Bean Quality Attributes of Arabica Coffees Grown in Ethiopia and the Potential for Discovering New Specialty Coffees

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Abstract: Coffee beans with unique flavour profiles that are produced in special geographical microclimates are known as specialty coffees. Specialty coffees have high niche markets and fetch premium prices. Bean quality attributes of coffees produced in Ethiopia are often determined based on results of green coffee bean assessment done on arrivals in the central market by Ethiopian Commodity Exchange (ECX) Company. This research was, therefore, conducted with the objective of studying bean quality attributes of coffees originating from distinct major and minor coffee growing regions in Ethiopia and to explore the potential for finding new specialty coffees using the methods employed by the Ethiopian Commodity Exchange (ECX) company and those employed by Efico (Belgian coffee company). Seventy coffee bean samples were collected from 24 locations representing four traditional coffee producing regions in Ethiopia (south-western, southern, western, and eastern regions) and one newly emerging (north-western) region. Red coffee cherries were collected by handpicking. The green coffee beans were sun-dried, hulled, and subjected to sensory evaluation using the aforementioned methods. The results revealed that location did not have significant effects on all coffee quality attributes (cup cleanness, acidity, body, flavour, total point, preliminary grade, aroma, aftertaste, balance, perfumed, and overall attributes) except hundred bean weight and bean moisture content. The preliminary quality attributes for the unwashed coffee samples indicated that more than 65% of the samples attained the grade point 2. Most of the specialty coffee quality attributes attained high score points for all regions. Thus, based on the cup quality test done by Efico, about 75.7% of the samples fitted specialty grade 1, 18.6% fitted specialty grade 2 (premium grade), and 5.7% fitted specialty grade 3 (commercial grade). Furthermore, based on this test, four additional specialty coffees, namely, Kabo, Kossa, Gore, and Anfilo were identified. However, based on the cup quality test done by Ethiopian Commodity Exchange (ECX) company, only 7% of the samples fitted specialty grade 1, 40.1% specialty grade 2, and the remaining 48.6% fitted specialty grade 3 (commercial grade). In conclusion, the study revealed that almost all coffee beans originating from the distinct coffee growing geographical regions in the country have comparably superior bean quality attributes, with about 3/4th of the samples falling in the category of the specialty grade, and there is high potential to discover new specialty coffees in the regions using the Efico method rather than the ECX method.

Keywords: Coffee origins; Coffee industry; Commercial grade; Cup quality test; Efico; Ethiopian Commodity Exchange (ECX); Specialty grade.

1. Introduction

A number of countries have expanded their coffee production and export volumes. Newly emerging coffee-producing countries have become strong competitors in the world coffee market. Thus, it does not seem feasible for developing countries like Ethiopia to overcome coffee marketing challenges and threats in the world only through expansion of production. Supplying high quality specialty coffees could be a viable option to persist in the competitive and fluctuating world coffee market for Ethiopia (Behailu *et al*., 2008).

Coffee market distinguishes exemplary, premium, and mainstream categories. Although between 80% and 90% of the coffee consumed worldwide is a mainstream quality, there are many other coffees, often of limited availability, with greatly varying taste characteristics that appeal to different groups of consumers, and are sold at a premium over the mainstream coffees (Donnet and Weatherspoon, 2006). Therefore, quality and availability determine whether a coffee can find a niche market under the influence of the international trade. The potential for specialty coffee consumption appears to be almost limitless. In fact, no more than 5% of green coffees could make specialty grade (ITC, 2011).

Arabica coffee, which originated in Ethiopia, has a long and well established root for which the country is most known for its tradition. In Ethiopia, more than 6000 Arabica coffee accessions have been collected and preserved by research centres, out of which 37 have been released (Taye, 2012). Recently, coffee research and development has been designed as a coffee growing area-based strategy with the initiative of multiplying and distributing specialty coffee varieties in their respective locality. Moreover, coffee quality testing and grading has been decentralized to keep up with growing area-specific traits. A study made in Ethiopia revealed significant

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variations due to location, genotype, and processing methods for most coffee quality traits, in which the overall quality was improved in a descending order of washed, semi-washed, and sun-dried coffees. Quality expression of genotypes was also found to be location-specific (Mekonen, 2009).

