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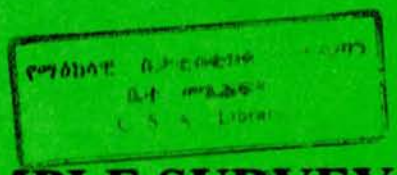

AGRICULTURAL SAMPLE SURVEY

1998/99 (1991 E.C.)

VOLUME V

REPORT ON

AREA AND PRODUCTION OF BELG SEASON CROPS

FOR

PRIVATE PEASANT HOLDINGS

ADDIS ABABA
DECEMBER 1999

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217 STATISTICAL BULLETIN 217

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PART I.

INTRODUCTION AND OBJECTIVE OF THE SURVEY

1. INTRODUCTION

Agriculture plays a major role in the economy of Ethiopia. It accounts for about 55 percent of the GDP, 80 percent of the employment and 60 percent of the exports. Hence, the collection of reliable, comprehensive and timely statistical information in this sector is considered essential for the formulation, planning and assessment of agricultural development plans. The seriously inadequate supply of reliable statistical data will adversely affect the ability of planners and policy makers in their decision-making process.

The Central Statistical Authority (CSA) has been conducting the Agricultural Sample Survey (AgSS) on an annual basis since the 1980/81 (1973 E.C.) crop seasons to provide the essential statistical data needed by decision-makers in Ethiopia. This Belg Season Report is Volume V of the series of reports that constitutes the published estimates derived from the AgSS data collection. The contents of this report include: Objectives of the survey, coverage and content of the survey, sample design, field organization, training of field staff, and method of data collection; and survey summary results on area, production and yield of major Belg Season crops for 1998/99 (1991 E.C.).

It should be noted that the 1998/99 (1991 E.C.) Agricultural Sample Survey was designed in such away that it allows more precise inference not only at the national and regional levels, but also at zonal level.

2. OBJECTIVES OF THE SURVEY

The general objective of the Survey is to collect basic quantitative information on Ethiopia's agriculture. This information is essential for economic development planning and socio-economic policy formulation.

In a micro-perspective, the objectives of this Survey are to estimate the total cultivated land; total production and yield per hectare of major crops for both the Meher and Belg Seasons. Data on area under different land uses; and quantity and cost of agricultural inputs by type for both seasons is also collected. From the sample, the number of livestock and poultry by type, purpose, sex and age, and number of beehives in the private peasant holdings are estimated at the national and regional levels.

PART II

SURVEY METHOLOGY, DATA COLLECTION AND PROCESSING

1. SCOPE AND COVERAGE OF THE SURVEY

The 1998/99 (1991 E.C.) annual AgSS covers only the sedentary rural agricultural population in all regions of the country. A total of 56 zones and 409 weredas were covered in the survey. The areal coverage of the survey is given in Table A.

A total of 1,450 enumeration areas were selected to be covered in the Survey in all regions. Due to various reasons, 22 Eas were not covered in the survey. Thus during the data collection stage the survey succeeded to cover only 1428 enumeration areas (EAS) for Belg Season Survey. In each EA a sample of 40 agricultural households were selected, where only the first 25 sampled agricultural households were used for obtaining information on area and production of major Belg Crops.

TABLE A. AREAL COVERAGE OF THE 1997/98 (1990 E.C.) AGRICULTURAL SAMPLE SURVEY

REGION	NUMBER OF ZONES		NUMBER OF WEREDAS COVERED IN THE SURVEY
	TOTAL	COVERED IN THE SURVEY	
TIGRAY[1]	5	4	33
AFAR[2]	5	3	7
AMHARA	11	10	93
OROMIA	12	12	171
SOMALE[3]	9	3	9
BENSHANGUL-GUMUZ	3	3	18
S.N.N.P.R.	14	14	73
GAMBELA	4	3	5
HARARI	1	1	1
A.ABABA[4]	6	2	5
DIRE DAWA	1	1	1
TOTAL	70	56	416

Notes

1- In Tigray Region, four out of five zones have rural settled population. In the remaining one zone the entire population is urban residents.

2- Afar region has a total of five zones, however only three zones have significant rural sedentary population.

3- Somalie Region has a total of nine zones, however only three zones have significant rural sudentary population.

