to purchase agricultural inputs, increasing family size tends to exert more pressure on consumption than the labor it contributes to production. Thus, it affects the food security status of households negatively as food requirements increase in relation to the number of persons in a household.

According to this study as shown in Table 5, the average number of sample household size is 5.68, which is above the regional average household members (5.20). This indicates that how households have economically been burdened by family members who are ready for eating, but not working and not benefiting to the households' income. The average lowest family member is in Gonji Kolela (5.18) and the highest is in Dega Damot (6.15). Similarly, the average dependency ratio in the 9 (nine) districts is 1.14. Dependency ratio is higher in East Estie (174 economically dependent persons are relied on 100 economically active persons) and the lowest is in Yilmana Densa (94 economically inactive persons are relied on 100 economically active persons). Thus, it can be inferred that such large family members, especially in the young age, exacerbates the existing food insecurity problem in the districts.

When we see the average sample households' age distribution, 51.64% are less than 15 years, 46.69% are between 15-64 years, and only 1.67% are greater than 64 years, indicating the proportion of older and experienced households are negligible compared to the younger and adultproportions of the sample population. The young ages are prominent over adult and aged population.

Subsistence farming, practiced in Ethiopia, is generally characterized by greater reliance on labor than commercial agriculture. In subsistence farming, households with larger labor supplies are better positioned to increase the productivity of their land. Availa-

bility of a relatively larger labor force, regardless of farm size, can be an advantage to those households who strive to achieve food security, provided that the excess labor force is engaged in other income generating activities.

Table 5 : Households' Family Sizeand Age Distribution (n=600)

No.	Districts	Average Family Size	Sample Household[1] Members by Age (%)			Dependency Ratio[2]
			<15	15-64	>64	
1	Yilmana Densa	5.40	46.60	51.54	1.85	0.94
2	Gonji Kolela	5.18	47.91	50.80	1.29	0.97
3	Mecha	6.10	55.46	43.17	1.37	1.32
4	Dembecha	5.93	47.19	51.12	1.69	0.96
5	Quarit	5.88	54.39	44.48	1.13	1.25
6	Dega Damot	6.15	52.30	47.15	0.55	1.12
7	Sekela	5.81	49.57	47.85	2.58	1.09
8	Jabi Tehinan	5.33	48.33	51.25	0.42	0.95
9	East Estie	5.60	59.72	36.51	3.77	1.74
	Total	5.68	51.64	46.69	1.67	1.14

1) The total number of sample household membersis 3,412.
2) Dependency ratio has calculated as the ratio of those segments of population who have attended the age of less than fifteen and above sixty-four years to those who have attain the age between 15-64 years.
Source : Field Survey, 2007.

This shows that labor availability is an important determinant of households' productivity and food security, especially in subsistence-oriented households given the necessary conditions of landholding and rainfall. However, in the study areas, land holding scarcity and erratic rainfall restricted the existed labor force to enhance agricultural production and productivity under the conditions of lack of other activity chances.

7. Landholding Size and Wealth Status

Various studies indicated that farmland size positively affects the food security status of households. This is because food production can increase extensively through expansion of areas under cultivation. Therefore, under subsistence agriculture, landholding size plays significant role in influencing farm households' food security. The sample households plough fragmented plots with different sizes. In this study, the average landholding size of the total sample households is 0.99 hectare. Here we can understand that the average land size (0.99 hectare) is expected to feed 5.68 average numbers of family members. The lowest average landholding size is 0.81 hectare in Mecha district and the highest is 1.31 hectare in Jabi Tehinan. Landless households account 10.67%. Except Mecha and Dega Damot, all districts have landless households with different proportions. However, land-

lessness is severe in Sekela district (25%) than any other districts.

In this study, it has tried to categorize the wealth status of households based on the quality and quantity of farmlands they have, and the number of livestock population they own. Households are classified as rich, medium, poor, and poorest of the poor according to those local standards mentioned above. Accordingly, large proportion of the poorest of the poor is recorded in Mecha (37.5%), East Estie (36.67%) and in Gonji Kolela and Jabi Tehinan is (30%). Basic variables taken for wealth status classification in descending order are farmland size and quality, number of animal population, and healthy labor.

