THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

CENTRAL STATISTICAL AGENCY

AGRICULTURAL SAMPLE SURVERY
2012/13 (2005 E.C) VOLUME V

REPORT ON AREA AND PRODUCTION OF
BELG SEASON CROPS FOR

PRIVATE PEASANT HOLDINGS

ADDIS ABABA
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CHAPTER I

1. INTRODUCTION AND OBJECTIVES OF THE SURVEY

1.1 INTRODUCTION

As it is true in most developing countries, in Ethiopia, agriculture is the dominant sector of the economy. As a result, Agriculture contributes the lion share of the Gross Domestic Product (GDP) and foreign currency earnings of the country from the sale of agricultural outputs abroad. Moreover, the sector creates employment opportunity to the majority of the country's population and at present nearly about 83 percent of the country's population depends on agriculture to sustain their livelihood. Hence, as it had been for centuries in the past, still being the leading sector at present, it is believed to remain being the determinant sector to play a dominant role to bring about an overall sustainable economic growth to the country, for the years to come. This would be materialized if and only if strenuous efforts are made by the government and the concerned stakeholders including the farmer, to increase productivity through increased use of farm inputs such as improved seed, fertilizers and modernize the farm activity through increased use of modern and improved farm implements and farming systems as well as through the introduction of modern farming technology to the sector as a whole. In order to meet the goals mentioned above and pave the way for the concerned stakeholders to identify, plan, implement and monitor agricultural projects and developmental programs among others, the availability and regular supply of reliable, comprehensive and timely statistical information on the overall performance of the sector is considered essential for use as a primary input to their planning purpose and related activities.

To minimize the existing data gap and fulfill the demand of the stakeholders concerned, for the past three decades, the Central Statistical Agency (CSA) has been conducting annual agricultural sample survey under which four integrated sample surveys designed for the collection of agricultural information on the performances of the sector were launched all over the country and used to disseminate the survey results to ultimate users

on annual basis. The 2012/13 (2005 E.C.), Belg Season Crop Production Sample Survey, for which this report is meant for, is among the four integrated sample surveys launched on annual basis under the umbrella of the agricultural sample survey all over the country. This report, which is Volume V of the nine series of statistical reports on agriculture, presents quantitative results on crop land area, production, and yield of major Belg crops, grown during the 2012/13 Belg season by private peasant holdings as obtained from the results of the 2012/13 (2005 E.C.), Belg Season Crop Production Sample Survey.

1.2 Objectives of the Survey

The objectives of the 2012/13 (2005 E.C.), Belg Season Crop Production Sample Survey is to produce basic quantitative information on:-

- Cropland area, production and yield of Belg season crops, and
- The extent and use of different farm management practices on Belg season crops such as fertilized crop land area and quantity of fertilizer used by crop and fertilizer type, irrigated crop land area, area under improved seed, pesticide treated cropland area … etc.

The adequate and timely supply of this information to ultimate users is therefore, important for use as a primary input in the process of policy formulation, designing developmental agricultural projects and programmes. This report, therefore, presents quantitative information on the above-mentioned major variables at country and regional levels.

CHAPTER II

2. SURVEY METHODOLOGY, DATA COLLECTION AN PROCESSING

2.1 COVERAGE

The 2012/13 (2005 E.C) Annual Agricultural Sample Survey (Belg season) covered the entire rural parts of the country except the non-sedentary population of three zones of Afar & six zones of Somali regions. Accordingly the survey took in to account of all parts of Harari, Dire Dawa, and actually 60 Zones / Special weredas (that are treated as zones) of other regions.

To be covered by the survey, a total of around **1,440** Enumeration Areas (EAs) were selected. However, due to some EAs weren't growing Belg season crops; in **212** EAs the survey could not be successful and hence interrupted. Thus, all in all the survey succeeded to cover **1,228** EAs throughout the regions. The Annual Agricultural Sample survey (Belg season) data was collected from 30 agricultural households selected from each EA.

2.2 SAMPLING FRAME

The list containing EAs of all regions and their respective households obtained from the 2007 Population and housing Census Frame was used as the sampling frame in order to select the Primary Sampling Units (EAs). Consequently, all sample EAs were selected from this frame based on the design proposed for the survey. The second stage sampling units, households, were selected from a fresh list of households that were prepared for each EA at the beginning of the survey.

2.3 SAMPLE DESIGN

In order to select the sample a stratified two-stage cluster sample design was implemented. Enumeration areas (EAs) were taken to be the primary sampling units (PSUs) and agricultural household have were the Secondary Sampling Units (SSUs). The sample size for the 2012/13 agricultural sample survey was determined by taking into account of both the required level of precision for the most important estimates within each domain and the amount of resources allocated to the survey. In order to reduce non-sampling errors, manageability of the survey in terms of quality and operational control was also considered. Except Harari, and Dire Dawa each region as a whole was taken to be the domain of estimation. Each zone of a region / special woreda was adopted as a stratum for which major findings of the survey are reported.

2.4 SELECTION SCHEME

Enumeration areas from each stratum were selected systematically using probability proportional to size sampling technique; size being number of agricultural households. The sizes for EAs were obtained from the 2007 Population and Housing census frame. From the fresh list of households prepared at the beginning of the survey 30 agricultural households within each sample EA were selected systematically. Estimation procedure of totals, ratios, sampling error and the measurement of precision of estimates (CV) are given in Appendix-I and II respectively.

2.5 Field Organization

The Central Statistical Agency (CSA) has 25 Branch Statistical Office which contains heads, field supervisors and enumerators, other supporting staff and drivers 24 Branch office were all involved in the field operation activities of the 2012/13 (2005 E.C.) Belg season Crop Production Sample survey. Addis Ababa statistics branch office of CSA is not participate on the 2012/13 (2005 E.C) Belg survey duo to the agricultural practice at small holder level doesn't exist in the Capital. In the rest all 24 branch office of CSA to accomplish the data collection activities, all field enumerators were equipped with the necessary survey equipment (i.e. GPS, compass, programmable calculator, measuring tape … etc). To assist with the field work and data collection activities all available four-

wheel drive vehicles were used for supervision and collection of completed questionnaires.

2.6 Training of Field Staff

At the beginning of the survey year, 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, statisticians and some of the field supervisors for one week at the capital of Amhara national state Bahirdar that lasted 7 days. Those trained in the first stage conducted similar training for field supervisors and enumerators for 20 days in the 24 Branch Statistical Offices, which are distributed all over the country. During the second stage training, the field staff were given detailed classroom instruction on the objectives and uses of the Agricultural Sample Survey (AgSS), concepts, and definitions of terms used, the method of area measurement, interviewing procedures, … etc. The enumerators and supervisors training also included a field practice to reinforce the procedures discussed in the classroom with regard to field area measurement, use of the programmable calculator, GPS and Compass rope techniques.

2.7 Methods of Data Collection.

Except cropland area of Belg Season crop, the data of which collected objectively using GPS, compass rope, and measuring tape, the information on production of major Belg Season crops and agricultural practices (uses of fertilizer, pesticide, improved seed and irrigation) were subjectively collected by interviewing the holders of sampled households.

A major characteristic of Ethiopian agriculture is the existence of two well-known crop production seasons referred to as the Meher (or main) and Belg(short rain) Seasons. The general 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 areas. 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 parts 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 as Meher (main) season crops.

This report consists of estimates of area, production and yield of major Belg Season crops for the year 2012/13 (2005 E.C.). The data collection period for obtaining the area, production and agricultural practices of the Belg season crops was from ‘Miyazia 15/2005 to Ginbot 30/2005 E.C. (i.e. From may 23 to June 7, 2013). Data on area under Belg season crop are collected objectively using compass/GPS and measuring tapes, while data on production of Belg season crops were using subjective method based on face-to-face interviewing of the holder by the enumerator. Data on production of Belg season crops are calculated from the condition factor data that are collected directly from the sampled holders within household and development agents (DA) The enumerators were trained to systematically present the questions to the respondents on percentage changes using the local translation and meaning. The enumerators were also trained on how to use comparative associations to represent the concept of percentage changes and fill in the questionnaire.

2.8 Data Processing

a. Editing, Coding and Verification

To insure the quality of the collected survey data an editing, coding, and verification instruction manual was written, and 25 editors, data coders and verifiers were trained for one day to edit, code and verify the data using the aforementioned manual as a reference and teaching aid. The enumerator completed edited and coded questionnaires sent to the head office were thoroughly verified by trained verifiers on a 100% basis before the questionnaires were sent to the data entry unit. The editing, coding, verification and manual cleaning of all questionnaires were completed in 15 days.

b. Data Entry, Cleaning and Tabulation

Before starting data entry computer edit specifications were prepared for use on personal computers, utilizing the CSPRO Software for data consistency checking purposes. The data on the coded questionnaires were then entered into the CSPRO software on personal computers. The data was then checked and cleaned using the computer edit specifications prepared earlier for this purpose. 78 data encoders and 6 supervisors were involved in this total process and it took 14 days to complete the job. Finally, tabulation was done on personal computers to produce results as indicated in the tabulation plan.

2.9 Basic concepts and definitions

For better understanding and ultimate use of the data presented in this report, the definitions and concepts of technical terms and terminologies used for the collection of all types of data of the 2012/13 (2005 E.C.) Belg Seasons Crop Production Sample Survey is presented here below: -

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 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 helps, 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 of 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**.**

Irrigated area: - refers to the area of land purposely and actually provided with water, other than by rain, for improving the production of crops. The uncontrolled flooding of land by the over flow of rivers or streams is not categorized as irrigation practice although sometimes farmers use this incidence for production.

Improved Seed: is defined as crop variety, which gives significantly higher yield, better quality and/or better benefit compared to traditional varieties of seeds, and usually produced by the Ethiopian Seed Enterprise (ESE) in Ethiopia.

Fertilizer: - refers to anything added to the soil intended to increase the amount of plant nutrients available for crop growth. Usually fertilizers are divided into two parts, Natural and commercial. Examples of natural fertilizers are farmyard manure and wood ashes while commercial fertilizers are DAP (Di-Ammonium phosphate) and UREA (Ammonium Nitrate).

Pesticides: Pesticides are chemicals useful for the mitigation, control or elimination of pests which are troublesome or harmful to crop. Insecticides, herbicides and fungicides are all considered as pesticides**.**

CHAPTER III

3. SUMMARY OF THE MAJOR FINDINGS OF THE SURVEY.

As it has been forecasted earlier by the Ethiopian Metrological Agency and practically proved by farmers interviewed at their farm gate during the survey field work, the overall performance of the 2012/13 (2005 E.C.) Belg season crop production activity was good in all Belg Crop producing areas across the country particularly the three major Belg production regions i.e. Oromia, Amhara and SNNP when compared to the previous year. Duo to, the better of whether conditions and the farmers were uses chemical fertilizers during the 2012/13(2005E.C) Belg season, are among the major reason that had positive effect on the land preparation and sawing activities, and resulted the increased Belg crop production as a whole. Consequently, considerable number of Belg season dependent farmers was in good position this year as compared to the previous year.

Based on the facts mentioned above, the main findings of the 2012/13 (2005 E.C.) Belg season crop production sample survey is presented as follows**.**

3.1.Grain Crops:- refer to the major crop category that included cereals, pulses and oilseeds, which not only constituted the major food crops for the majority of the country's population but also served as a source of income at household level and a contributor for the country's foreign currency earnings, among others. The results of the 2012/13 (2005E.C) Belg season crop production survey indicate that a total land area of about 1,230,769.94 hectares of land was estimated to be covered by major Belg crops from which a total production of 9,804,770.23 quintals was estimated to be harvested at country level. Out of the above mentioned total Belg season cropland area and total volume of production, cereals contributed the lion share both in cropped area coverage and volume of production i.e. about 958,381.83 hectares (77.87%) of the country total Belg cropland area) and about 8,404,743.02 quintals (85.72%) of the country total

Production), followed by Pulses that covered about 256,945.50 hectares (20.88%), with a production of 1,395,577.38 quintals (14.23%). (For details see Summary Table 1).

Country Level

Crop Category	Total Cropland Area		Total Production	
	in Hectare	%	In Quintals	%
Cereal	958,381.83	77.87	8,404,743.02	85.72
Pulses	256,945.50	20.88	1,395,577.38	14.23
Oilseeds	*15,442.61*	*1.25*	*4,449.84*	*0.05*
Grain Crops	1,230,769.94	*100.00*	9,804,770.23	*100.00*

Summary Table 1*: Cropland Area and Production of Major Belg Crops: Private Peasant Holdings, 2012/13 (2005 E.C.).*

Note:-To give bird's eye view on the performance of the 2012/13 Crop production Year, the total estimated Cropland Area and production of Major Crops for Private peasant holders and commercial farms cropland area and production of 2012/13(2005E.C) production year, the country level total crop production of both season from all sectors are presented as follows;-

	Grain Cropped Area in Ha	Volume of Production in Qts
Private holdings in 2012/13 Meher Season	12,282,929.98	231,288,471.77
Private holdings in 2012/13 Belg Season	*1,230,769.94*	9,804,770.23
Commercial farms 2012/13	569,825.62	9,956,773.88
Grand Total	**14,083,525.54**	**251,050,015.88**

3.2. Estimates of the 2012/13 (2005 E.C) Total Cropland Area and Production of Major Crops Both Seasons (Meher and Belg)

The year 2012/13(2005 E.C.) total cropland area and production of major crops of private peasant holders during both seasons, was estimated to be 13,513,699.92 hectares and

241,093,699.92 quintals, respectively. Out of the above mentioned totals, cereals covered about 10,559,417.09 hectares (78.14%) of the total cropland area covered during both seasons) with a production of 204,916,258.48 quintals (84.99 %) of the total volume of production of the year); While Pulses and Oilseeds covered about 2,120,390.92; 833,891.91 hectares which accounted for about 15.69% and 6.17**%** of the total cropland area, respectively. (For the details see Summary Tables 2 and 3).