4- Addis Ababa has a total of six zones, however, only two zones have rural settled population. In the remaining four zones the entire population is urban residents.

S.N.N.P.R. = Southern Nations, Nationalities and peoples Region

2. BASIC CONCEPTS AND DEFINITIONS

The definitions of concepts and terminology used for the collection of all AgSS questionnaire data are as follows:

Enumeration Area (EA): An Enumeration Area in rural parts of the Country is a locality that is less than or equal to a farmer's association area and usually it consists of 150-200 households.

Household:- A household may be either;

a) a one person household, that is a person who makes provision for his own food or other essentials for living without combining with any other person to form part of a multi person household or

b) a multi person household, that is, a group of two or more persons who live together and make common provision for food or other essentials for living. The persons in the group may pool their incomes and have a common budget to greater or lesser extent. They may be related or unrelated persons, or a combination of both.

Agricultural Household:- A household is considered an agricultural household when at least one member of the household is engaged in growing crops and/or breeding and raising livestock in private or in partnership with others.

Holder:- A holder is a person who exercises management control over the operations of the agricultural holding and takes the major decision regarding the utilization of the available resources. He has technical and economic responsibility for the holding. He may operate the holding directly as an owner or as a manager.

Under conditions of traditional agricultural holding the holder may be regarded as the person, who with or without help, of others, operates land or raises livestock in his own right, i.e. the person who decides on what, when, where and how to grow crops or raise livestock and has right to determine the utilization of the products.

Holding:- A holding is all the land and livestock kept which is used wholly or partly for agricultural production and is operated as one technical unit by

one person alone, or with others, without regard to title, legal form, size or location.

Parcel:- A parcel of holding is any piece of land entirely surrounded by land, water, road, forest, ... etc. which is not part of the holding. It may consist one or more cadastral units, plots or field adjacent to each other.

Field:- A field is defined as any plot of land which is a parcel or part of a parcel under the same crop.

Belg Season crops:- are defined as any crops that are harvested during the months of March (Megabit) to August (Nehase).

Meher Season Crops:- are those crops that are harvested during September (Meskerem) to February (Yekatit) are considered as main (Meher) season crops.

3. SAMPLE DESIGN

A two-stage stratified sample design is used for the 1998/99 (1991 E.C.) Annual Agricultural Sample Survey. All regions except Harari, Addis Ababa, Dire Dawa and Gambella are broken into zones and treated as strata/reporting levels for survey summarization purposes, but for the four mentioned regions, the reporting levels are the regions themselves. The sample design first- stage consists of primary sampling units (PSUs) in all strata which are enumeration areas (EAs). The second-stage sampling units are agricultural households selected as the secondary level sampling units. The survey questionnaires are administered to all agricultural holders in the sampled agricultural households.

Based on cost and field enumeration considerations, a fixed number of sample EAs were allocated to each stratum/reporting level taking into consideration the desired precision of the estimates and number of households per stratum. The overall sample number of EAs in a stratum was proportionately allocated to zones/special weredas within stratum based on their number of households. From within each Zone /Special Werda sample EAs were selected with probability proportional to size, size being the total number of households identified for EAs as obtained from the 1994 Population Census. From each sample EA, 40 agricultural households were

sampled systematically without replacement from a newly enumerated list of agricultural households.

Information was collected from the first twenty-five households except for crop-cutting data which is collected from 15 agricultural households, starting from the 11th selected agricultural households. Data is collected on separate questionnaires from each holder within these twenty-five sampled households.

The estimation formulation procedures for totals and ratios of the agricultural variables estimated is presented in the ***Appendix I.***

4. FIELD ORGANIZATION.

CSA branch statistical office heads, field supervisors and enumerators, other support staff and drivers were all involved in the conduct of the AgSS area and production survey data collection effort. To accomplish the data collection all field enumerators were equipped with the necessary survey equipment (i.e. compass, protractor, ruler, measuring tape, balance scale, poles, ropes, sample bags, ...etc.) at the completion of training. To assist with the field work and data collection activities all available four-wheel drive vehicles were used if or supervision and collection of completed questionnaires.