Ethiopia has already a number of specialty coffees with their own appellations such as Yirgachaffe Coffee, Harar Coffee, and Sidama coffee. However, the country is facing stiff competitions in the international market from increasing numbers of specialty coffees being discovered and produced in other countries (Dessie, 2008). Fortunately, Ethiopia possesses favourable agro-ecologies and microclimate to produce unique coffee types (Dessie, 2008). However, this potential has not yet been exploited to a desired level since little work has been done to identify and label specialty coffees in the main coffee growing regions of the country. Therefore, the country needs to explore and identify new specialty coffees rigorously to sustain and develop its coffee industry and foreign exchange earnings.

The information on the quality of coffee in Ethiopia is mostly based on assessment of green coffee beans on arrivals in the central market by Ethiopian Commodity Exchange (ECX) Company. Thus, systematic and rigorous tests on the profile of Ethiopian Arabica coffee quality attributes associated with origins of the coffees have not yet been done. Thus, the objective of this research was to determine the profile of Ethiopian Arabica coffee quality attributes based on origin by using both ECX methods and the methods employed by Efico (Belgian coffee company), and to identify specialty coffees. The study was also intended to compare the rigour of the two methods in discerning coffee bean quality attributes.

2. Materials and Methods

2.1. Site Selection and Sample Preparation

The study regions included the major coffee growing areas stretching between 30^0 30' to 14^0 55' North latitude and 330 to 48^0 East longitude (Figure 1. and Table 1). The regions and locations in the regions were purposely selected considering the natural barriers and/or spatial location and agro climatic situation. Twenty-four coffee farms (Table 2) were selected from South-western (n = 33); Western (n = 9); Southern (n = 3); North-western (n = 12); and Eastern (n = 13) regions. Coded samples of green coffee beans with moisture contents ranging between 8.8 - 10% were used as an experimental material. A total of 70 coffee bean samples from the five regions were obtained by the dry or unwashed coffee processing method viz. red ripe cherries were handpicked, sun dried, and hulled. The coffee samples were carefully prepared and handed over to Ethiopian Commodity Exchange (ECX) (100 g), Jimma Centre and Efico (50g) in Belgium. A panel of 3-4 trained cuppers evaluated the coffee quality attributes in each case.

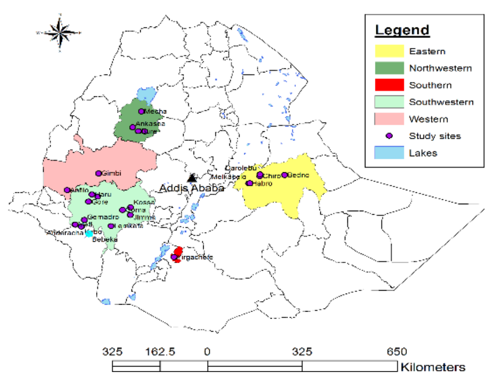

Figure 1. Map of coffee growing regions in Ethiopia from where the green coffee bean samples were collected.

Table 1. Mean annual weather data and altitudinal range of the geographical regions.

Geographical Regions (Locations)	Climatic Factors					Altitude range (m a.s.l.)
	RF (mm)	MAX (^{0}C)	MIN (^{0}C)	RH (%)	Sunshine (HRS/day)	
Eastern (26 yrs)	643.7	27.8	12.8	NA	NA	1874 - 2266
North-western (23 yrs)	1140.5	NA	NA	NA	NA	1774 - 2000
Southern (30 yrs)	1345.7	26.6	11.7	69	5.7	2091
South-western (30 yrs)	1564.9	26.1	13.2	73.3	5.4	1150 - 1820
Western (28 yrs)	1385.2	25.6	13.9	70.5	6.5	1800 - 1907

Note: NMSA = National Meteorological Services Agency; NA = data not available; RF mm = rainfall in mm; MAX (^{0}C) = maximum temperature; MIN (^{0}C) = Minimum temperature; RH (%) = Relative humidity; HRS = hours; m a.s.l. = metres above sea level.
Source: NMSA, Ethiopia (2010).

Table 2. Origins of unwashed green coffee bean samples in Ethiopia.