Summary Table 2. Cropland Area under Major Crops; Private Peasant Holdings2012/13 (2005 E.C.), Both Seasons:

Country Level

	Total Cropland Area in Hectares during					
	Meher Season		***Belg Season***		***Both seasons Total***	
Crop Type	***Area in Ha***	***%***	***Area in Ha***	***%***	***Area in Ha***	***%***
Cereal	**9,601,035.26**	**78.17**	**958,381.83**	**77.87**	**10,559,417.09**	**78.14**
Pulses	**1,863,445.42**	**15.17**	**256,945.50**	**20.88**	**2,120,390.92**	**15.69**
Oilseeds	**818,449.3**	**6.66**	**15,442.61**	**1.25**	**833,891.91**	**6.17**
Total	**12,282,929.98**	**100**	**1,230,769.94**	**100.00**	**13,513,699.92**	**100.00**

Moreover, since Meher is a long rainy season almost 80 to 90 % of the private peasant farmers perform their crop production activities during this season. As a matter this fact, out of the total cropland area cultivated under major crops during the 2012/13(2005 E.C.) production year, Cropland area cultivated under major crops during Meher Season was found to be the highest i.e, **12,282,929.98** hectares Contributing about 90.89% to the total cropland area coverage, with a total production of 231,288,471.77 quintals (95.93%) at

Summary Table 3. Total Production of Major Crops Harvested by Private Peasant Holdings; 2012/13 (2005 E.C.), Both Seasons:

Country Level

	Total Production in Quintals, Harvested during					
Crop	Meher Season		Belg Season		Both seasons Total	
Type	Prod. in Qts	%	Prod. in Qts	%	in (000) Qts	%
Cereal	196,511,515.46	84.96	8,404,743.02	85.72	204,916,258.48	84.99
Pulses	27,510,311.88	11.89	1,395,577.38	14.23	28,905,889.26	11.99
Oilseeds	7,266,644.43	3.14	4,449.84	0.05	7,271,094.27	3.02
Total	231,288,471.77	100	9,804,770.24	100.00	241,093,242.01	100.00

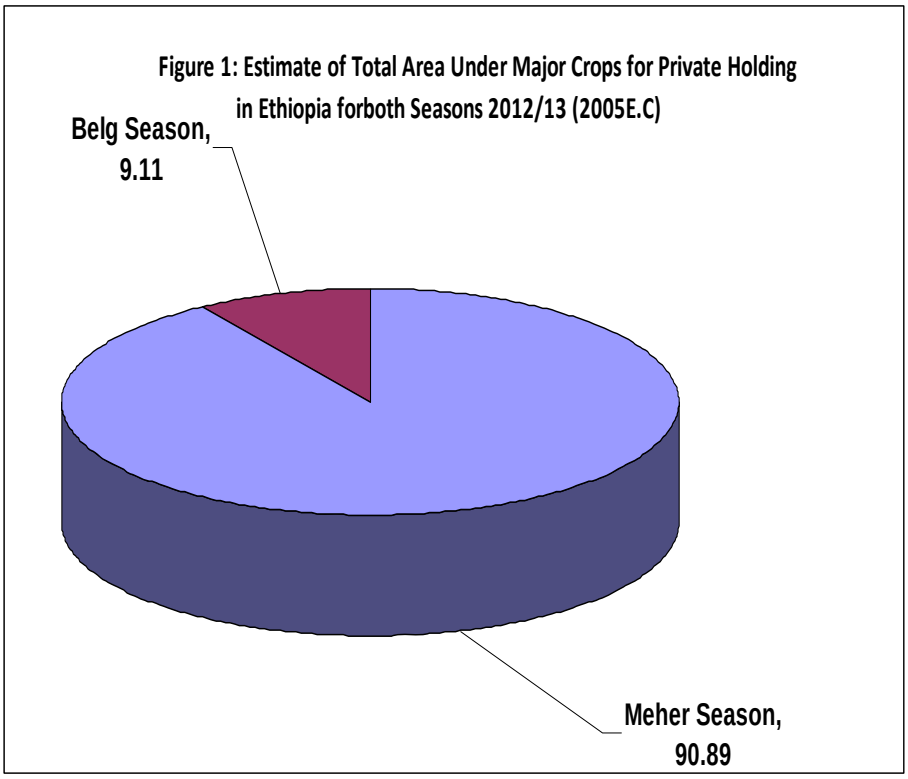


Figure 1*: Estimate of Total Area under Major Crops for Private Holding in Ethiopia for both Seasons 2012/2013(E.C)*

country level. While Belg season contributes the remaining about 9.11% (i.e. 1,230,769.94 hectares) to the total cropland area with about 4.07 % (i.e. 9,804,770.24 quintal) share from the total production volume reported at country level (For the details see Figs 1 and 2).

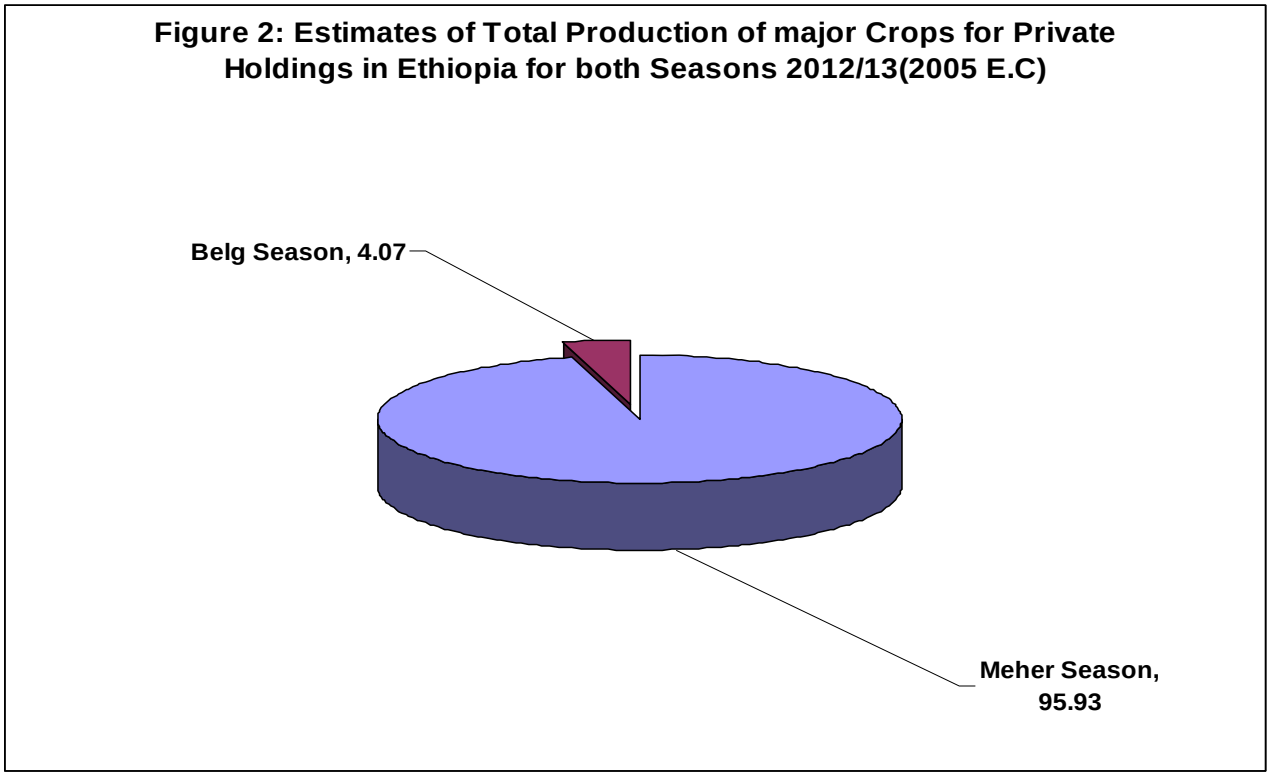


Figure 2*: Estimates of Total Production of major Crops for Private Holdings in Ethiopia for both Seasons 2012/13(E.C)*

3.2.2 <u>Vegetables</u>: - holders living near to urban centres largely practice vegetable farming. Most vegetables are not commonly practiced by the rural private peasant holders, hence the small volume of production recorded as well evidenced by the survey results. Figure 3 underlines this more in the report. Vegetables took up about 1.99% of the area under all crops at national level. Of all the area under vegetables 84.22% and 6.86% was under Ethiopian Cabbage and Tomato, respectively (See Statistical Table 5). As to production of vegetables, 88.78% and 6.33% was that of the same crops, in that order.

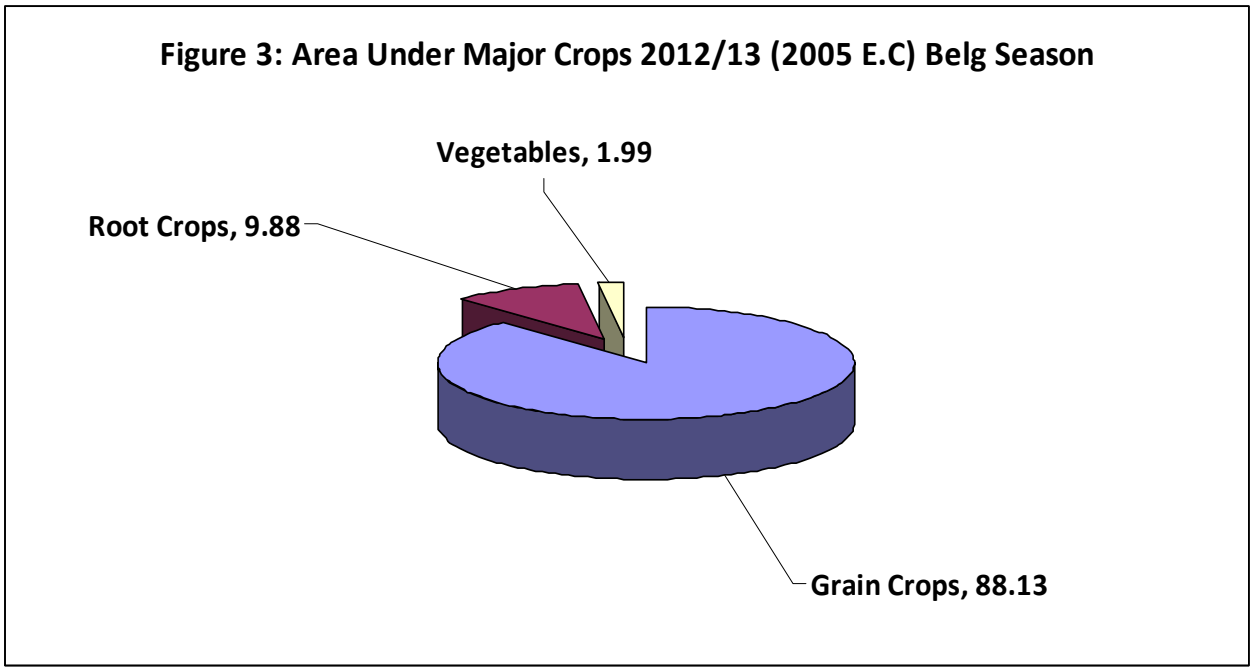


Figure 3*: Area under Major Crops 2012/13(2005 E.C) Belg Season*

3.2.3. Root Crops: - Some root crops like onion and garlic are indispensable to improve the taste and scent of the food we eat. Others like potatoes, sweet potatoes and taro/ Godere are among the list of major food crops that are consumed across the country. These and other economic importance's prompt the peasant holders to grow many of the root crops as shown in the survey results. See the statistical table substantiates this point in more details.

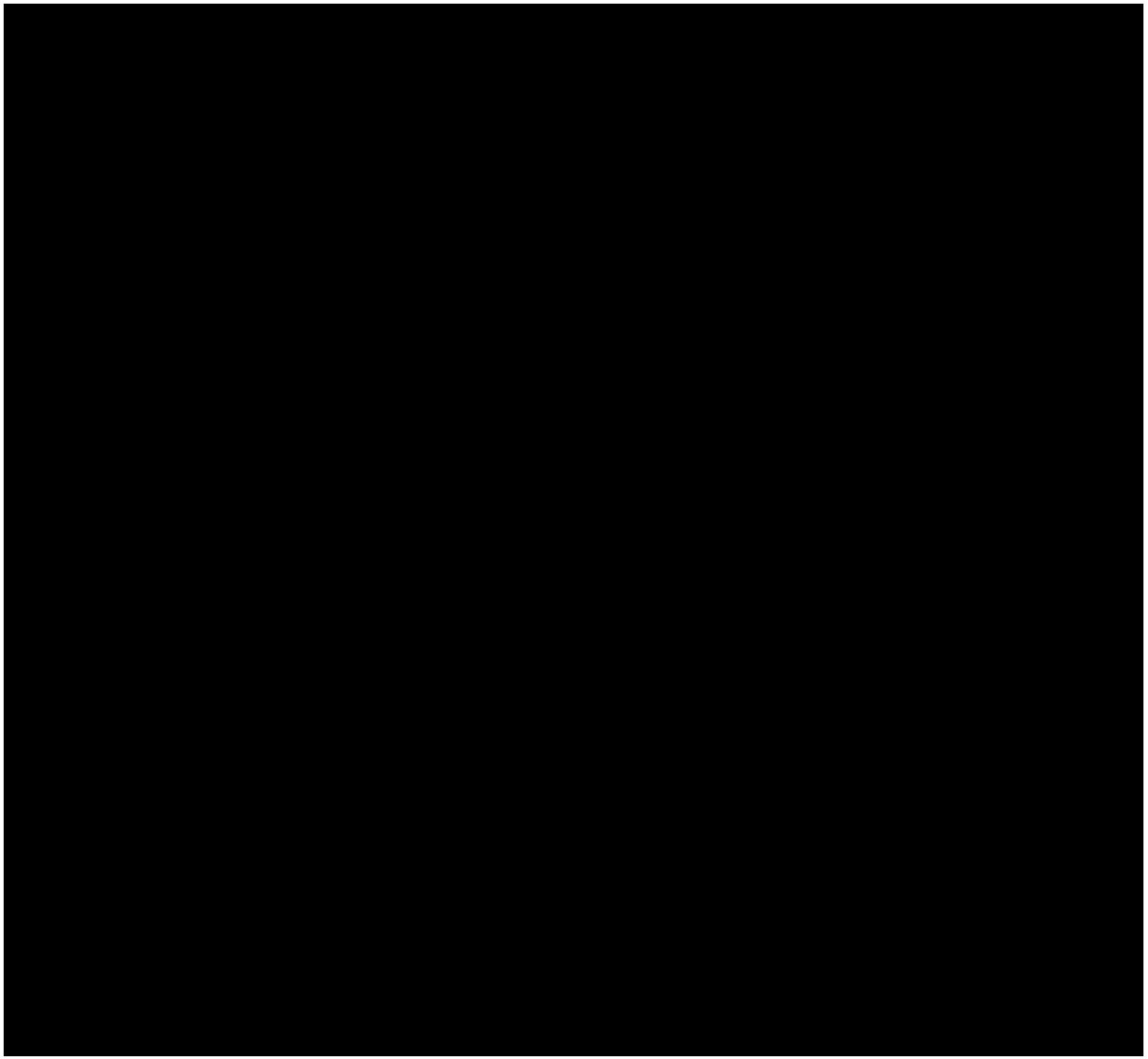
Root crops covered more than 9.88% of the area under all crops in the country. Potatoes, Onion and sweet potatoes added 75.66%, 9.77% and 7.65% of the area to the root crops total. The same crops contributed 69.54%, 7.58% and 15.97% to the root crop production total in the same order.