5. TRAINING OF FIELD STAFF

The field staff training program was carried out in two stages. The first stage consisted of trainees from the head office, Branch Statistical Office heads and some of the field supervisors being given training for one week at CSA's headquarters complex in Addis Ababa. Many of those trained in the first stage conducted similar training for field supervisors and enumerators for 10 days in all of CSA's 22 branch offices which are distributed around the country. During the second – stage training, the field staff were given detailed classroom instruction on the objectives and uses of the AgSS, concepts and definitions of terms used, the method of area measurement, method of crop cutting, as well as correct interviewing procedures, ...etc. The enumerators' training also included a field practice to reinforce the

concepts discussed in the classroom with regard to field measurement and crop cutting data collection.

6. METHOD OF DATA COLLECTION.

The information of area and production of major Belg Season crops, agricultural practices (uses of fertilizer, pesticide, improved seed and irrigation) were subjectively collected by interviewing the holders of sampled households. Appendix II illustrates the total number of EAs and households reporting 1998/99 (1991/E.C.) Belg crop production by region.

A major characteristic of Ethiopian agriculture is the two well-known crop production seasons referred to as the Meher (or main) and Belg Seasons. The generally accepted definition of the Meher season is that of the long rainy season, which normally occurs from June to September. The Belg Season most often refers to small but timely rainy season, which normally occurs from February to May but in limited areas of the country. Generally, the Meher Season rainy period provides ideal growing conditions for the longer maturing crops. Planting and harvest of Meher crops can extend to December or January in some area. Most of the time holders rely on short maturing crops for planting during the Belg rainy period and harvest of the crops is in June or July.

A point of contention arises with respect to the pure definition of the Belg crop. Belg cropping practices are heterogeneous across different portions of the country. The nature of the sowing period also overlaps with some of the Meher Season crops. Consequently, the report on Belg Season crops in the past faced a problem of a clearly defined growing period. It is important not to overlook or miss agricultural practices performed all year round due to use of irrigation or soil moister from sufficiently dried areas that from time-to-time are swampy or marshy. To help clarify the two-crop season, the following definition has been in use since 1987/88:

Belg Season crops were defined as any crops that are harvested during the months of March to August, while those crops that are harvested during September to February are considered Meher (or main) season crops.

This report consists of estimates of area, production and yield per hectare of major Belg Season crops for the year 1998/99 (1991 E.C). The data collection period for obtaining the area, production and agricultural practices of the Belg season crops ranged from Genbot 15-30, 1991 E.C. (ie. From May 23-June 7, 1999). Differing from Meher Season objective crop-cutting methodology, the Belg production estimation uses subjectively obtained data based on face - to - face interviewing of the holder by the enumerator. Subjective data on local units require conversion to an equivalent metric units using the conversion factors available for local units at Woreda level prepared by CSA's Natural Resources and Agricultural Statistics Department (NASD). The conversion factors came from experimentally derived data using actual holder cropped area and production data associated with each local unit.

7. DATA PROCESSING

a. EDITING, CONDING AND VERIFICATION

To insure the quality of the collected survey data an editing, coding, and verification instruction manual was written, and fifty five editors, coders and verifiers were trained for one day to edit, code and verify the data using the aforementioned manual as areference and teaching aid.

The enumerator completed questionnaires were edited, coded, and later verified by supervisors on a 100% basis before the questionnaires were sent to the data processing unit for data entry. The editing, coding and verification of all questionnaires was completed in twelve days.

b. DATA ENTRY, CLEANING AND TABULATION

Before starting data entry professional staff of Agricultural Statistics Department of Central Statistical Authority prepared edit specifications for use on personal computers utilizing the Integrated Microcomputer Processing System (IMPS) Software for data consistency checking purposes.

The Data on the coded questionnaires were then entered into the IMPS software on personal computers. The data was then checked and cleaned using the edit specifications prepared earlier for this purpose. Forty data

encoders were involved in this total process and it took Seven days to complete the job.

Finally, tabulation was done on personal computers to produce results as indicated in the tabulation plan.

PART III.

1. SUMMARY OF THE RESULTS OF 1998/99 (1991 E.C.) Belg Season Crop Production survey

In this part of the report the estimates of Belg crop area and production for the 1998/99 (1991 E.C.) are presented. Discussions on some of the major survey findings and other important points on the Belg season crop production survey are given below.