Farm	N=70	Location	Adm. Region	Adm. Zone	Latitude	Longitude
Bebeka	3	Southwest	SNNP	Benchmaji	6.99442	35.5684
Anderacha	3	Southwest	SNNP	Godere	7.23987	35.3169
Kabo	3	Southwest	SNNP	Godere	7.24124	35.3197
Meti	3	Southwest	SNNP	Godere	7.32297	35.1288
Gemadro	3	Southwest	SNNP	Sheka	7.48639	35.4131
Lemkefa	3	Southwest	SNNP	Kafa	7.27274	36.2427
Jimma	3	Southwest	Oromia	Jimma	7.67884	36.8385
Kossa	3	Southwest	Oromia	Jimma	7.95452	36.8468
Goma	3	Southwest	Oromia	Jimma	7.85752	36.5885
Yayo	3	Southwest	Oromia	Illuababora	8.33601	35.8226
Gore	3	Southwest	Oromia	Illuababora	8.14905	35.5369
Gimbi	3	West	Oromia	West Wollega	9.17125	35.8359
Haru	3	West	Oromia	West Wollega	8.40717	35.6396
Anfilo	3	West	Oromia	Kelem Wollega	8.55386	34.8651
Yirgachaffe	3	South	SNNP	Gedeo	6.15848	38.1958
Jabi	3	Northwest	Amhara	West Gojam	10.6918	37.2665
Bure	3	Northwest	Amhara	West Gojam	10.7003	37.0668
Ankasha	3	Northwest	Amhara	West Gojam	10.8436	36.8914
Mecha	3	Northwest	Amhara	West Gojam	11.417	37.1557
Chiro	2	East	Oromia	West Hararghe	9.06989	40.8646
Habro	3	East	Oromia	West Hararghe	8.81697	40.5167
Darolabu	3	East	Oromia	West Hararghe	9.14549	40.8691
Malkaballo	2	East	Oromia	East Hararghe	8.82672	40.5499
Badano	3	East	Oromia	East Hararghe	9.11447	41.6335

Note: Adm. = Administrative.

2.2. Laboratory Analysis and Procedures

According to the Specialty Coffee Association of America (SCAA, 2009) protocol the raw and cup quality analyses were conducted and evaluated on 40% and 60%, respectively.

2.2.1. Raw quality analysis

A green coffee bean sample weighing 100 g was used for the raw evaluation test before roasting, and primary and secondary defects, shape and make, colour, and odour of the coffee samples were assessed according to the procedure developed by Ethiopian standard, and based on the green coffee reference chart (QSAE 4257, 2000). The evaluation scores for the tested unwashed coffee are shown in Table 7. The weight of 100 beans (HBW) for each sample was measured using a sensitive balance. Moisture content (MC%) of the green coffee beans was determined with SINAR AP 6060 coffee moisture analyzer, UK.

2.2.2. Roasting and brew preparation

Batch roaster equipped with a cooling system, in which air was forced through a perforated plate, capable of roasting up to 500 g of green coffee beans, was used for roasting the coffee beans. A 100 g of bean was used for each sample and the beans were carefully roasted at the temperature of 170 - 200 ^{0}C to a medium brown roast colour (7 – 8 minutes).

The roasted beans were ground to a medium level using the Guatemala SB coffee grinder. Then, the powder was brewed. The water used for brewing contained 0.3 mmol to 1.2 mmol of calcium carbonate ($CaCO_3$), which was free from chlorine or other foreign flavour affecting factors. Using the preheating graduating cylinder, 150 ml of boiled water (93 ^{0}C) was poured into a cup containing 12 g roasted coffee powder and the infusion was allowed to steep for approximately 4 minutes to settle. The cup was then evaluated for its aroma and the surface of the beverage skimmed off to remove foams after which the beverage was cooled down up to a comfortable temperature (55 ^{0}C) for tasting (ISO, 1991).

2.2.3. Cup quality analysis

Coffee bean samples were evaluated for all cup quality attributes and summed up to 60 out of 100%. A panel of trained, experienced and internationally certified (Q graders) cuppers took 6 to 8 cc of the brew from 5 cups using soupspoons and forcefully slurped it to spread evenly over the entire surface of the tongue and palate and then expectorated on to the spittoon. Cup cleanness, acidity, body, and flavour were evaluated in accordance with the standard method (ECX, 2009). The results are shown in Table 9. Finally, the preliminary grade assessment was made based on the scores of the raw and cup quality analyses.