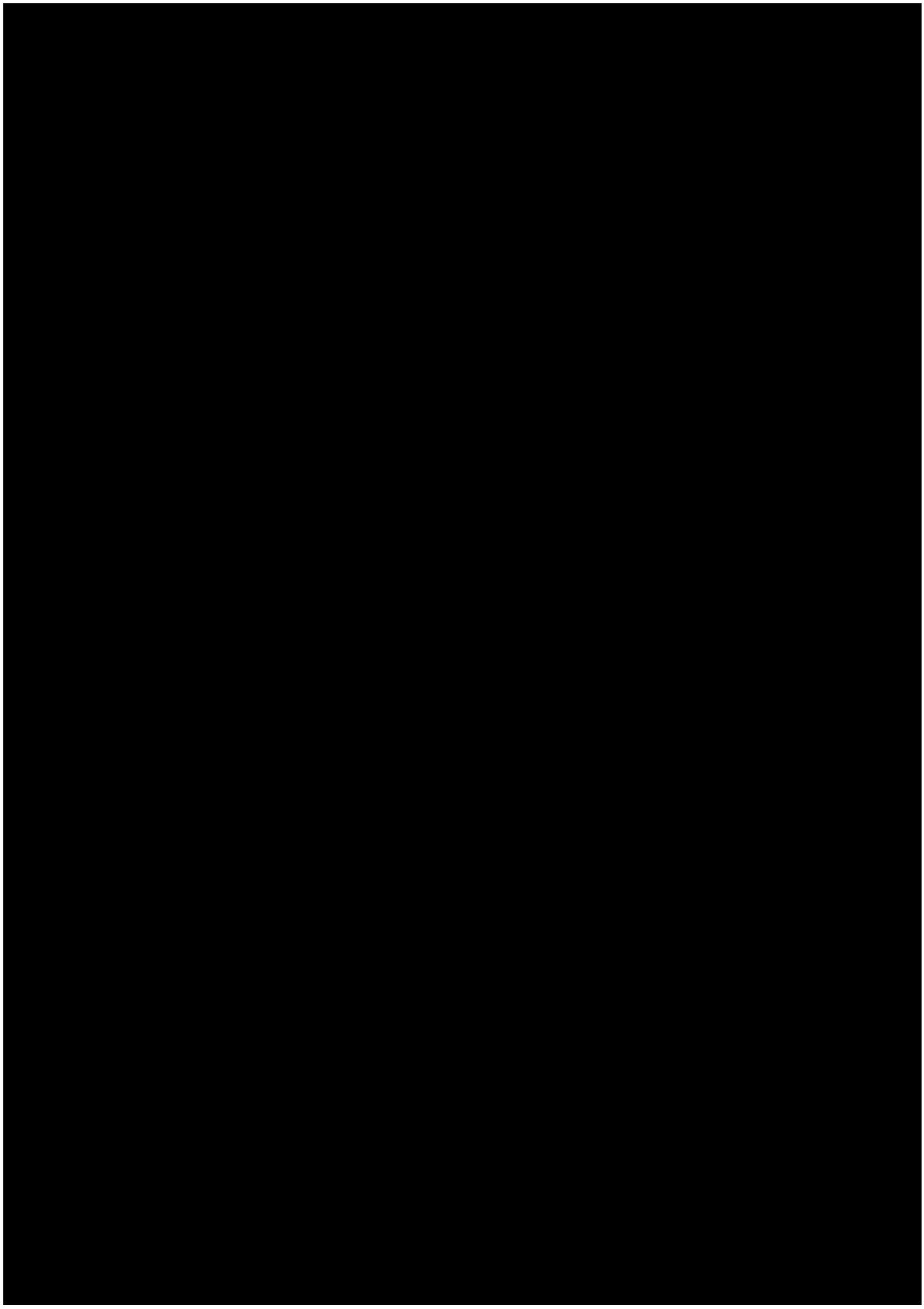
NOTES: -

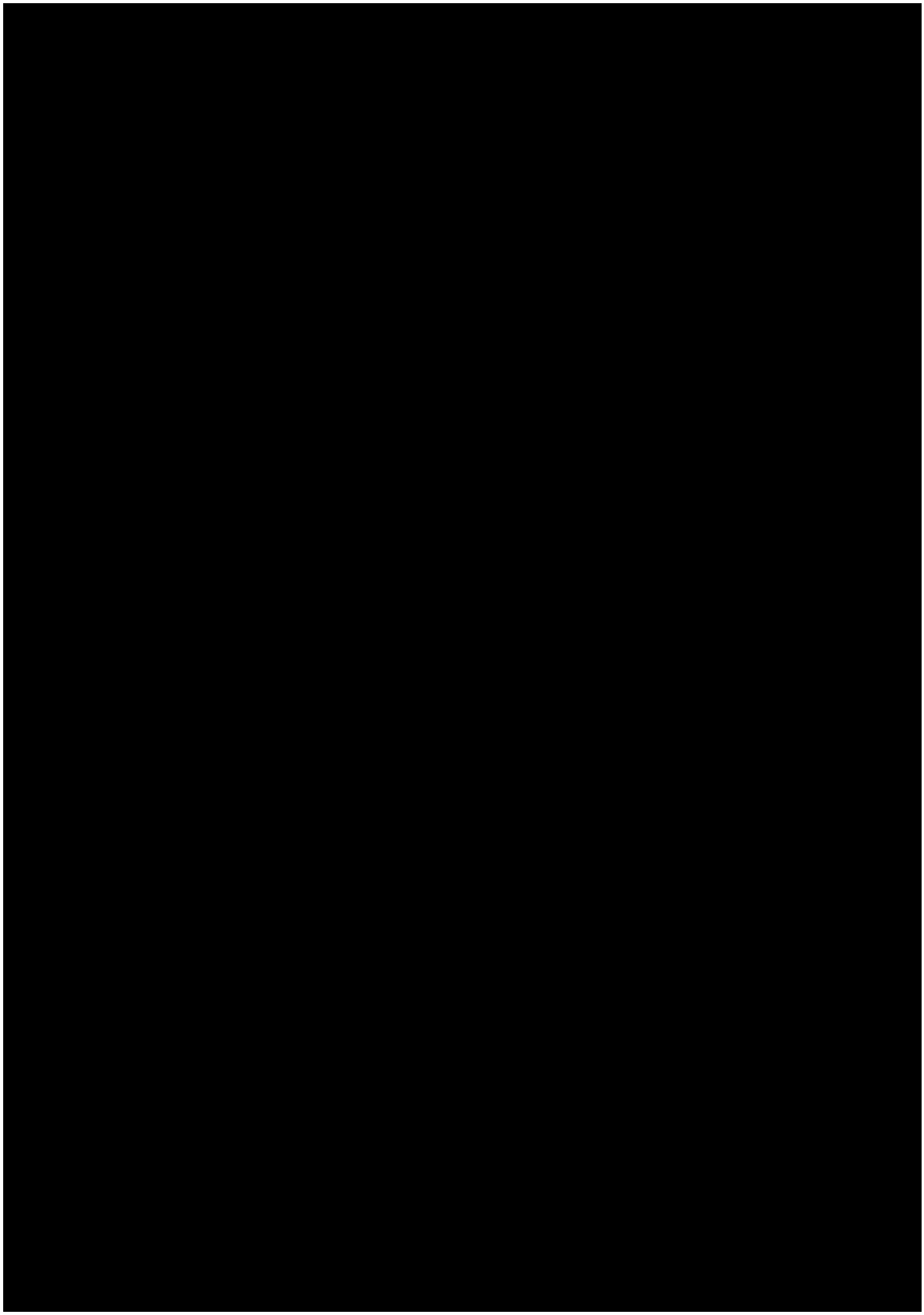
1. **Some estimates in all reporting levels are excluded due to high coefficient of variations. Nevertheless, they are incorporated in the total estimates. Hence the sum of the specific estimates may not be equal to the total estimates.**
2. **Users are also advised to use those estimates with 30-50% coefficient of variation (CV) cautiously**

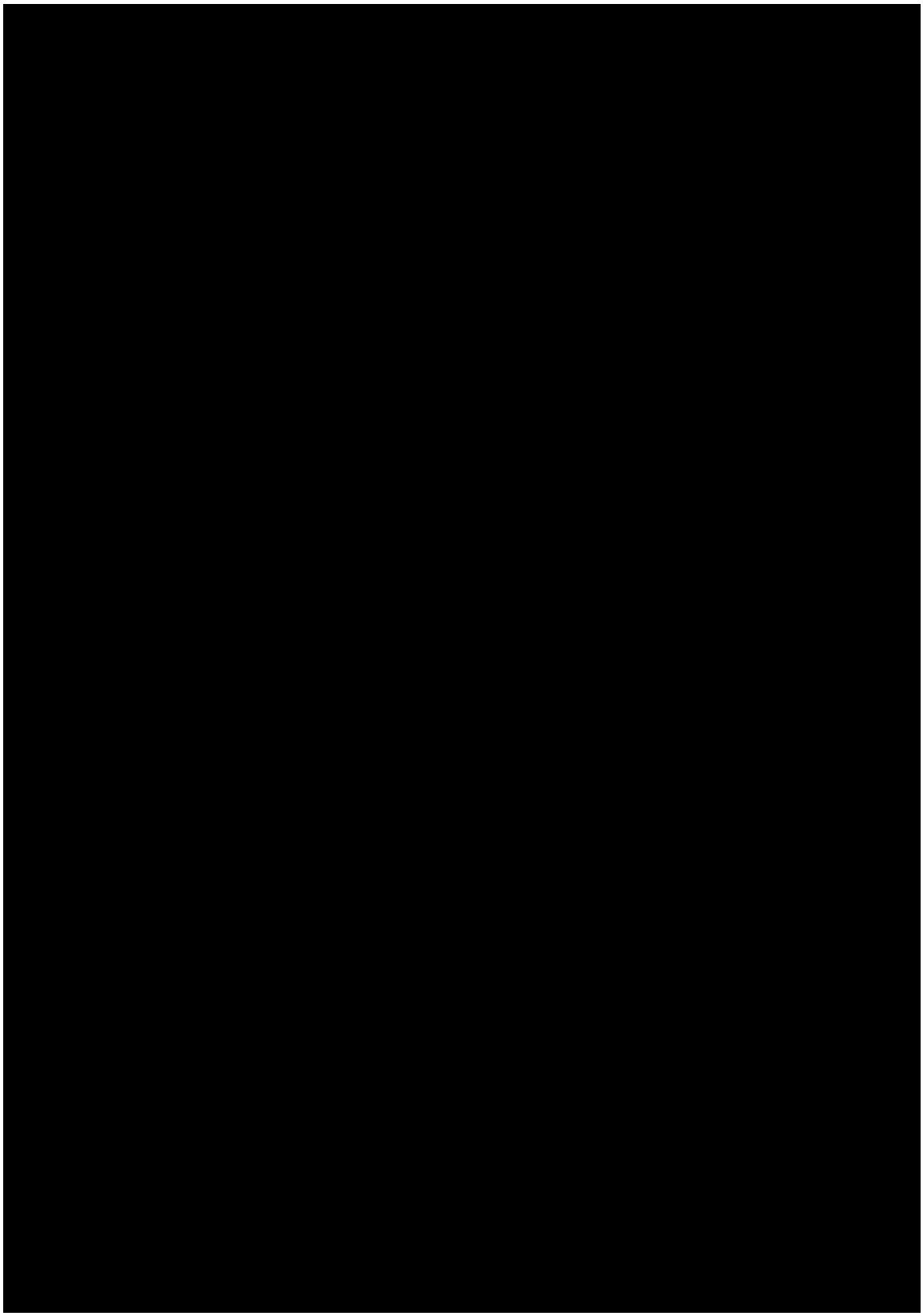
3. **Even though area is reported for some crops in some reporting levels, no production data is available such cases are designated by Not Stated (NS). On the other hand, in all tables "-" labeled for data not available totally.**

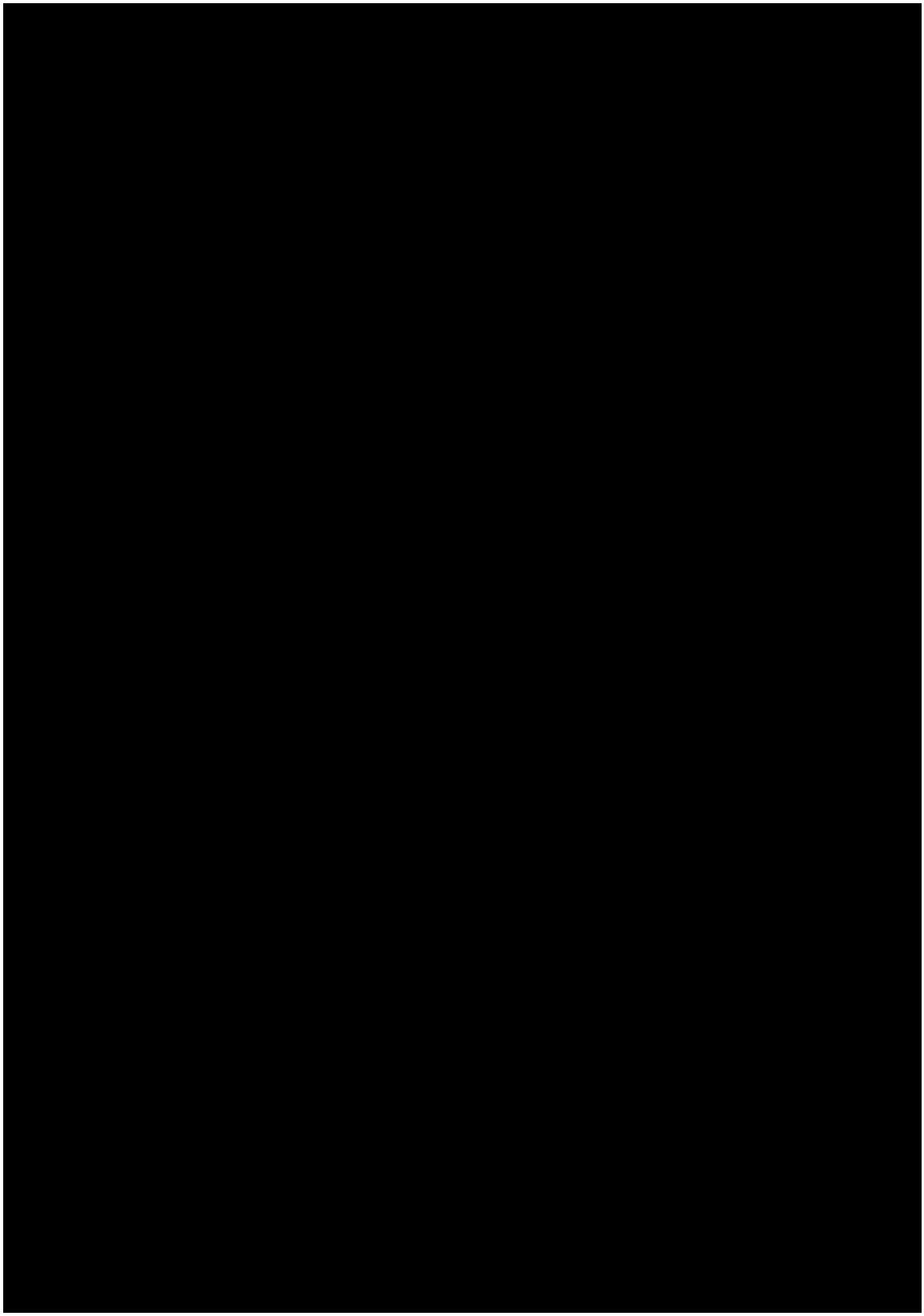
Statistical Tables Presenting Results at National and Regional Levels