Based on the 1998/99 (1991 E.C.) Belg season crop production survey results, it is estimated that about 500.21 thousand hectares of land was covered by major belg crops. From these crop area, a total of 2830.81 thousand quintal of production was obtained at country level. Out of this total crop area, the highest which is about 428.57 thousand hectares were under cereals followed by pulses that covered about 70.02 thousand hectares, and about 1.61 thousand hectares were covered by others (mainly oil crops).

From the above mentioned total crop area an estimated production of about 2,747.27, 465.42 and 3.37 thousand quintals of cereals, pulses and others (mainly oils seeds) are obtained at country level, respectively.

Table A. Estimates of Total Area and Production of Major Belg Crops for Private Peasant Holdings in Ethiopia, 1998/99 (1991 E.C)

Crop Type	Area		Production		Yield Qt/ha
	In thousands (ha.)	%	In thousands (qt.)	%	
Cereal	428.57	85.68	2747.27	97.05	6.41
Pulses	70.02	13.99	465.42	16.44	6.65
Others	1.61	0.33	3.37	1.31	2.09
All Crops	500.21	100.00	2830.81	100.00	

Furthermore, in this report an attempt is made to compare the performance of Belg seasons of the year 1997/98 (1990 E.C.) with that of the 1998/99

(1991 E.C.) in terms of crop area, production and yield of major Belg season crops. (see Tables 1 and 2).

As indicated in Table 1, one can easily observe the very poor performance of the 1998/99 (1991 E.C.) Belg season crop production activities when compared to the previous year i.e. 1997/98 (1990 E.C.) Belg area and production estimates. For instance the total crop area and production of major belg season crops showed a decrease by 39.24 % and 61.75 % when compared with that of 1997/98 (1990 E.C.) Belg seasons crop production estimates, respectively. While the decrease in crop area ranges from 87.59 % for Lentils to 8.08 % for Haricotbeans, and the decrease in production ranges from 96.15 % for lentils to 32.36 % for Millet. Of course, similar situation holds true when one considers the yield differences for the other crops when compared with that of 1997/98 production estimates (for details see Table 1).

As it can be observed from the comparison made in both tables (Tables 1 and 2), one can easily conclude that the performance of the 1998/99 (1991 E.C.) Belg season crop production activity was very poor when compared to the previous year i.e. 1997/98 (1990 E.C.) which was said to be poor when compared to that of the 1996/97 (1989 E.C.).

Among a number of factors that contributed for the very poor performance of the 1998/99 (1991 E.C.) Belg season crop production activity, the major one was the unusual prolonged delay of the on set of Belg rains that lasts for a month and even more not getting the Belg rains in most parts of the country, which have discouraged and hindred the overall farmers' activity for Belg crop production. This situation forced a number of farmers to leave Belg crop fields fallow, hoping to use them for the coming Meher season crop production.

Besides its prolonged delay, the belg rains were unsatisfactory both in amount and distribution in most parts of the country. Hence, the overall shortage of Belg rains either discouraged the farmers from attempting to prepare the land and plant it with Belg crop or completely or partly damaged Belg crops at their early growing stage. As a result, only few farmers in some parts of the country were able to manage the 1998/99 (1991 E.C.) Belg season crop production activity.

Table 1. Estimate of 1997/98(1990 E.C.) and 1998/99(1991 E.C) Area, Production and YIELD of major Belg season Crops for peasant holdings in Ethiopia