With regard to specialty assessment by Efico, aroma, acidity, flavour, body, aftertaste, and balance attributes were evaluated. Then, the overall score was calculated as an average of the six attributes. Aftertaste has a preference rating on a scale of 1 to 10, ranging from "Very Poor" to "Outstanding." Flavour receives a preference rating on a scale of 1 to 10, ranging from "very poor" to "outstanding." Cuppers' Points (balance) are a critically important preference rating and are awarded on a scale of -5 to +5, in a range from "very poor" to "outstanding." Cuppers rank acidity according to its intensity, which ranges from 1 – "very flat," to 3 – "very soft," to 5 – "slight sharp," to 7 – "very sharp," to 10 – "very bright." Body is given an intensity ranking on a scale of 1 to 10, ranging from 2 – "Thin," to 4 – "light," to 6 – "full", to 9 – "heavy. "Fragrance/aroma is a preference rating, and ranges from Zero (not rated) to 10, and Plus 1 to Plus 5 means "very poor" to "average; " Plus 6 to Plus 10 means "good" to "outstanding" (Marsh and De Laak, 2006; SCAA, 2009).

2.3. Data Analysis

A one-way analysis of variance was conducted using SPSS 16 v2 software. Moreover, covariance analysis was done to distinguish percentage contribution of predictors to the variation in coffee quality attributes. In addition, the frequency distribution of coffee quality attributes with respect to score points was done.

3. Results

3.1. Hundred Seed Weight and Moisture Content

Locations did not have a significant influence on all coffee quality attributes except hundred bean weight (HBW). Coffee beans originating from the eastern region had significantly ($P < 0.001$) higher mean values of HBW than those from the north-western region. The hundred seed weights of coffee beans that originated from the other regions were all in statistical parity with the hundred seed weight of beans from both the eastern and north-western regions (Table 3).

The moisture content of coffee beans that originated from the north-western region was significantly higher than the one that originated from the southern region. However, the moisture contents of coffee beans from the other regions were all in statistical parity with the moisture content of bean obtained from both the north-western and southern regions (Table 4).

Table 3. Effect of growing region on preliminary coffee quality attributes (mean ± SE of the mean).

Location	N	HBW	Primary Defect	Secondary Defect	Odour	Acidity	Body	Flavour	Total Point	Preliminary Grade	Specialty	Cup Cleanness
South-western	33	15.8±0.3 [ab]	14.5±0.4	11.6±0.6	9.9±0.1	11.4±0.2	10.1±0.3	9.9±0.3	82.4±1.1	2.3±0.1	80.6±0.6	15±0.0
Western	9	15.8±0.4 [ab]	14.7±0.3	11.0±1.0	10.0±0.0	11.3±0.4	10.0±0.5	11.3±0.7	83.3±1.9	2.1±0.2	81.9±1.2	15±0.0
Southern	3	14.9±0.2 [ab]	15.0±0.0	15.0±0.0	10.0±0.0	12.0±0.0	10.0±1.0	10.0±1.0	87.0±2.0	1.7±0.3	80.5±2.0	15±0.0
North-western	12	14.1±0.2 [b]	14.8±0.3	11.1±1.2	9.7±0.2	11.0±0.4	9.8±0.4	10.5±0.5	81.8±1.1	2.3±0.1	80.0±0.6	15±0.0
Eastern	13	16.8±0.5 [a]	15.0±0.0	13.2±0.8	10.0±0.0	11.1±0.4	10.4±0.4	10.2±0.6	84.8±1.5	2.0±0.2	79.6±1.6	15±0.0
P		< 0.001	0.923	0.229	0.228	0.755	0.879	0.320	0.433	0.435	0.729	1
SD		1.6	1.7	3.5	0.4	1.3	1.4	1.8	5.6	0.7	3.9	0.0
CV%		10.3	11.7	29.2	4.1	11.5	14.4	17.6	6.7	31.4	4.9	0.0

Note: Means followed by same letter (s) within a column are not significantly different (P> 0.05); SE = Standard Error; HBW = Hundred Bean Weight (g).

Table 4. Effect of growing region on specialty coffee quality attributes (Mean ± SE of the mean).