Among all livestock ownership status, oxen ownership is the determinants of the food security status of households. Oxen serve as a source of traction in all parts of Ethiopia, thereby significantly affecting households' crop production. Animal traction power enables households to cultivate greater areas of land and execute agricultural operations on a given season.

In the study peasant administrations, the only means of land plough is oxen traction power, and the average ox holding is 1.09. This indicates that the average number of oxen is nearly one, and it shows how farmers have lost their basic input for their cultivation. Normally in the study areas, traction is only possible by a pair of oxen. In case when a household has only one ox, the household is required to integrate his single ox with someone

Table 6 : Sample Households Landholding and Wealth Status (n=600)

Districts	Land Holdings (%)		Average Land Holdings in Hectare	Productivity (Quintal/ Hectare)	Average Oxen Holdings	Wealth Status of Households (%)			
	Have Land	Landless				Rich	Medium	Poor	Poorest
Yilmana Densa	95.00	5.00	0.82	11.33	1.05	11.67	35.00	31.67	21.67
Gonji Kolela	95.00	5.00	1.01	7.40	1.18	10.00	30.00	30.00	30.00
Mecha	100.00	0.00	0.81	9.72	1.08	10.00	21.67	30.00	38.33
Dembecha	95.00	5.00	1.15	7.45	1.20	11.67	21.67	41.67	25.00
Quarit	91.67	8.33	0.83	5.88	0.60	13.33	26.67	38.33	21.67
Dega Damot	100.00	0.00	0.91	13.28	1.30	21.67	28.33	28.33	21.67
Sekela	75.00	25.00	0.99	8.31	0.72	20.00	30.00	30.00	20.00
Jabi Tehinan	84.44	15.56	1.31	8.86	1.50	11.11	28.89	30.00	30.00
East Estie	76.67	23.33	0.96	3.11	1.00	10.00	18.88	34.44	36.67
Total	89.33	10.67	0.99	6.88	1.09	13.00	26.50	32.67	27.83

Source : Field Survey, 2007.

having the same, then they can plough their land turn by turn. Such single ox integration system hinders farmers' activity to sow crops within a given limited rain season and hence it adversely affects the amount of crop production.

In Table 6 above, it is shown that in all of the districts sample households productivity is less than the national average (13.39 quintal per hectare) and regional average productivity (12.09 quintal per hectare), except Dega Damot (13.28 quintal per hectare), which has better productivity than the regional level; but still lower than the national level. Even the average of all the sample household districts productivity (6.88 quintal per hectare) is less than the regional average productivity (12.09 quintal per hectare). Such low productivity is especially depicted in East Estie (3.11 quintal per hectare) and Quarit (5.88 quintal per hectare).

7.1 Statistical Test for Landholding

Based on the mean of the sample population in each of the districts landholders and landless households, it is possible to test whether the means of each of the districts landholding is statistically different from the nine districts average landholding. Setting $\alpha = 0.05$, Z- statistic test has been taken as a method to test the significant difference between the districts mean and the total of the nine regions landholders' mean.

The following test statistic formula has been adapted to compute the difference between the two means.

$$Z_{(P_1-P_2)} = \frac{P_1 - P_2}{\sqrt{\frac{P_1(1-P_1)}{N_1} + \frac{P_2(1-P_2)}{N_2}}}$$

Where ; P_1 = the mean of sample landholders in a district

P_2 = the mean of all sample population landholders

N_1 = the sample population of a district

N_2 = the total sample population of the nine regions

Variance of each districts sample mean is given by $P_1(1-P_1)$

$$\text{Standard Error} = \sqrt{\frac{P_1(1-P_1)}{N_1}}$$

As shown in Table 7, the variance, standard error and test statistic results of the nine districts have been computed and presented. Each of the respective statistic tests have been computed in comparison with the mean of all districts. This made easier to test each of the districts mean significant variation from the overall districts total mean. Setting alpha $(\alpha) = 0.05$ and taking $|Z|$, critical value is $+1.645$. Therefore, by taking for each of the districts and comparing the result with the given critical value, we can test whether each of the districts mean are signi-