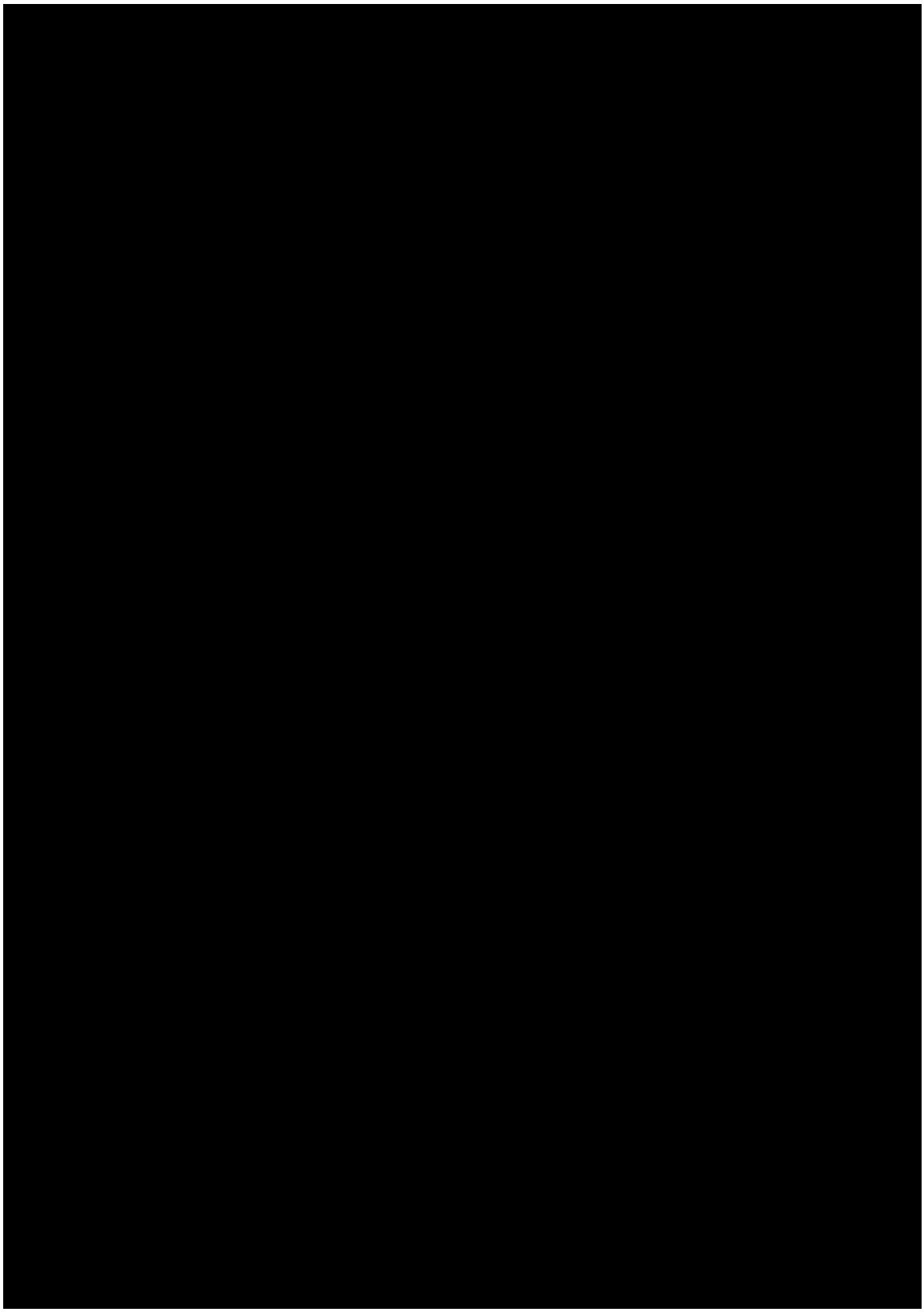


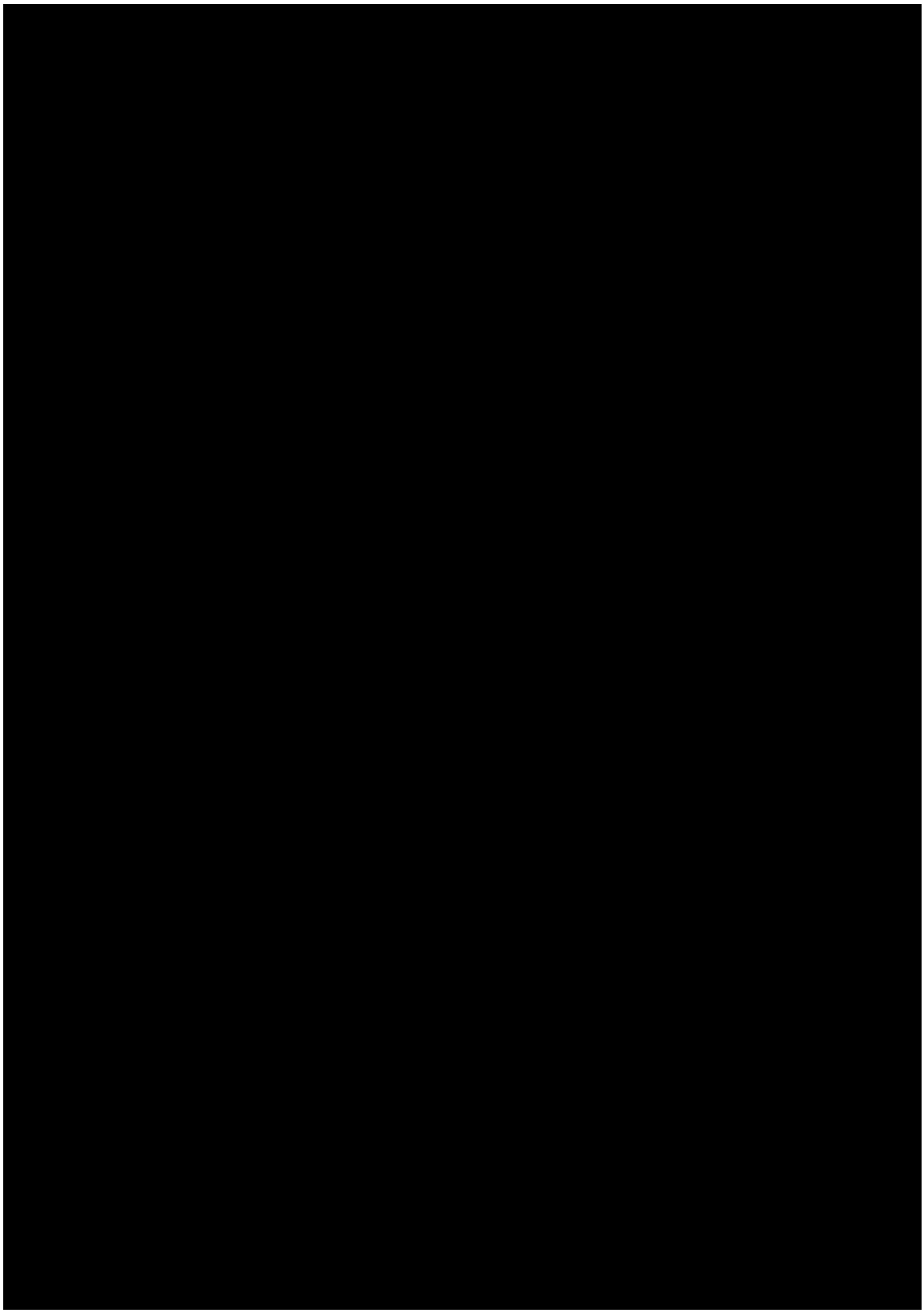


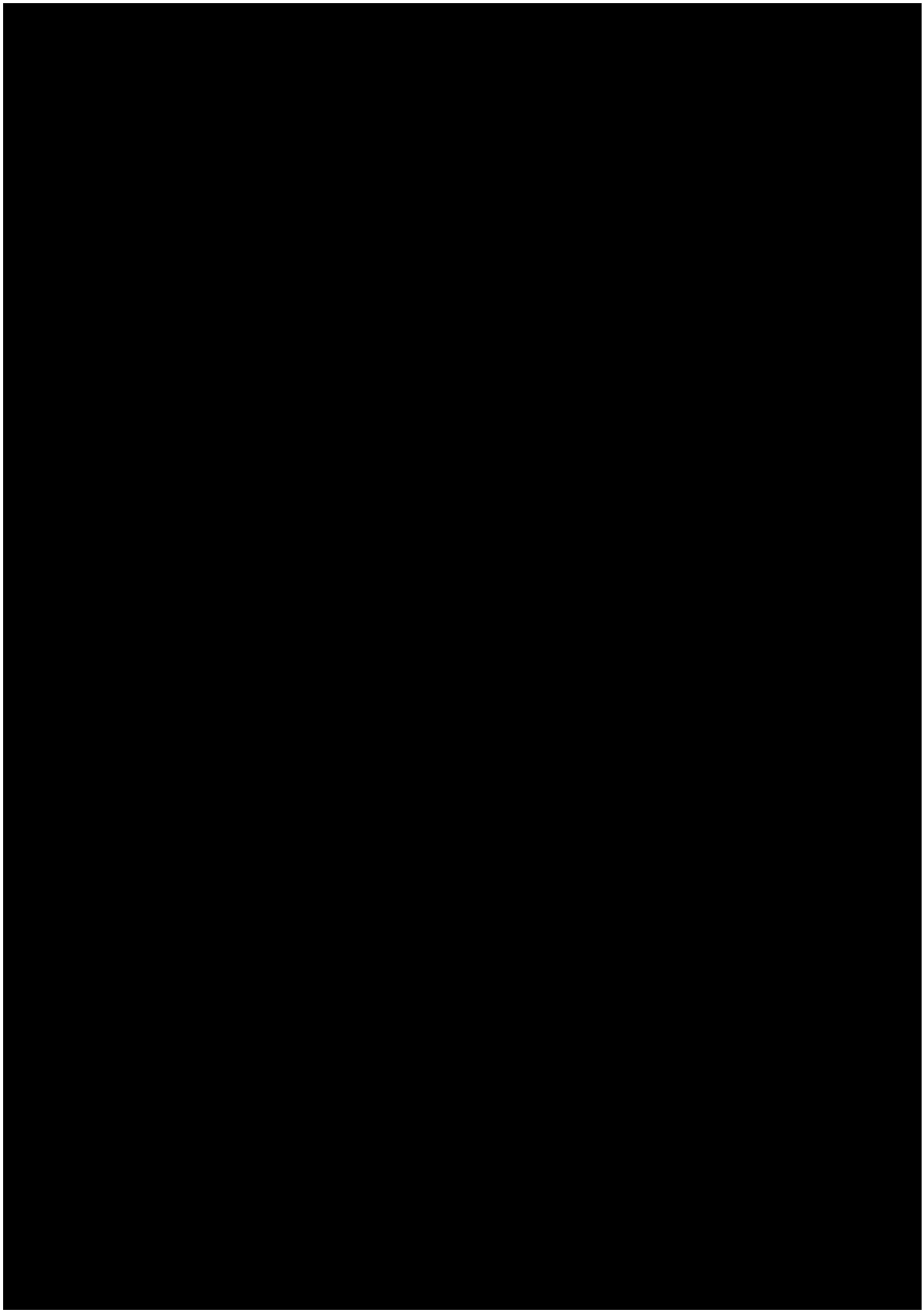


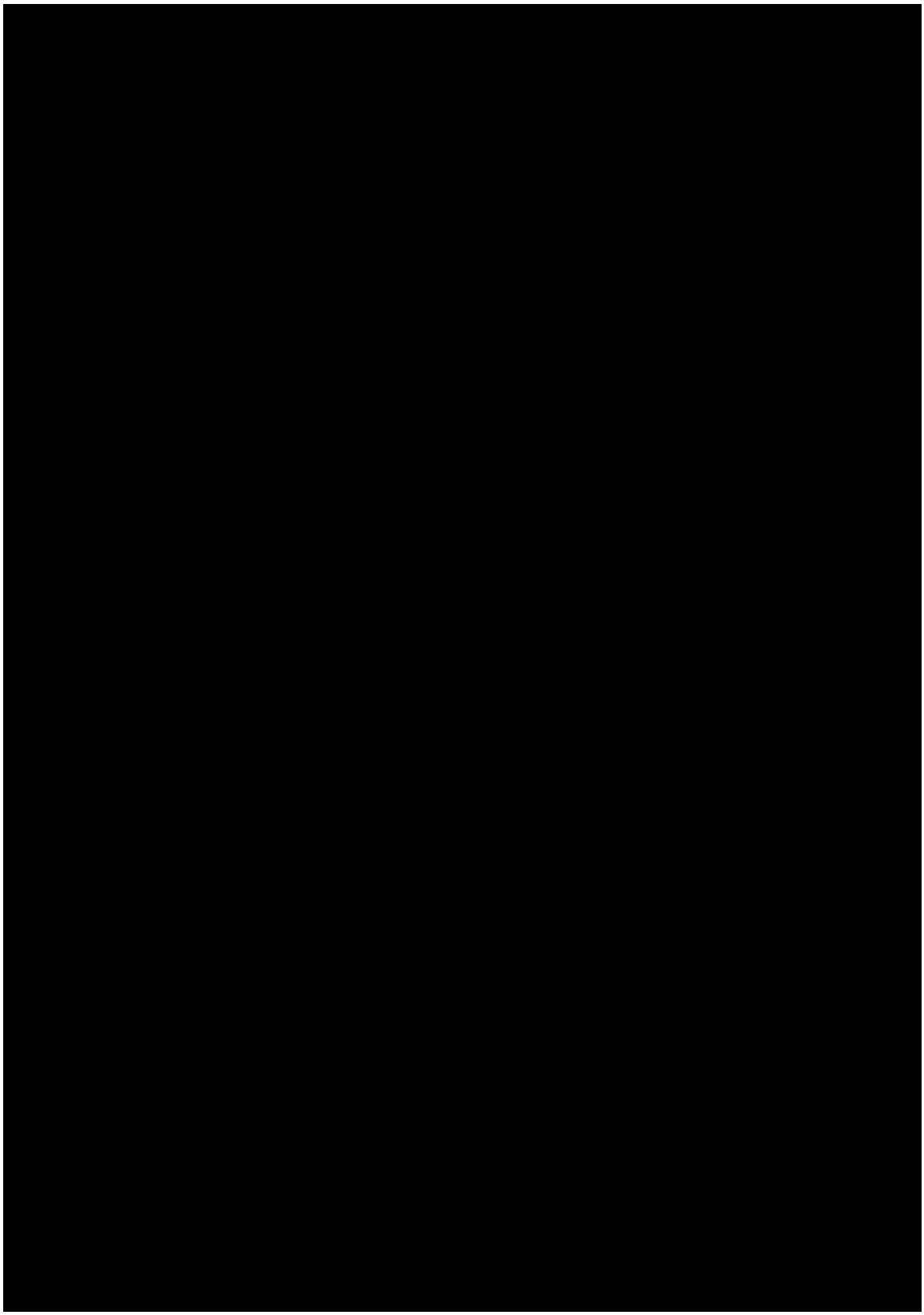


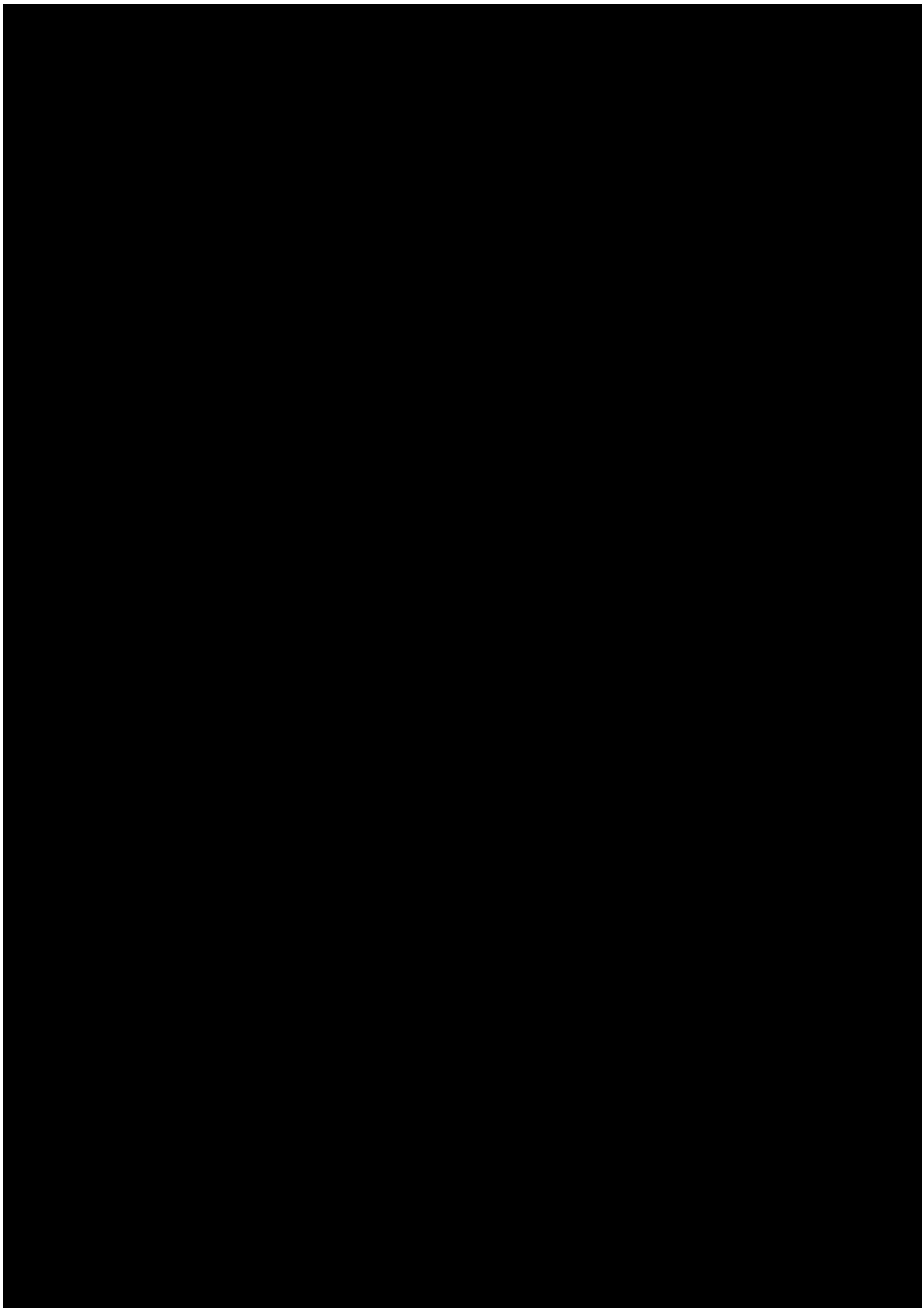


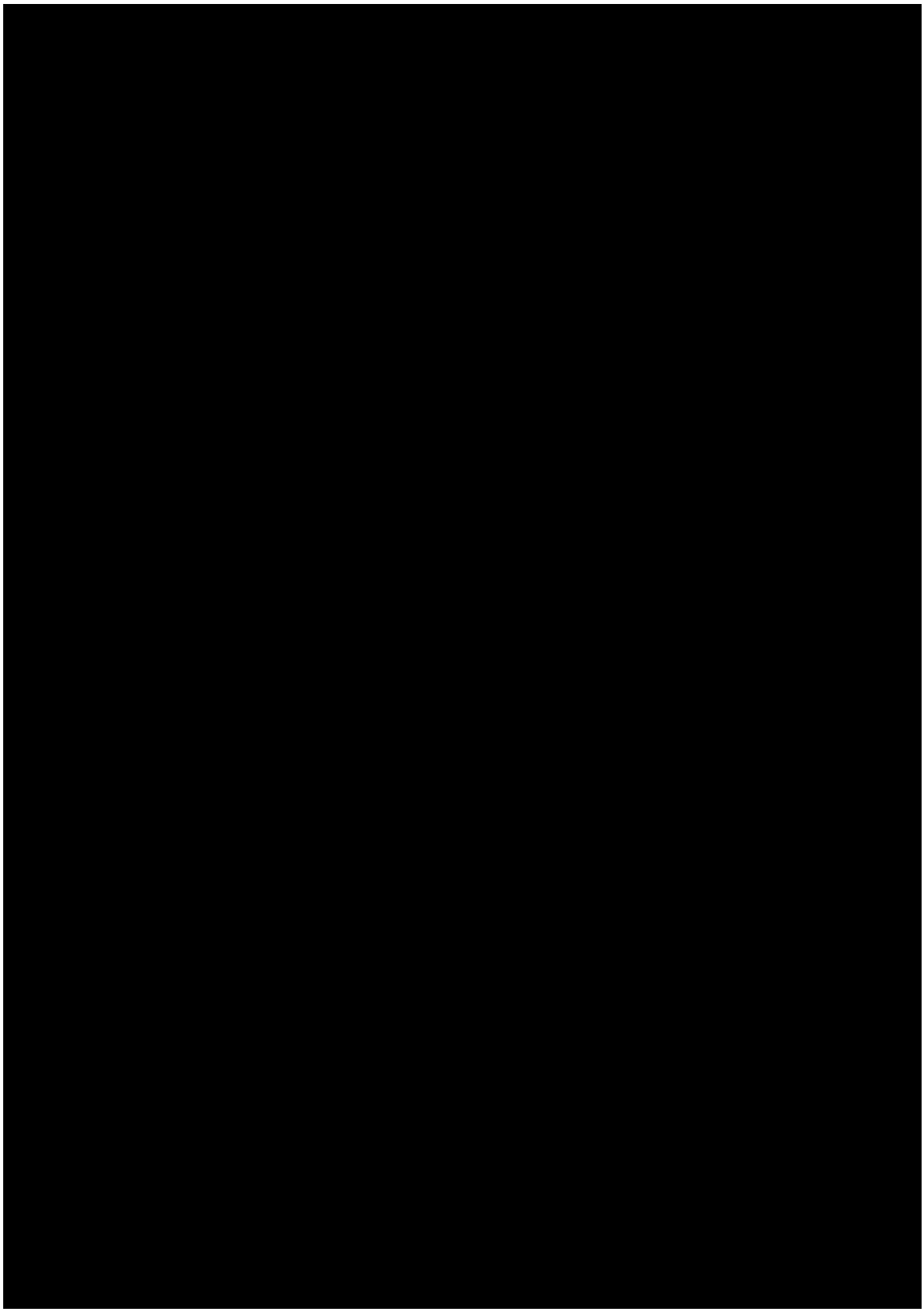


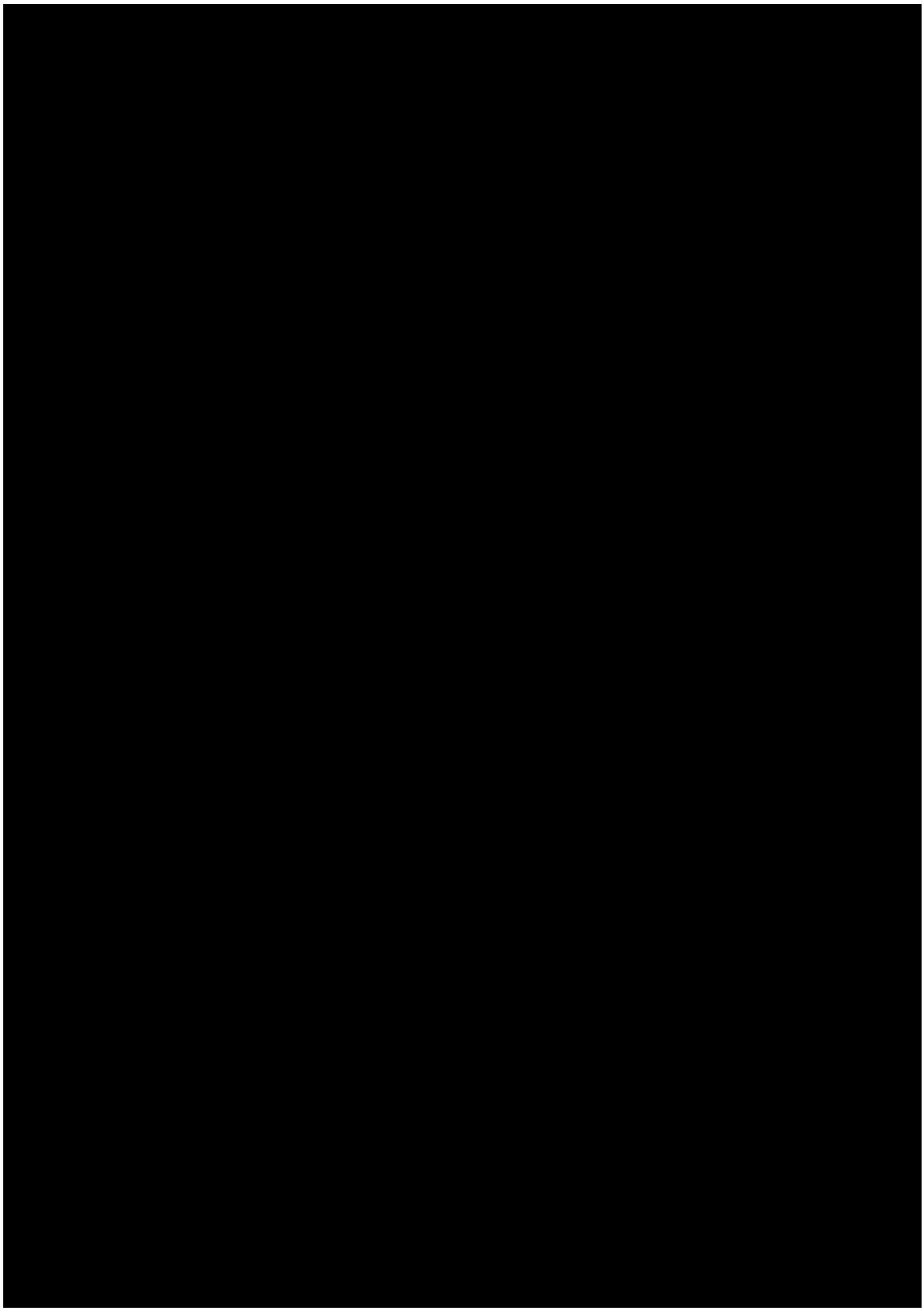












Appendix I

Estimation Procedures of Totals, Ratios and Sampling Errors

APPENDIX I Estimation Procedures of Totals, Ratios and Sampling Errors

The following formulas were used to estimate total area of land under specific crop and production of specific crop in a stratum.

1. For estimating Total Area of Land under Specific Crop:

$$\hat{A}_h = \sum_{i=1}^{n_h} W_{hi} \sum_{j=1}^{h_{hi}} a_{hij} = \sum_{i=1}^{n_h} W_{hi} a_{hi}$$

in which, $W_{hi} = \frac{M_h H_{hi}}{n_h m_{hi} h_{hi}}$ is the basic weight.

Where:

h represents the stratum

n_h is the total number of sample EAs successfully covered in the hth stratum.

M_h is the measure of size of the hth stratum as obtained from the sampling frame.

m_{hi} is the measure of size of the ith sample EA in the hth stratum obtained from the sampling frame.

H_{hi} is the total number of agricultural households of the ith sample EA in the hth stratum.

h_{hi} is the number of sample agricultural households successfully covered in the ith sample EA in the hth stratum.

a_{hij} is the value of area for agricultural household j, in the ith EA in the hth strtatum under a specific crop.

a_{hi} is the sample total area under specific crop for EA i in stratum h

$\hat{A}_h$ estimate of total area under specific crop in stratum h

2. For estimating Total Number of Holders :

$$Y_h = \sum_{i=1}^{n_h} W_{hi} H_{hi}$$

in which, $H_{hi} = a_{hi} * \bar{Y}_{hi}$

Where,

$\bar{Y}_{hi}$ is average yield per square meter of a specific crop in the i[th] EA in the h[th] stratum.