Location	N	MC	Aroma	Body	Acidity	Balance	Fruity	Perfumed	Flavour	Aftertaste	Overall
South-western	33	9.3±0.1 [ab]	5.5±0.2	5.5±0.2	6.3±0.2	5.5±0.2	4.8±0.3	4.3±0.3	4.5±0.3	5.2±0.2	5.2±0.2
Western	9	9.6±0.2 [ab]	5.8±0.2	5.6±0.2	6.2±0.2	5.8±0.1	5.9±0.6	5.1±0.4	5.3±0.4	5.8±0.3	5.7±0.3
Southern	3	8.8±0.1 [b]	5.7±1.3	5.7±0.9	5.5±0.8	5.3±1.2	6.3±1.8	5.7±2.3	5.7±1.9	6.2±1.6	5.8±1.4
North-western	12	10.0±0.3 [a]	6.3±0.3	6.3±0.2	6.8±0.2	6.2±0.2	5.1±0.8	5.5±0.5	6.0±0.4	6.3±0.3	6.1±0.2
Eastern	13	9.0±0.2 [ab]	5.9±0.2	6.1±0.2	6.6±0.3	5.9±0.2	6.0±0.3	5.2±0.3	5.2±0.3	5.7±0.3	5.8±0.2
P		0.009	0.185	0.059	0.369	0.144	0.219	0.180	0.068	0.154	0.092
SD		0.8	1.0	0.9	1.1	0.9	2.0	1.7	1.7	1.3	1.0
CV%		8.4	18.2	16.2	17.3	16.5	37.0	34.8	33.0	23.7	18.9

Note: Means followed by same letter (s) within a column are not significantly different (P= 0.05); SE = Standard Error; MC = Moisture Content (%).

3.2. Effect of Location to Specialty Coffee

The covariance analysis indicated that the effect of location on the variation in both preliminary and specialty coffee quality attributes was by far higher than the effect due to farms (Figures 2 and 3).

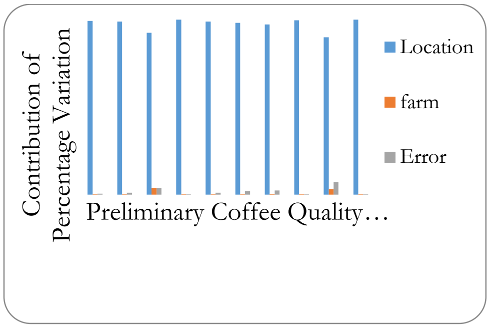

Figure 2. Percentage contribution of predictors for variation of preliminary coffee quality attributes; HBW = Hundred Bean Weight.

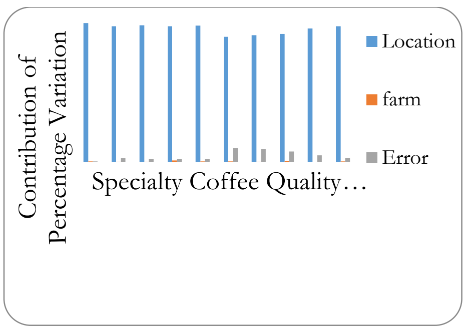

Figure 3. Percentage contribution of predictors for variation of specialty coffee quality attributes.

3.3. Distribution of Preliminary Quality Attributes

There were no differences among the coffee samples with respect to the cup-cleanness attribute. With respect to odour, 95.7% of the samples were invariably clean (10%) while 4.3%, were fairly clean. Samples could be grouped into two main categories based on acidity and body attributes (Figure 4). In both cases, the samples scored medium-pointed (75.5%) to medium (24.3%) for acidity, and medium-full (35.7%) to medium (64.3%) points for body. Moreover, 94.3% of the samples scored < 5 defects for the primary defect attribute while 4.3% and 1.4% scored 6% - 10% and 11% - 15% defects, respectively (Figure 4).

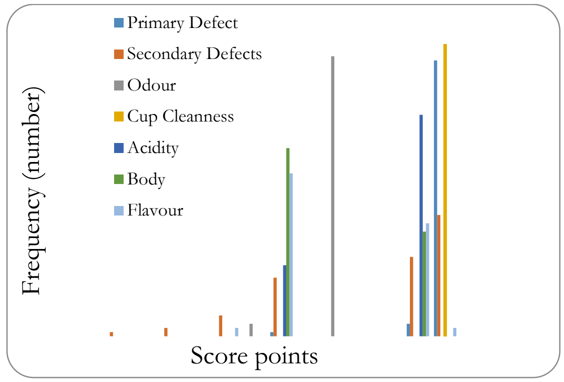

Figure 4. Distribution of preliminary quality attributes for unwashed coffee samples.