Table 7 : Statistic Test for Landholding

No.	Districts	Variance	Standard Error	Statistic Test (Z- Test)
1	Yilmana Densa	0.05	0.03	+1.84
2	Gonji Kolela	0.05	0.03	+1.84
3	Mecha	0.00	0.00	+8.47
4	Dembecha	0.05	0.03	+1.84
5	Quarit	0.08	0.03	+0.62
6	DegaDamot	0.00	0.00	+8.47
7	Sekela	0.19	0.05	−2.50
8	JabiTehinan	0.13	0.04	−1.22
9	EastEstie	0.18	0.04	−2.73

Source : Computed by the Author.

ficantly different from the total of the nine districts mean landholding.

Accordingly, the statistical test in Yilmana Densa, Gonji Kolela, Mecha, Dembecha, Dega Damot, Sekela, and East Eastie indicated that the $|Z|$ is greater than the critical value (+ 1.645), and hence it shows these districts mean landholding is significantly different from the total mean of nine districts' landholding. In these districts, the mean of landholders have deviated to either the left or right of the total districts landholding mean. Referring back to the proportion/percentage of sample population presented in Table 6, these districts landholding condition is found far less or greater than the total of the nine districts' landholding mean. On the other hand, the remaining two districts (Jabi Tehinan and Quarit) have $|Z|$ less than the critical value (+ 1.645). This indicates that there is no statistical significant difference between these two districts landholding means and the nine districts mean of landholding size. In other words, the landholding situation in these two districts is nearly as equal as the nine districts mean landholding size statistically. Consequently, the $|Z|$ value is less than the critical value. The districts that have no significant statistical difference from the total districts' mean have found relatively different situation in average landholding size in reference to the average landholding size of the total districts shown in Table 6. Therefore, it is viable to conclude that the difference and similarity between each districts' sample population landholding size mean to the nine districts total mean landholding size situation resulted from the test statistics does not reflect the average landholding size of households. Hence, the two districts that have difference in average landholding size in relation to the average of the nine districts landholdings (Table 6) have found insignificant statistically.

8. Extension Service Use

The current government of Ethiopia, which came to power in 1991, has adapted a new

agricultural development strategy to industrialize the country. This strategy is primarily focus on smallholders farming community agricultural production improvement, and then to industrial sector. To this end, extension service rendering system with regard to the use of soil fertilizer, herbicides, pesticides, selected seeds and other related means of modern production inputs has been run by development agents assigned in each of the peasant administrations. Development agents are responsible to give professional advisory services to those who are registered and incorporated under extension package. Therefore, it is believed that those farmers incorporated under the package are advantageous in terms of access to the various inputs mentioned above and advisory services which would be given by the development agents. The implication is that farmers who are not registered as the participant of extension service by fulfilling some set criteria would not have the chance to share benefits as those who are registered as extension package participants.

Subsistence farming, by its nature, is production for direct consumption and any farm input that would augment agricultural productivity is expected to boost the overall production. This contributes toward attaining households' food security and can boost agricultural production to influence the food security status of households.

Table 8: Extension Service Use (n=600)

No.	Districts	Extension Service (%)	
		Users	Non-Users
1	Yilmana Densa	20.00	80.00
2	Gonji Kolela	8.33	91.67
3	Mecha	45.00	55.00
4	Dembecha	61.67	38.33
5	Quarit	16.67	83.33
6	Dega Damot	80.00	20.00
7	Sekela	20.00	80.00
8	Jabi Tehinan	47.78	52.22
9	East Estie	26.67	73.33
	Total	36.33	63.67

Source: Field Survey, 2007.