CROP TYPE	Total Area ('000 ha.)			Total Production ('000 ha.)			Yield		
	1997/98 (1990 E.C)	1998/99 (1991 E.C)	% Change	1997/98 (1990 E.C)	1998/99 (1991 E.C)	% Change	1997/98 (1990 E.C)	1998/99 (1991 E.C)	% Change
CEREALS	710.80	428.57	-39.71	6'986.52	2'747.27	-60.68	9.83	6.41	-34.78
Teff	59.92	30.50	-49.10	214.33	96.33	-55.06	3.58	3.16	-11.70
Barley	215.20	86.26	-59.92	1'963.29	619.76	-68.43	9.12	7.18	-21.25
Wheat	44.07	36.70	-16.72	359.14	226.48	-36.94	8.15	6.17	-24.27
Maize	348.25	248.48	-28.65	4'154.44	1'686.24	-59.41	11.93	6.79	-43.11
Sorghum	27.01	15.74	-41.73	135.31	69.46	-48.67	5.01	4.41	-11.91
Millet	0.88	**	-	8.59	**	-	9.76	-	-
Oats	15.47	10.12	-34.58	151.42	43.21	-71.46	9.79	4.27	-56.38
PULSES	108.03	70.02	-35.18	387.40	191.77	-50.50	3.59	2.74	-23.63
Horse Beans	4.10	3.28	-20.00	15.83	6.57	-58.50	3.86	2.00	-48.12
Field Peas	16.77	7.25	-56.77	46.22	15.97	-65.45	2.76	2.20	-20.08
Haricot Beans	57.55	52.90	-8.08	227.48	143.22	-37.04	3.95	2.71	-31.51
Chick Peas	9.91	**	-	**	**	-	-	-	-
Lentils	19.02	**	-		**	-	-	-	-
Vetch	**	0.20	-	**	**	-	-	-	-
OTHERS	4.40	1.61	-63.41	26.63	3.37	-87.35	6.05	2.09	-65.42
Neug	**	-	-	**	-	-	-	-	-
Line seed	**	**	-	-	**	-	-	-	-
Rapeseed	0.02	**	-	**	-	-	-	-	-
Ground Nuts	**	-	-	-	-	-	-	-	-
Sunflower	-	-	-	**	-	-	-	-	-
Sesame	-	-	-	**	-	-	-	-	-
Fenugreek	**	**	-	**	**	-	-	-	-
ALL CROPS	823.23	500.21	-39.24	7'400.55	2'830.81	-61.75			

Table 2. Estimate of 1997/98(1990 E.C.) and 1998/99(1991 E.C) Area, Production and Yield of major Belg season Crops for peasant holdings in Ethiopia, by region

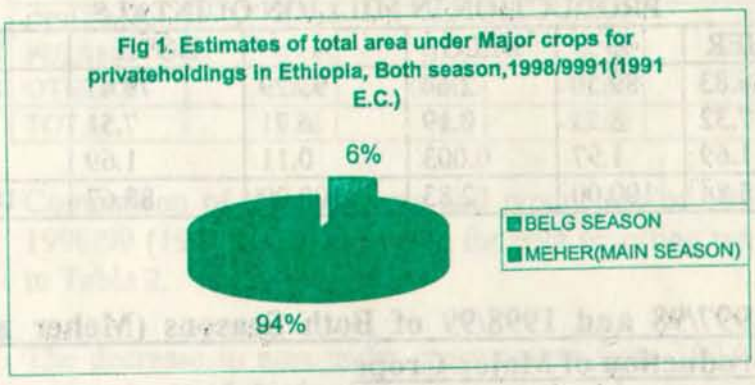
Region	Area under Major Crops ('000 ha.)			Production under Major Crops ('000 ha.)		
	1997/98 (1990 E.C)	1998/99 (1991 E.C)	% Change	1997/98 (1990 E.C)	1998/99 (1991 E.C)	% Change
Tigray	10.47	4.16	-60.27	148.18	7.61	-94.86
Afar	3.83	1.14	-70.23	4.40	0.98	-77.73
Amhara	185.78	68.19	-63.30	1'236.57	212.09	-82.85
Oromiya	413.39	220.41	-46.68	3'655.11	1'677.78	-54.10
Somali	4.80	1.64	-65.83	80.93	10.24	-87.35
Benshangul	6.91	1.06	-84.66	39.42	16.06	-59.26
S.N.N.P	195.45	201.18	2.93	2'222.59	888.02	-60.05
Gambela	1.24	2.12	70.97	11.35	17.70	55.95
Harari	0.89	0.24	-73.03	1.15	0.24	-79.13
Addis Ababa	0.09	-	-100.00	0.01	-	-100.00
Dire Dawa	0.38	0.08	-78.95	0.84	0.09	-89.29
All Regions	823.23	500.21	-39.24	7'400.55	2'830.81	-61.75