A distinction was made for the secondary defect weight attribute. With regard to this, 41.4% of the samples scored < 5% defects while 27.1% had < 10%. The remaining 20%, 7.1%, 2.9% and 1.4% of the samples scored <15%, <20%, <25% and >25% defect weights, respectively.

The most remarkable distinction was further observed based on the profile of flavour attribute in which micro-environmental factors may have played important roles. In this regard, it was noted that sub-farms (2.9%) of Anfilo and Kossa were sorted out with a score point of good while the remaining 38.6% of the samples had the score of fairly-good, 55.7% had average, and 2.9% had fair scores (Appendix Table 33). The distribution of the score values of preliminary quality attributes for the unwashed coffee samples indicated that 10% of the observed samples scored a preliminary grade of 1 while 65.8%, 21.4%, 1.4%, and 1.4% scored preliminary grade points of 2, 3, 4 and 5, respectively (Table 5). The distribution of the samples with respect to the preliminary grade assessment showed that one unit farm each at Kossa, Gore, Anfilo, Yirgachaffe, Chiro, Malkaballo, and Badano scored the grade 1 point. Farms including Meti, Gemadro (2 sub-farms), Lemkefa, Goma, Kossa, Gimbi (2 sub-farms), Bure (2 sub-farms), Mecha, Darolabu, Malkabelo, Bedeno and Ankasha scored grade 3 while the remaining samples from farms, namely, Bebeka, Anderacha, Kabo, Meti, Gemadro, Jimma, Kossa, Goma, Yayo, Gore, Gimbi, Haru, Anfilo, Yirgachaffe, Jabi, Bure, Ankasha, Mecha, Chiro, Habro, Darolabu and Badano scored the grade point of 2. The least preliminary grade was observed for coffee originating from Lemkefa, a semi-forest coffee farm. Re-evaluation for specialty by ECX gave 47.1% of the samples their Q1 and Q2 grades (Table 6).

Table 5. Preliminary grade distribution of unwashed coffee samples.

Grade	Score points	Frequency	Percent
1	91-100	7	10
2	81-90	46	65.8
3	71-80	15	21.4
4	63-70	1	1.4
5	58-62	1	1.4
6	50-57		
7	40-49		
8	31-39		
9	20-30		
UG	15 -19		
Total		70	100
SD		0.69	

SD = Standard deviation.

Table 6. Specialty grade (by ECX) distribution of unwashed coffee samples.

Grade	Frequency	Percent
Q1	5	7
Q2	28	40.1
Commercial 3	34	48.6
Valid	67	95.7
Missing system	3	4.3
Total	70	100
SD	3.904	

SD = Standard deviation.

3.4. Distribution of Specialty Quality Attributes

From the specialty cupping analysis point of view by Efico, all samples fitted the grade of 1 through 3 out of which 75.7% of the samples scored class 1 (specialty grade) while 18.6% and 5.7% scored class 2 (premium grade) and class 3 (commercial) grade, respectively (Table 7).

Table 7. Specialty grade (by Efico) distribution of unwashed coffee samples.

Specialty grade	Frequency	Percent
1 (Specialty)	53	75.7
2 (Premium)	13	18.6
3 (Commercial)	4	5.7
4 (Below standard)	0	0
5 (Off-grade)	0	0
Total	70	100

Scoring by Efico indicated that 37.1% of the samples were below "good" for both aroma and body attributes (Figure 5). Coffee quality attributes, namely, acidity, balance, fruity, perfumed, flavour, and aftertaste contributed to 15.7%, 38.6%, 46.2%, 63%, 50% and 41.5% of the samples, respectively to score below "good" rating. Although "perfumed" and "flavour" attributes of most of the samples contributed to scores below "good" rating, most samples performed better with respect to "aroma", "body", "acidity", "balance", "fruity" and "aftertaste" quality attributes and hence were rated from "good' to "outstanding", which ultimately resulted in 94.3% of the samples attaining the specialty grades 1 and 2. In this regard, about 10% of the samples scored values less than 4 for aroma whereas about 10% scored values less than 5% rating while the 40% scored about 6% points for body. About 5.7% of the samples hade values less than 4 for acidity, and balance. With respect to flavour, about 50% of the samples showed poor rating (< 6%), while about 41.4% showed poor aftertaste (< 5%). Coffee samples from about 47.1% of the origins were fruity in their taste (< 5%), and about 58.6% of the origins were poorly perfumed (< 5%).