As depicted in Table 8, it is only 36.33% of the total sample households use extension services. The remaining proportions of sample households (63.67%) are not incorporated in extension service program. Among the nine districts, the highest proportion of extension service program user are found in Dega damot (80%), followed by Dembecha (61.67%), Jabi Tehinan (47.78%) and Mecha (45%). This situation can tell us two implications. Firstly, Dega Damot district ranks first in terms of the proportion of population who are extension package participants, but when we see its average production it did not

keep its rank though it holds true in terms of productivity. Secondly, the result of such extension users and non-users variation implies that there is no as such huge gap between the users and non-users in terms of improved production. In some districts like Gonji Kolela, the proportion of population under extension package are much smaller than others, but in terms production, productivity and annual food coverage it is still better than some other districts which have more extension participants.

From this it is clear that extension package participation has positive influence on production and productivity and hence to food security. However, the proper implementation of the package, the environmental (soil, vegetation and rainfall) and other related factors affecting the effectiveness of extension package have to be investigated to know the clear meaning of such extension service on production and productivity. Because when we see the impact of extension package participation in relation to production, productivity and food availability, it is difficult to see its clear implication. For example, when we see some of the better performing districts like Yilmana Densa district, it has only 20% of households participating in the extension package, but in terms of productivity it shows 11.33 quintal per hectare, 11.11 quintal of average production and 18.33% of them are able to cover their annual food demand. On the other hand, in Dembecha, extension participants are 61.67%, but productivity is 7.45 quintal per hectare, average production 8.41 quintal and food consumption coverage is 16.67%.

8.1 Statistical Test on Extension Service Use

Based on the comparison between the mean of extension users in the sample population to the means of extension users in the total nine districts sample population, statistic test has made two evaluate whether a given district extension usage is significantly different from the mean of the nine districts extension users. The following formula has used to compute test statistic for the difference between the two means.

$$Z_{P1-p2}=\frac{P_1-P_2}{\sqrt{\frac{P_1(1-P_1)}{N_1}+\frac{P_2(1-P_2)}{N_2}}}$$

Where; P_1=the mean of extension users in a district

P_2=the mean of all sample population extension users

N_1=the sample population of each district

N_2=the total sample population of the nine districts

Variance of each districts sample mean is given by $P_1(1-P_1)$

$$\text{Standard Error}=\sqrt{\frac{P_1(1-P_1)}{N_1}}$$

Table 9 : Statistical Test for Extension Service Use

No.	Districts	Variance	Standard Error	Statistic Test (Z- Test)
1	Yilmana Densa	0.16	0.05	−2.96
2	Gonji Kolela	0.08	0.03	−7.00
3	Mecha	0.25	0.06	+1.29
4	Dembecha	0.24	0.06	+3.86
5	Quarit	0.14	0.05	−3.79
6	Dega Damot	0.16	0.05	+7.91
7	Sekela	0.16	0.05	−2.96
8	Jabi Tehinan	0.25	0.05	+2.04
9	East Estie	0.19	0.04	−1.91

Source : Computed by the Author.

As depicted in Table 9, the variance, standard error and test statistic results of the nine districts have been computed and presented. Each of the respective statistical tests has been computed in comparison with the mean of all districts. This made easier to test each of the districts whether they are significantly different from the overall districts mean. Setting alpha (α)=0.05 and taking $|Z|$, the critical value is +1.645.

The statistic test in Yilmana Densa, Gonji Kolela, Dembecha, Quarit, Dega Damot, Sekela, Jabi Tehinan and East Eastie indicated that the is greater than the $|Z|$ critical value (+1.645), and hence these districts extension service use means are significantly different from the total of the nine districts' mean. In these districts, the mean of extension users have deviated to either the left or right of the total districts mean of extension service users. Referring back to the proportion/percentage of sample population presented in Table 8, these districts extension service condition is found far less / greater than the total of the nine districts' landholding situation. This implies that extension service users in these districts are either far behind or ahead of the average extension service users of the nine districts. On the other hand, the remaining one district (Mecha District) $|Z|$is less than the critical value (+1.645). This indicates that there is no significant difference between this districts extension service use mean and the nine districts total mean of extension service use. This implies that the mean of extension service users in this district is as similar as the average of the nine districts extension service users, and hence this district extension service users' are found in the midway between districts with very low and relatively higher extension service users. This district that has no statistical significant difference with the total districts' mean have found similar situation in the frequency distribution shown in Table 8. Based on this result, it can be concluded that the difference and similarity between each districts' sample population extension service users' mean to the nine districts total sample means extension users is also supported by the statistical test. Consequently, extension service mobilization related works, for example, capacity building activities for extension workers and