2. Results of 1998/99 (1991 E.C) Both Seasons (Meher and Belg)

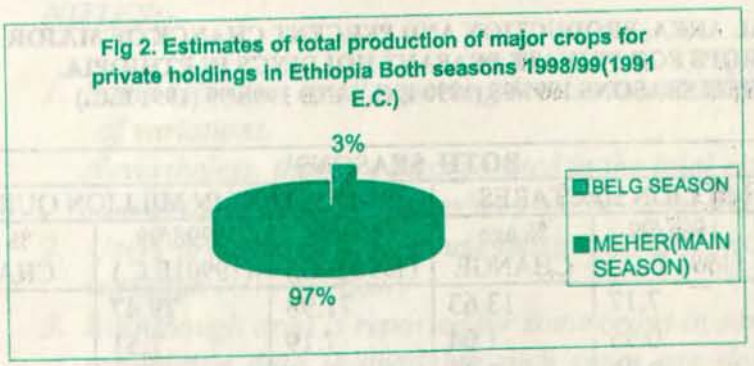
In this section of the report, summary Tables B-D present the estimates of area and production of major crops for both Meher and Belg seasons.

The total area and production of major crops in 1998/99 (1991 E.C.) both seasons, was estimated to be 8.52 million hectares and 88.67 million quintals.

Out of the above mentioned totals 0.50 (6%) million hectares and 2.83 (3 %) million quintals was the contribution of Belg season. (For the details see Figs 1 and 2, and Summary Tables B and C).



Out of the total output of major crops (both Meher and Belg seasons) of 19998/99 (1991 E.C) area cereals accounted for 7.17 million hectares (84.16%) with a production of 79.47 million quintals (89.62 %).



About 0.95 million hectares (11.15%) with a production of 7.51 million quintals (8.47 %) accounted for pulses, and 0.40 million hectares (4.71 %) with a production of 1.69 million quintals (1.91 %) accounted for other crops (mainly oilseeds) (for details see summary Table B).

SUMMARY TABLE B. TOTAL AREA AND PRODUCTION OF MAJOR CROPS FOR PRIVATE PEASANT HOLDINGS IN ETHIOPIA BOTH SEASONS, 1998/99 (1991 E.C.)

TYPE OF CROP	AREA IN MILLION HECTARES					
	MEHER	%	BELG	%	BOTH	%
CEREALS	6.74	84.04	0.43	86.00	7.17	84.15
PULSES	0.88	10.97	0.07	14.00	0.95	11.15
OTHERS	0.40	4.99	0.001	0.20	0.40	4.71
TOTAL	8.02	100.00	0.50	100.00	8.52	100.00
TYPE OF CROP	**PRODUCTION IN MILLION QUINTALS**					
	MEHER	%	BELG	%	BOTH	%
CEREALS	76.83	89.50	2.64	93.29	79.47	89.62
PULSES	7.32	8.53	0.19	6.71	7.51	8.47
OTHERS	1.69	1.97	0.003	0.11	1.69	1.91
TOTAL	85.84	100.00	2.83	100.00	88.67	100.00

3. Comparison of 1997/98 and 1998/99 of Both Seasons (Meher and Belg), Area and production of Major Crops

Comparison of the total area and production of 1997/98 (1990 E.C) and 1998/99 (1991 E.C) was made for both seasons and Belg season separately, in summary Tables C and D, respectively.

SUMMARY TABLE C. TOTAL AREA, PRODUCTION AND PERCENT CHANGE OF MAJOR CROPS FOR PRIVATE PEASANT HOLDINGS IN ETHIOPIA, BOTH SEASONS 1997/98 (1990 E.C.) AND 1998/99 (1991 E.C.)

TYPE OF CROP	BOTH SEASONS					
	AREA IN MILLION HECTARES			PRODUCTION IN MILLION QUINTALS		
	1997/98 (1990 E.C.)	1998/99 (1991 E.C.)	% age CHANGE	1997/98 (1990 E.C.)	1998/99 (19901E.C.)	% age CHANGE
CEREALS	6.31	7.17	13.63	71.98	79.47	10.41
PULSES	0.96	0.95	-1.04	7.19	7.51	4.45
OTHERS	0.41	0.40	-2.44	1.87	1.69	-9.63
TOTAL	7.68	8.52	10.94	81.04	88.67	9.42

Accordingly, the 1998//99 (1991 E.C) both seasons' total outputs of the major crops have increased by 10.94 % in area, and by 9.42 % in production as compared to the previous year. The 1998/99 (1991 E.C) total area for major Belg season crops have decreased by 39.24 % and by 61.81 % for production when compared to last year's estimate (for details refer summary Table D).