H_h is estimate of total quantity of production of a specific crop in the h[th] stratum.

H_{hi} is estimate of total quantity of production under specific crop for EA i in stratum h.

3. Sampling Variance of Estimates:

Sampling variance for the estimate of stratum total of area, production and yield for a specific crop are estimated by the following formulas.

$$Var(\hat{A}_h) = (1 - f_h) \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} \left(\hat{A}_{hi} - \frac{\hat{A}_h}{n_h} \right)^2 + f_h \sum_{i=1}^{n_h} (1 - f_{hi}) \left(\frac{h_{hi}}{h_{hi} - 1} \right) \sum_{j=1}^{h_{hi}} \left(\hat{A}_{hij} - \frac{\hat{A}_{hi}}{h_{hi}} \right)^2$$

$$Var(\hat{P}_h) = (1 - f_h) \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} \left(\hat{P}_{hi} - \frac{\hat{P}_h}{n_h} \right)^2 + f_h \sum_{i=1}^{n_h} (1 - f_{hi}) \left(\frac{h_{hi}}{h_{hi} - 1} \right) \sum_{j=1}^{h_{hi}} \left(\hat{P}_{hij} - \frac{\hat{P}_{hi}}{h_{hi}} \right)^2$$

Where,

f_h = average first stage probability of selection of EAs within stratum *h*.

$f_{hi} = \frac{h_{hi}}{H_{hi}}$ = average second stage probability of selection within the *i*[th] sample EA in stratum *h*.

$\hat{A}_{hi}, \hat{P}_{hi}$ are weighted total area and production, respectively, of a specific crop in the i[th] EA and h[th]

Stratum.

$\hat{A}_{hij}, \hat{P}_{hij}$ are weighted values of area and production, respectively, from j[th] agricultural household in the

i[th] EA and h[th] stratum under a specific crop.

Since all strata are independent, the total variance at regional and country level is computed by aggregating the result obtained at Zone/Special Wereda level, i.e.

$$Var(\hat{A}) = \sum_{h}^{L} Var(\hat{A}_h), Var(\hat{P}) = \sum_{h}^{L} Var(\hat{P}_h)$$

Where, L is the number of strata (Zone/Special Wereda).

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 simplifies the estimation procedure.