farmers ; supply of selected seeds, herbicides, pesticides, and fertilizers ; creation of alternative income generating schemes ; and credit access facilities have to be strengthened in order to augment the number of extension service users.

9. Conclusion

The overall result of the study shows the presence of persistence food shortage in all of the study peasant administrations with different degrees. In all districts : production, productivity, per capita production and other food related parameters are very low as compared to the regional and national standards. There are smaller proportions of the sample population that could cover their annual food consumption. Such food shortage problem is severe in East Estie, Quarit, Sekela and Mecha districts vulnerable peasant administrations.

In fact, the districts' reports in all districts showed as if there is better food availability in the district level. Nevertheless, the surplus producers of other peasant administrations within each districts obscured these food shortage vulnerable peasant administrations and hence different governmental and non-governmental organizations are overlooked them rather than incorporating in their development programs. It is difficult to see the clear image of these districts food security problems by using the district reports alone, as other surplus producers hide those food insecurity vulnerable peasant administrations. In other words, food is available in most of the districts but the poor/food shortage vulnerable peasant administrations households do not have the access to get such available food production.

Furthermore, the Z-statistical significant tests show that the majority of the study districts sample mean is significantly different from the total of the districts average values beside the frequency and average value indicators. This entails that there are even district variations among the study districts despite all of them have experienced inadequate food availability in the household level.

References

Alemu, ZG, Osthuizen, LK and Van Schalkwyk (2002) : Agricultural Development Policies of Ethiopia since 1957, South Africa, Pretoria.

Amartaya Sen (1981) : Poverty and Famines : An Essay on Entitlement and Deprivation, Oxford, Oxford University Press.

Amhara National Regional State (1998) : Food Security Evaluation in Amhara Region, Bahir Dar, Ethiopia.

Amhara National Regional State Districts' Report (2005-2007): Districts' Agriculture and Rural Development Yearly Report, Bahir Dar, Ethiopia.

Amhara National Regional State (2005): Food Security Assessment in Amhara Region, Bahir Dar Ethiopia.

Central Statistical Authority (2004): National Agricultural Production Survey, Addis Ababa, Ethiopia.

David Knoke, George W. Bohrnstedt and A. P Mee, (2002): Statistics for Social Data Analysis, Fourth Edition, USA, New York.

Ethiopian Mapping Agency (2004): Political Map of Amahara National Regional State, Addis Ababa, Ethiopia.

Food and Agricultural Organization (1983): Food Security Assessment in Ethiopia, Addis Ababa , Ethiopia.

Food and Agricultural Organization (1996): Rome Declaration on World Food Security, Rome, Italy.

Food and Agricultural Organization (1998): Crop Assessment in Ethiopia, Addis Ababa, Ethiopia.

Food and Agricultural Organization (2005): Crop and Food Supply Assessment Mission in Ethiopia, Rome, Italy.

International Monetary Fund (2005): Poverty Reduction Strategy Paper Joint Staff Assessment in Ethiopia, Addis Ababa, Ethiopia.

Maxwell S. (1996): Food Security: A Post Modern Perspective, Rome, Italy.

UNDP (2005): Food Security Report in Ethiopia, Addis Ababa, Ethiopia.

UNDP (2006): The Patterns of Food Intake and Households' Expenditure in Rural Ethiopia, Addis Ababa, Ethiopia.

(Received May 18, 2010)