SUMMARY TABLE D. TOTAL AREA, PRODUCTION AND PERCENT CHANGE OF MAJOR CROPS FOR PRIVATE PEASANT HOLDINGS IN ETHIOPIA, BELG SEASON 1997/98 (1990 E.C.) AND 1998/99 (1991 E.C.)

TYPE OF CROP	BELG SEASONS					
	AREA IN MILLION HECTARES			PRODUCTION IN MILLION QUINTALS		
	1997/98 (1990 E.C.)	1998/99 (1991 E.C.)	% age CHANGE	1997/98 (1990 E.C.)	1998/99 (19901E.C.)	% age CHANGE
CEREALS	0.71	0.43	-39.44	6.99	2.64	-62.23
PULSES	0.11	0.07	-36.36	0.39	0.19	-51.28
OTHERS	0.004	0.001	-75.00	0.03	0.003	-90.00
TOTAL	0.82	0.5	-39.02	7.41	2.83	-61.81

Comparison of the total area and production of 1997/98 (1990 E.C.) and 1998/99 (1991 E.C.) was made for belg reporting regions, and is presented in Table 2.

The decrease in area under crops ranges from 100.00 % for Addis Ababa region to 46.65 % for Oromiya region and crop production from 100 for Addis Ababa to –54.10 % for Benishangul/Gumuz region. However, the decrease of both area and production of Belg season crops is mainly due to the poor performance of the 1998/99 (1991 E.C.) belg season rainfall.

***NOTES*:-**

1. *Some estimates in all reporting levels are excluded due to high coefficient of variations.*
   Nevertheless, they are incorporated in the total estimates. Hence the sum of the specific estimates may not be equal to the total estimates.
2. *Users are also advised to use those estimates with 30-50% coefficient of variation (CV) cautiosly*
3. *Eventhough area is reported for some crops in some reporting leveles, no production data is available such cases are designated by Not Stated (NS). On the other hand, in all tables "-" labeled for data not available totally.*

Table 3. Estimates of total Area, Production and percent share of Belg for 1998/99(1991 E.C.) for private peasant holdings in Ethiopia, by region

Region	Area under Major Crops ('000 ha.)			Production under Major Crops ('000 ha.)			Total	
	Meher	Belg	% Belg	Meher	Belg	% Belg	Area ('000 ha.)	Production ('000 qt.)
Tigray	580.21	4.16	0.71	6,530.89	7.61	0.12	584.37	6,538.50
Afar	15.22	1.14	6.97	183.46	0.98	0.53	16.36	184.44
Amhara	2,985.73	68.19	2.23	28,532.46	212.09	0.74	3,053.92	28,744.55
Oromiya	3,529.48	220.41	5.88	41,109.08	1,677.78	3.92	3,749.89	42,786.86
Somali	46.24	1.64	3.43	262.32	10.24	3.76	47.88	272.56
Benshangul	156.99	1.06	0.67	1,776.76	16.06	0.90	158.05	1,792.82
S.N.N.P	673.09	201.18	23.01	7,044.14	888.02	11.20	874.27	7,932.16
Gambela	11.18	2.12	15.94	222.82	17.70	7.36	13.30	240.52
Harari	5.50	0.24	4.18	46.53	0.24	0.51	5.74	46.77
Addis Ababa	7.40	–	0.00	74.33	–	0.00	7.40	74.33
Dire Dawa	5.28	0.08	1.49	55.63	0.09	0.16	5.36	55.72
All Regions	8,016.31	500.21	5.87	85,838.42	2,830.81	3.19	8,516.52	88,669.23

Table 4. Estimates of Area, Production, their Percentage Distribution and Yield for 1999(1991 E.C.) Belg season Crops for Private Peasant Holdings