5. Coefficient of Variation (CV) of Estimates:

Coefficient of Variation (CV) in percentage of estimate of stratum total of area and production for a specific crop are given by:

$$CV(\hat{A}_h) = \frac{\sqrt{Var(\hat{A}_h)}}{\hat{A}_h} * 100, CV(\hat{P}_h) = \frac{\sqrt{Var(\hat{P}_h)}}{\hat{P}_h} * 100,$$

6. Ninety-five percent confidence interval (CI) of stratum total of area:

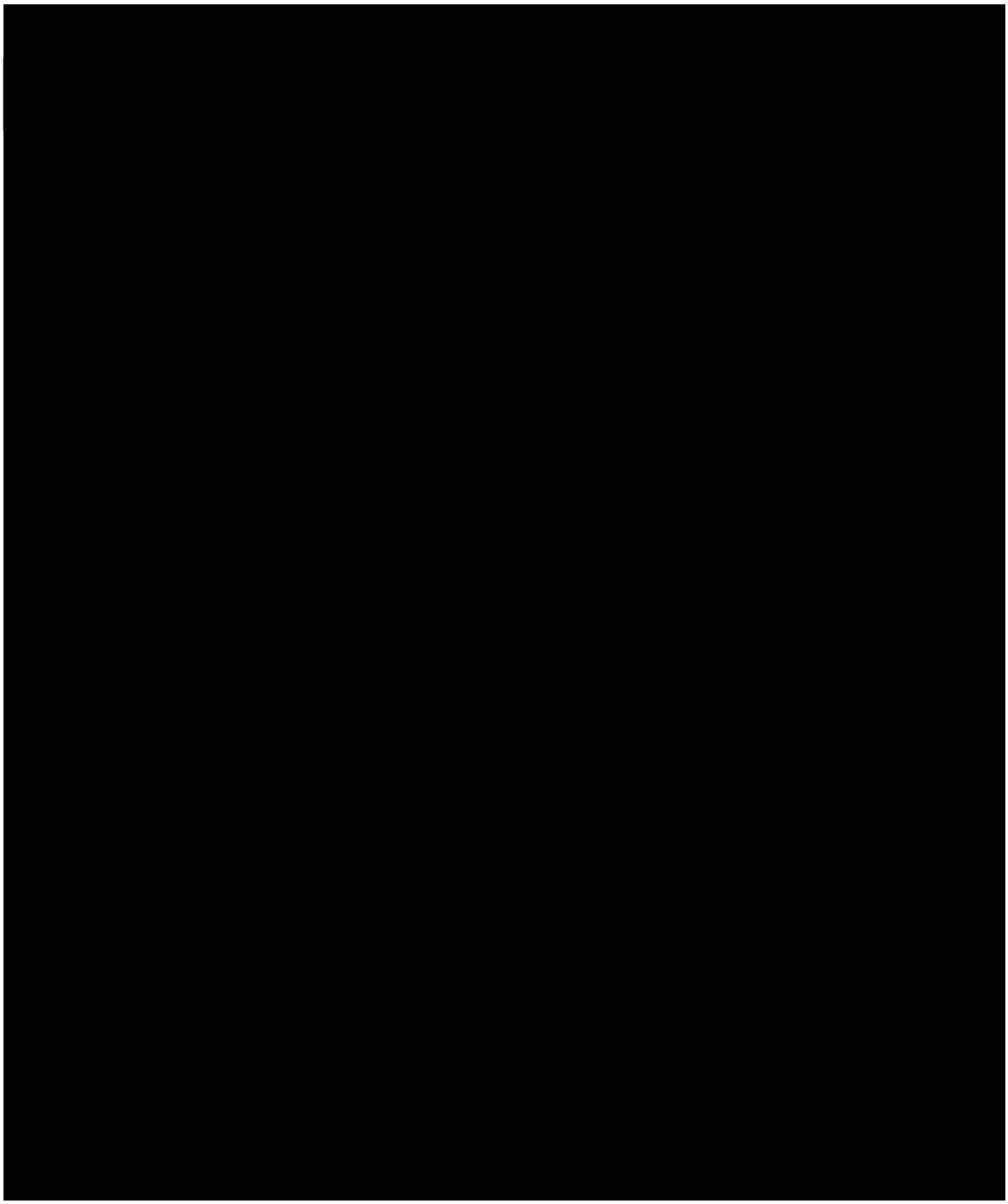
$$\hat{A}_h \pm 1.96 * SE(\hat{A}_h) \quad ,$$

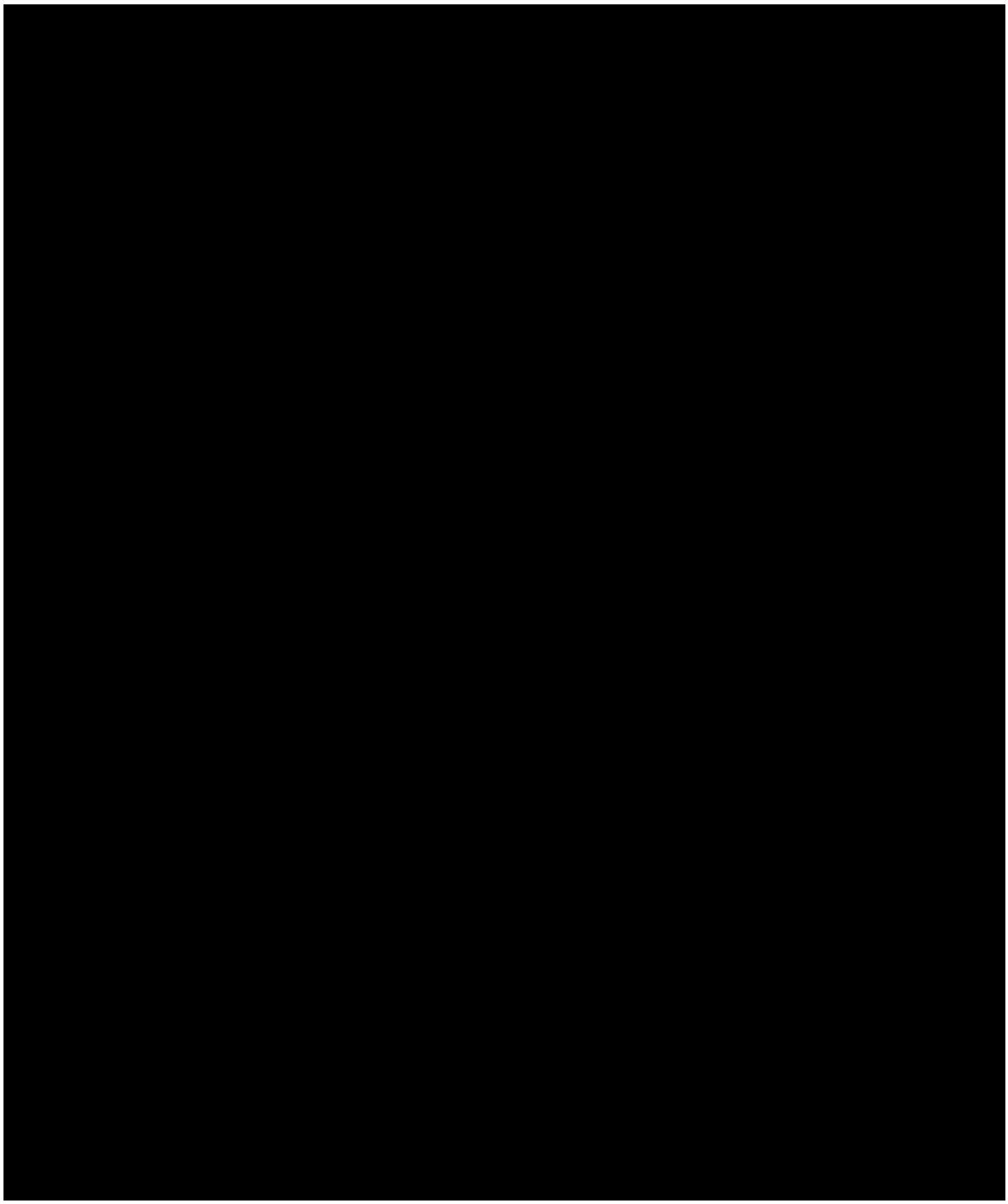
Where $SE(\hat{A}_h) = \sqrt{Var(\hat{A}_h)}$ is standard error of the estimate of the stratum total of area.

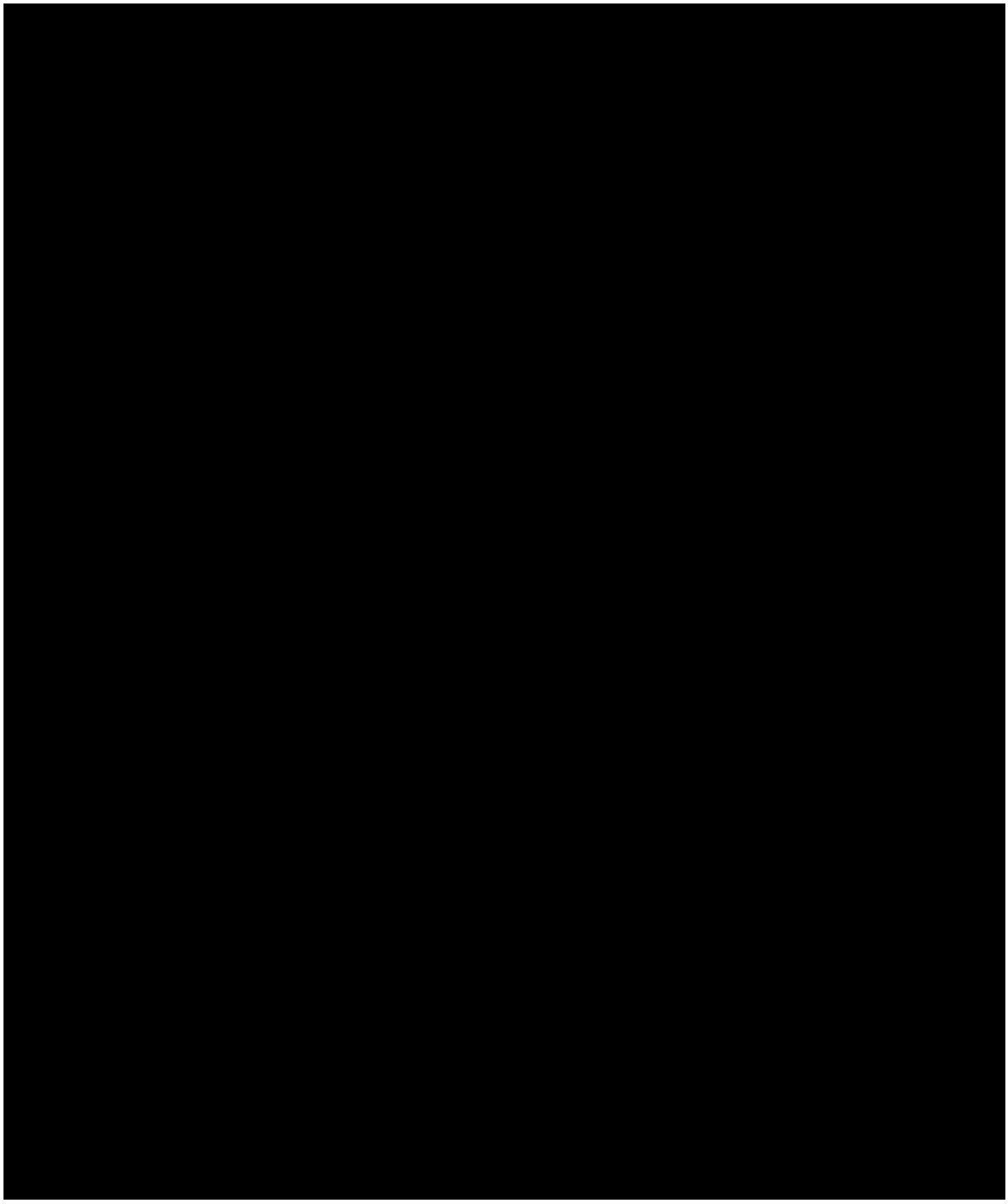
Estimates of standard error and confidence interval for the other estimates can also be calculated by adopting the above formulas.

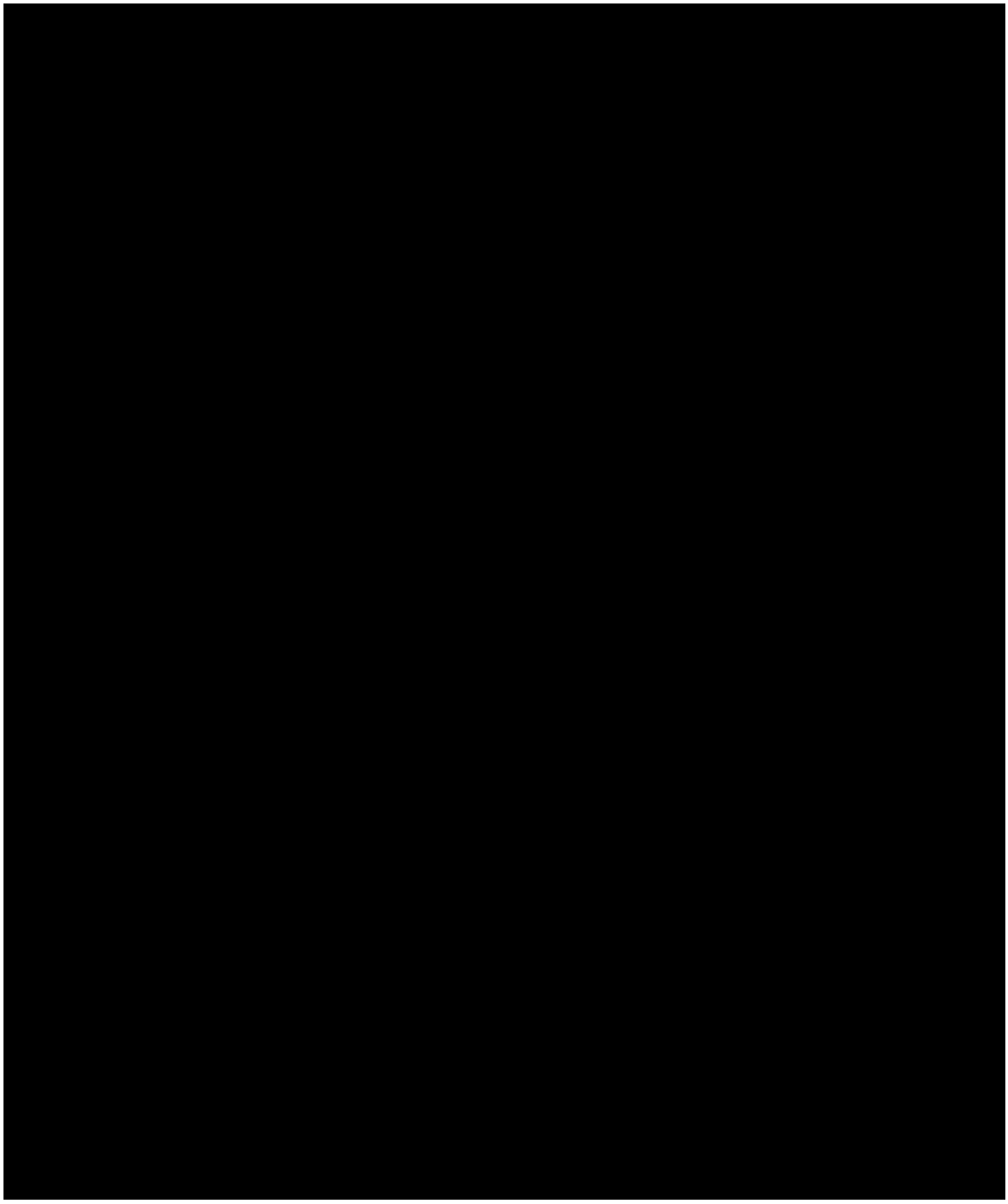
Appendix II

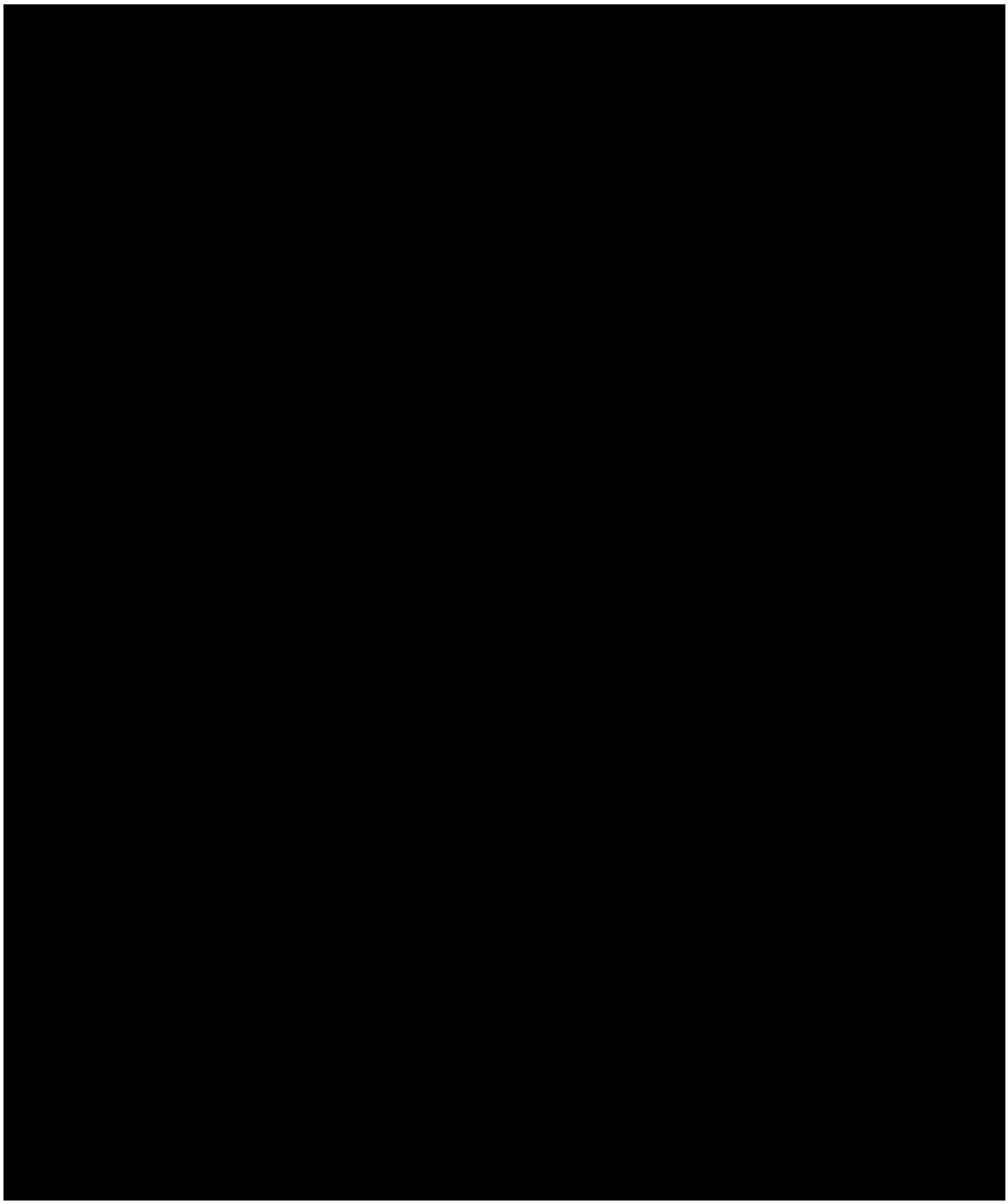
Standard Errors and Coefficient of Variation for Area and Expected Production