National

CROP TYPE	TOTAL AREA ('000 hectare)	%	TOTAL PRODUCTION ('000 quintal)	%	YIELD (QT/HA)
Cereals	428.57	85.68	2,635.66	93.11	6.15
Teff	30.50	6.10	96.33	3.40	3.16
Barley	86.26	17.24	619.76	21.89	7.18
Wheat	36.70	7.34	226.48	8.00	6.17
Maize	248.48	49.68	1,574.70	55.63	6.34
Sorghum	15.74	3.15	69.39	2.45	4.41
Millet	.77	.15	5.81	.21	7.55
Oats	10.12	2.02	43.21	1.53	4.27
Pulses	70.02	14.00	191.77	6.77	2.74
Horse Beans	3.28	.66	6.61	.23	2.02
Field Peas	7.25	1.45	15.97	.56	2.20
Haricot Beans	52.90	10.58	143.22	5.06	2.71
Chick Peas	**	**	**	**	**
Lentils	**	**	**	**	**
Vetch	**	**	**	**	**
Others	1.61	.32	3.37	.12	2.09
Neug	-	-	-	-	-
Linseed	**	**	**	**	**
Rapeseed	**	**	**	**	**
Ground Nuts	-	-	-	-	-
Sunflower	-	-	-	-	-
Sesame	-	-	-	-	-
Fenugreek	**	**	**	**	**
All Crops	500.21	100.00	2,830.81	100.00	5.66

- NOT REPORTED.

APPENDIX I

ESTIMATION PROCEDURES OF TOTALS

APPENDIX I

ESTIMATION PROCEDURES OF TOTAL AND SAMPLING ERRORS.

The following formula are used to estimate total area of land under specific crop level of production and yield of specific crop in a given stratum.

Note:- Since all information on belg season agricultural activities are collected using subjective methods, by interviewing each holder in the sampled 25 agricultural households. Hence the data on area and production for major belg season crops were usually reported in local units. Therefore one has to note that before applying the estimation procedures defined here below, the reported area and production of a specific crop in local units of each field has to be converted in to standard units using conversion equivalents.

for Estimating total Area of land under specific crop

$$\hat{A}_h = \sum_{i=1}^{n_h} w_{hi} a_{hi}$$

in which

$$W_{hi} = \frac{N_h M_{hi}}{n_h N_{hi} m_{hi}}$$

is the weight

where

h represents the stratum.

n_h is the total number of EAs selected in h^{th} stratum.

N_h is the measure of size of the h^{th} stratum obtained from the sampling frame.

N_{hi} is the measure of size of the i^{th} sample EA in the h^{th} stratum obtained from the sampling frame.

M_{hi} is the total number of agricultural households of the i^{th} sample EA in the h^{th} stratum obtained from households listing of the survey.

m_{hi} is number of sampled agricultural households of the i^{th} sample EA in the h^{th} stratum.

a_{hi} is the sample total of area values in the i^{th} EA in the h^{th} stratum for the specific agricultural input for the specific crop.

$\hat{A}_h$ is estimate of total area under specific crop where a certain agricultural input was used in the h^{th} stratum.

2. For Estimating level of production

$$\hat{P}_h = \sum_{i=1}^{n_h} w_{hi} p_{hi}$$

in which

$$W_{hi} = \frac{N_h M_{hi}}{n_h N_{hi} m_{hi}}$$

is the weight given above.

where

$\hat{p}_h$ is estimate of total production of a specific crop land in the h^{th} stratum.

p_{hi} is the sample total of production of a specific crop in the i^{th} EA in the h^{th} stratum.

3. Estimate of yield of a specific crop is given by

$$\hat{Y}_h = \frac{\hat{P}_h}{\hat{A}_h}$$

4. Estimating Sampling Variance

Sampling variance of estimate of stratum total of area for a specific crop where a certain agricultural input used and quantity of a certain fertilizer are estimated by the following

formulas respectively.

$$Var(\hat{A}_h) = \frac{n_h}{n_h - 1}\left[\sum_{i=1}^{n_h} \hat{A}_{hi}^2 - \frac{\hat{A}_h^2}{n_h}\right]$$

In estimating the sampling variance by the above formula, selection of EAs within a stratum is assumed to be with replacement. By so doing the variance estimate may be slightly over estimated but it greatly simplify the estimation procedure. Further more the finite population correction (fpc) is ignored in the formula. This is due to the fact that its effect is negligible.

5. Estimating Coefficient of Variation

Coefficient of Variation (CV) of estimate of stratum total area and quantity are given by:

$$CV(\hat{A}h) = \frac{\sqrt{var(\hat{A}h)}}{\hat{A}h} x100\%$$

$$CV(\hat{Q}h) = \frac{\sqrt{VAR(\hat{A}h)}}{\hat{Q}h} X100\%$$

Regional or National Estimates of the total Characteristic and Sampling variance are obtained by aggregating the respective stratum totals.