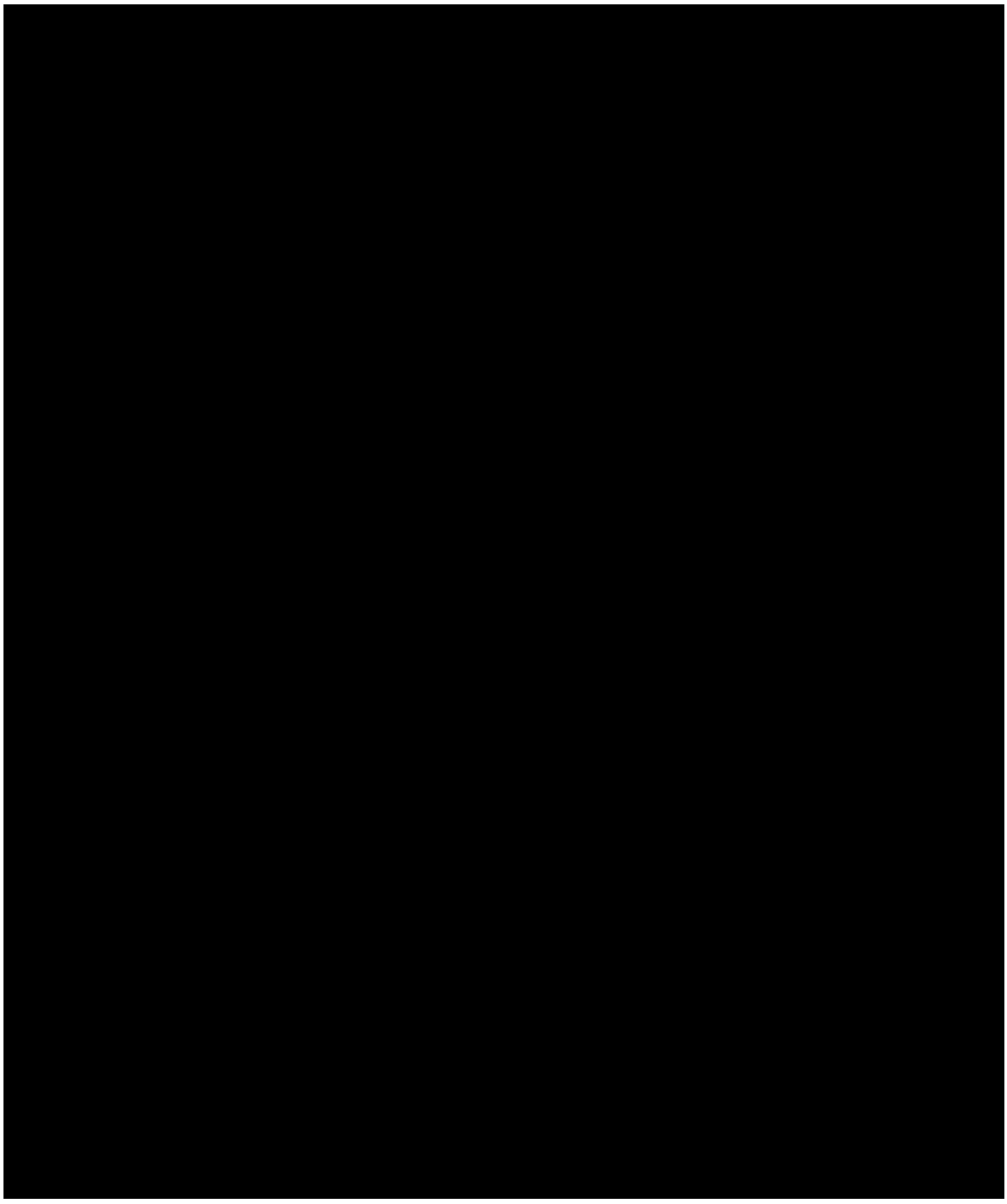


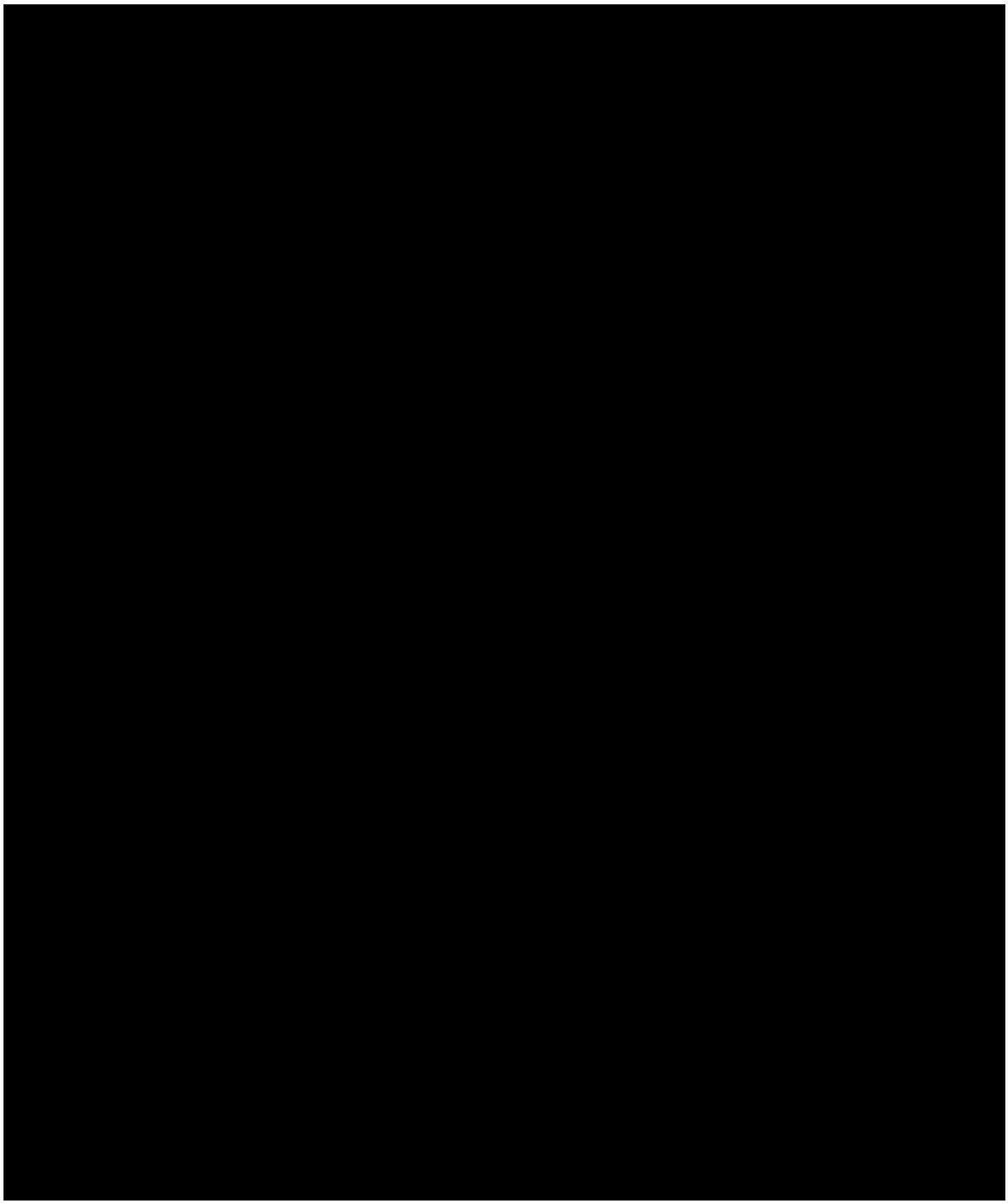


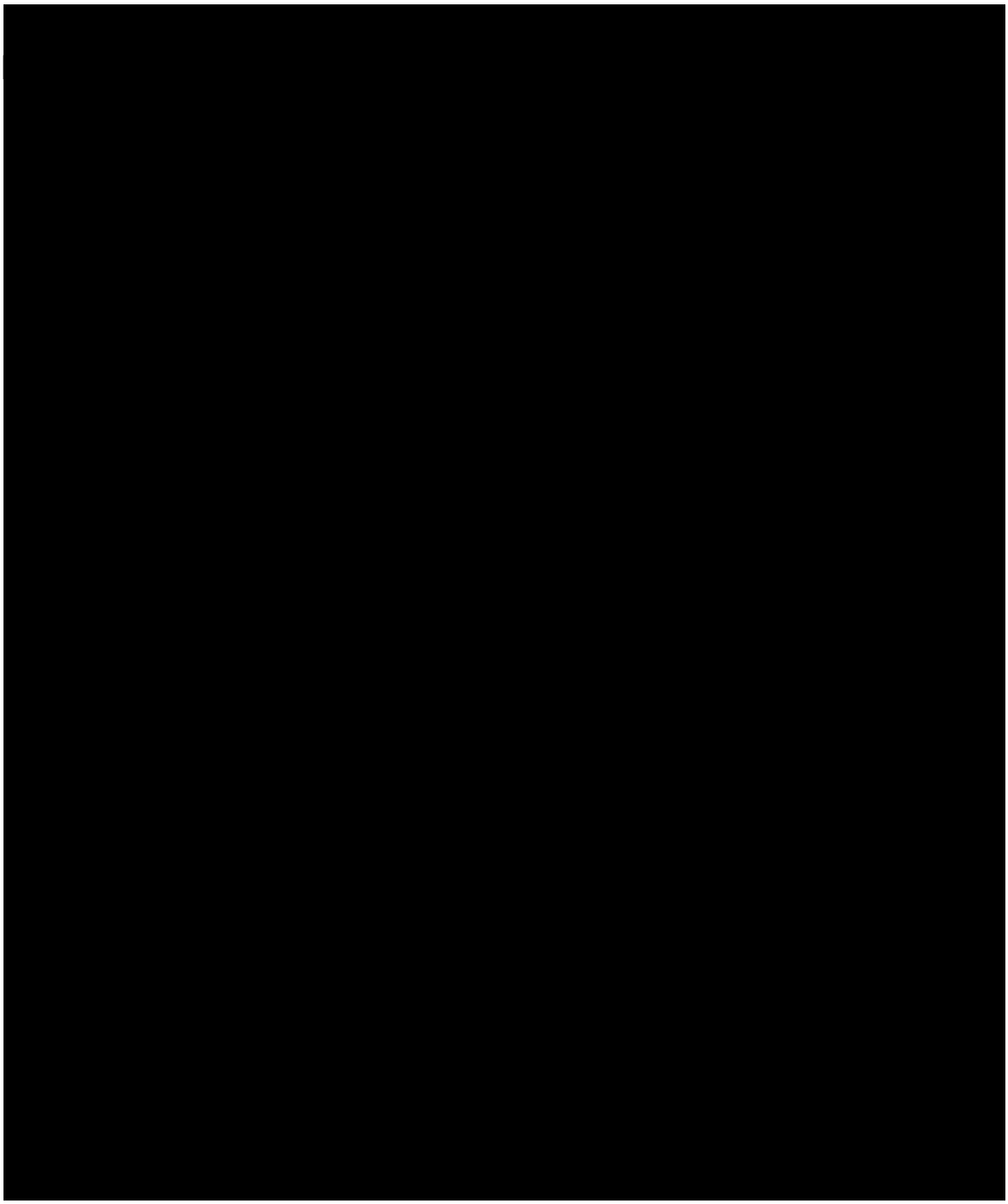


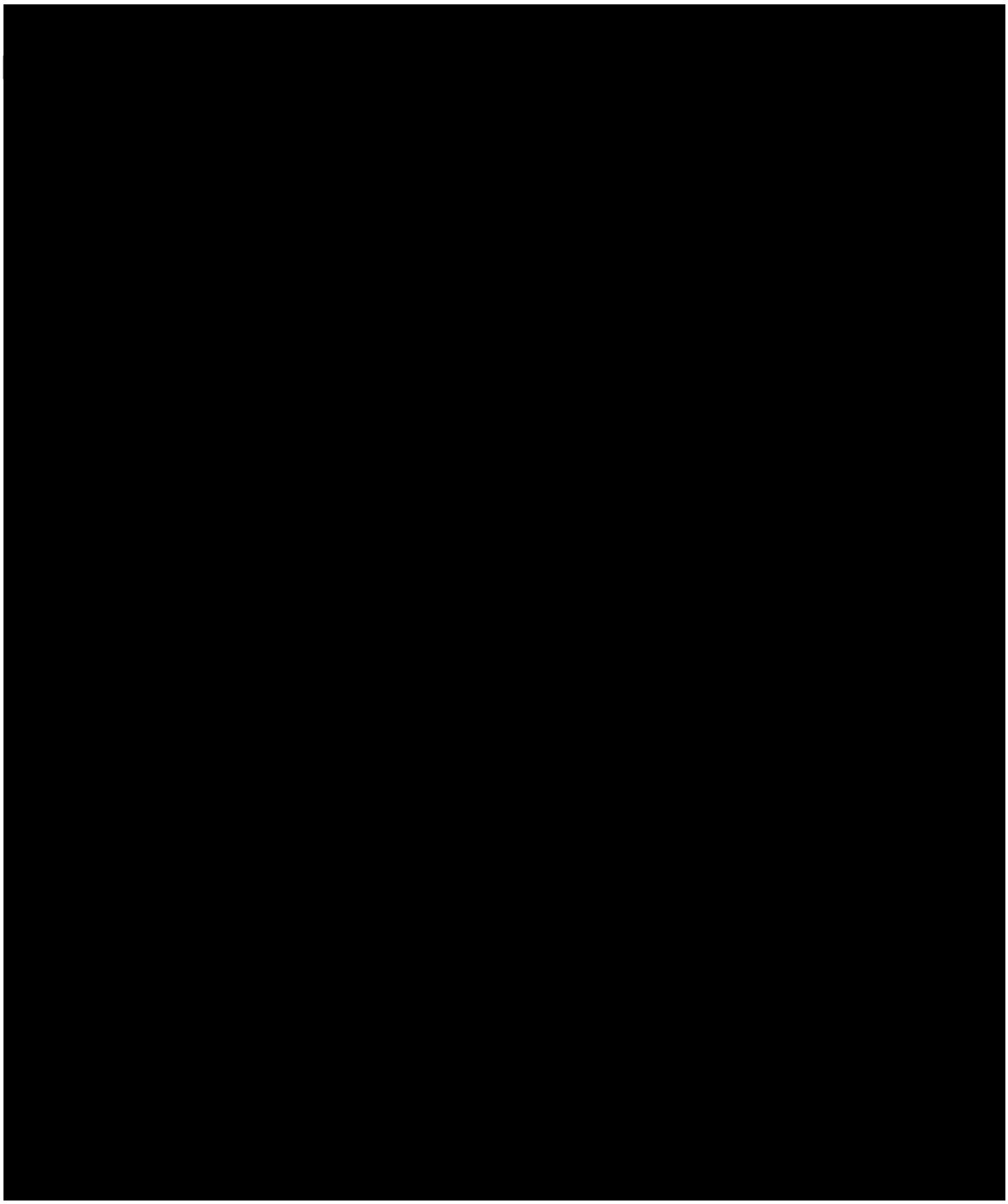


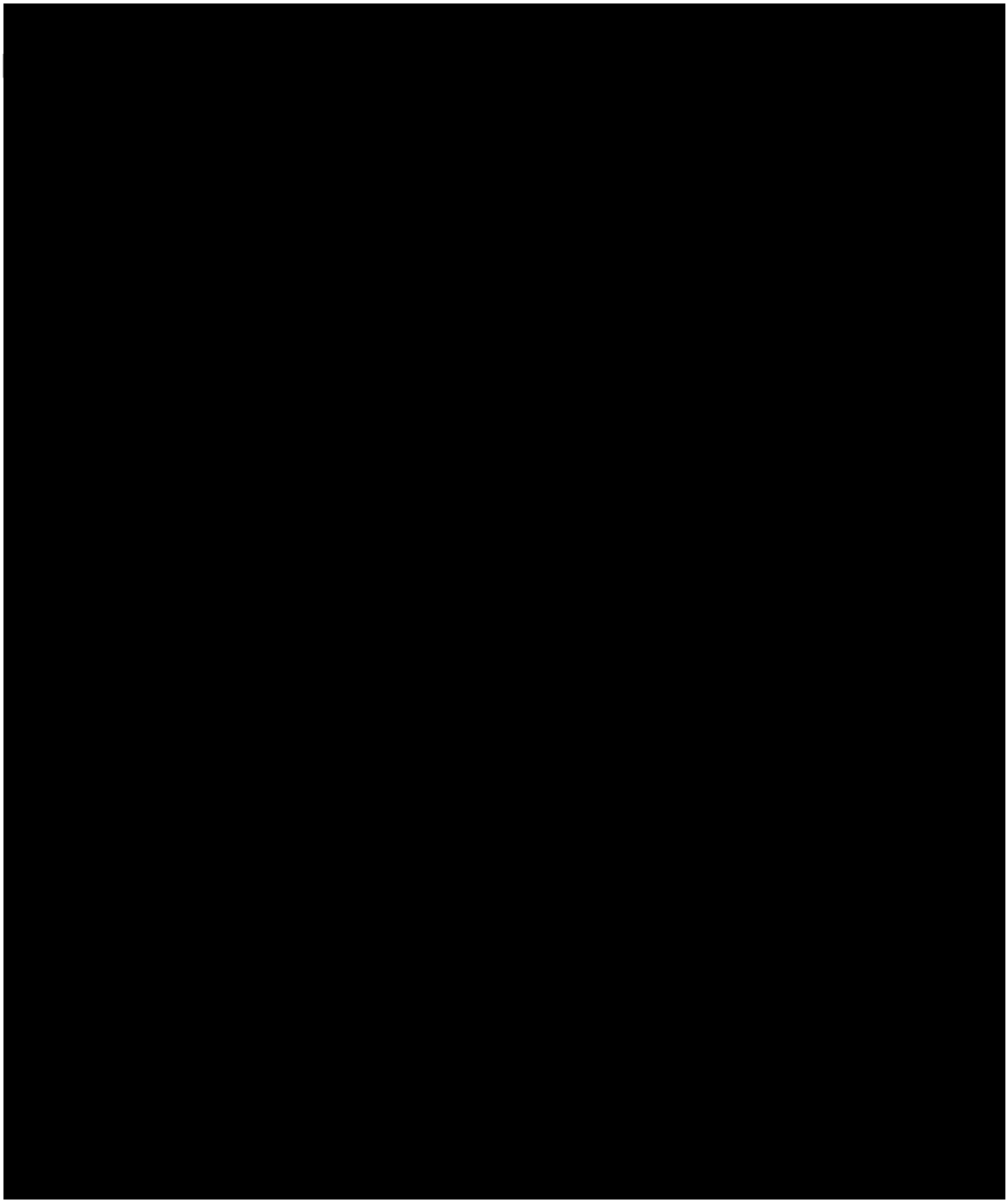


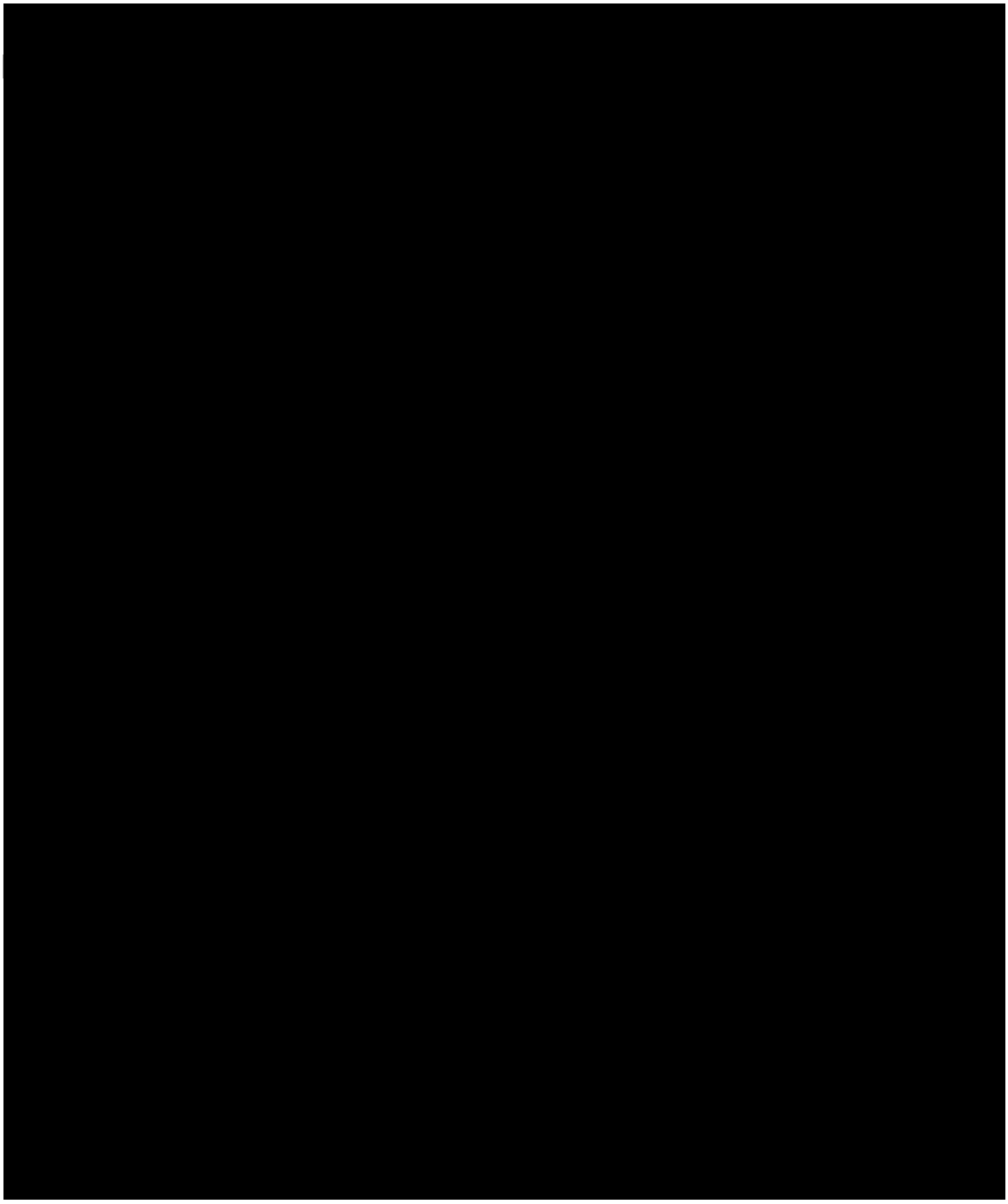












Appendix III

Questionnaires

Form AgSS 2005/8

CENTRAL STATISTICAL AUTHORITY
ETHIOPIAN AGRICULTURAL SAMPLE SURVEY 2012/2013 (2005 E.C)

PART I – IDENTIFICATION PARTICULARS

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Region	Zone	Were da	PA / REST .AR	EA LO CA L	HH ID	HH HEAD SEX 1=M 2=F	HOLD ER ID	HOLDER'S NAME	AGE	SEX M=1 F=2	HIGHES T GRADE COMPL ETED	HOLDE R'S HH SIZE	FARMIN G TYPE CROP=1 LIVEST =2 BOTH=3

PART II – CROP FIELD / OTHER LAND USE

15		16	17					
			PARCEL NO.		FIELD NO.			
			IS THE FIELD PURE STAND =1 MIXED CROP =2 OTHER LAND USE=3					
			CROP/OTHER NAME		CROP NAME		CROP NAME	
SER. NO.		QUESTIONS FOR THE HOLDER	CODE		CODE		CODE	
0	1	Ownership Own = 1 Rented in =2 Other =3						
0	2	Is field under Extension Program? Yes =1 No = 2						
0	3	Is Field Irrigated? Yes =1 No =2						
0	4	If Field Irrigated source of water. River =1 Lake =2 Pond =3 Harvested water =4 other =5						
0	5	Percent share of mixed crops						
0	6	Crop growing methods 1=by line 2=by broadcasting						
0	7	Seed / Seedling Type Improved Seed = 1 indigenous seed = 2						
0	8	*For Cereals, Pulses & Oilseeds only* Quantity of improved seeds used	Kilo	Gram	Kilo	Gram	Kilo	Gram
0	9	*For Cereals, Pulses & Oilseeds only* Price of improved seeds used	Birr	Cents	Birr	Cents	Birr	Cents
1	0	*For Cereals, Pulses & Oilseeds only* Quantity of indigenous seeds used	Kilo	Gram	Kilo	Gram	Kilo	Gram

1	1	Was crop damaged? Yes = 1 No =2									
1	2	If yes in question number 10, Cause of damage →									
		Code →									
1	3	Percent of damaged crop									
1	4	Prevention/precaution measure taken? Yes =1 No =2									
1	5	Type of measure if any? Chemical = 1 Non – chemical = 2 Both = 3									
1	6	Chemical type used if any. Pesticide =1 herbicide =2 Fungicide =3 1&2 = 4 1 & 3 = 5 2 & 3 = 6 All = 7									
1	7	Is Fertilizer Used? Yes =1 No = 2									
1	8	Type of fertilizer used if any? Natural = 1 Chemical = 2 Both = 3									
1	9	If chemical fertilizer used 18.1 Type UREA = 1 DAP = 2 Both = 3									
		18.2 Quantity of chemical fertilizer used	Kilo						Gram		
2	0	If natural fertilizer used, type Manure = 1 Compost = 2 Organic = 3 1 &2 = 4 1&3 = 5 2 & 3 = 6 All = 7 others = 8									
2	1	Quantity of crop produced in standard/local measurement	Name	Code	Quantity	Name	code	Quantity	Name	Code	Quantity

PART 3A: RESULTS OF AREA MEASUREMENTS using GPS

18	19	20	21	22	23	24	25
GPS Accuracy during field measurement	Is the field measured? yes =1 No =2						
	Area of measured field		Is the field Flat =1 Partialy Sloppy = 2 Sloppy = 3	Code	If the field covered? None , 1 With plant / permanent crop = 2 With house = 3 Partially covered , 4 Others , 5	Code	Comments
	Area in square meters (Clockwise)	Area in square meters (Anti-Clockwise)					
Field measurement			*Date*		*Month*		

PART 3B : RESULTS OF AREA MEASUREMENTS USING COMPASS-ROPE

18	19	20	21	22	23	24	25	26
Is the field measured? Yes =1 No = 2 Code								
Side	1 - 2	2 - 3	3 -	4 -	5 -	6 -	7 -	8 -
Bearing (0)								
Length								
Side	9 -	10 -	11 -	12 -	13 -	14 -	15 -	16 -
Bearing(0)								
Length								
Side	17 -	18 -	19 -	20 -	21 -	22 -	23 -	24 -
Bearing (0)								
Length								
Side	25 -	26 -	27 -	28 -	29 -	30 -	31 -	32 -
Bearing (0)								
Length								
Field Measurement	date	month	**Closure error**		Area in square meters			

	Name	Signature	Date
Data collector			
Field Supervisor			