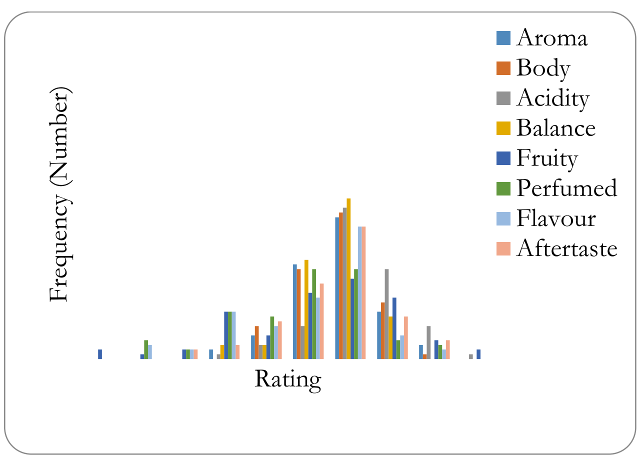

Figure 5. Distribution of specialty attribute of unwashed coffee samples.

As shown on Table 8 below, the trend for preliminary total points and grade scores showed increasing improvement from north-western to south-western to western to eastern to southern region. However, the trend for specialty (overall attribute) was improved from south-western to western to southern to eastern to north-western region.

Table 8. Trend for coffee quality by growing regions.

Location	Overall specialty attribute (Efico)	Preliminary total point (ECX)	preliminary grade (ECX)
North-western	6.1	81.8	2.3
South-western	5.2	82.4	2.3
Western	5.7	83.3	2.1
Eastern	5.8	84.8	2.0
Southern	5.8	87.0	1.7

4. Discussion

The differences observed in hundred bean weight among the locations could be due to differences in metabolism (physiology) of the coffee fruit development under the influence of moisture and temperature, which could be controlled by management, altitude, and soil moisture. That the highest bean weight was recorded for coffees originating from the eastern region could be ascribed to low temperature at the higher altitudes, which enhances slower fruit growth and better physiological maturity of the beans. This suggestion is consistent with that of Wrigley (1988) that the ultimate bean size is determined in the period of rapid fruit expansion following the pinhead stage and reflects the availability of soil moisture at this time. Similarly, Van der Vossen (1985) stressed that high altitudes are critical for the successful production of high quality Arabica coffees in equatorial regions. Lower temperatures, and their longer daily amplitudes, tend to induce slower growth and more uniform ripening of the berries, thereby producing larger and denser beans. Temperature reduces by 1^0C for every 180 metres above sea level increment in altitude (Coste, 1992). A study by Srirat *et al.* (2007) at Agro-industry Kasetsart University indicated that uniform bean maturity enhances bean quality. Bean size and density is often correlated with aroma, flavour, and superior beverage quality. It is reported that the better quality of Arabica coffee at high altitudes is provided by the more intense UV radiation, which leads to the development of hard beans with more acidity in the taste (Alègre, 1959; Coste, 1992).

The variations in the green coffee bean moisture content could be attributed to the drying process, relative humidity of the drying site, and the warehouse used to store the coffee beans as well as physiological maturity of the bean. The moisture content of coffee beans is one factor to indicate that the coffee beans reached commercial standard quality (SCAA. 2009). The results revealed less variations in most of the preliminary and specialty coffee quality assessment scores among the locations and farms despite the variations in geography (climate, micro-environment, and soil), agronomic practices, genotypes, age of the coffee trees, and post-harvest management practices. Usually, coffee quality analyses are reported based on total points and grade scores not as statistical outputs. In this regard, subtle differences which might not have been captured in this study could likely cause considerable preferences by consumers for coffee taste. Observations at coffee auctions revealed that other factors not captured by the scoring protocols influenced the price of specialty coffees (Ferguson, 2006).

The findings of this study are inconsistent with the results of Mekonen (2009), who reported significant variations in the preliminary and specialty attributes of coffees originating from different locations in Ethiopia. The absence of variability in most of the coffee quality attributes are also partly in contrast to the report by Ferguson (2006) who stated the existence of natural variation in relation to differences in coffee varieties, soil, altitude and rainfall conditions, and cultivation and processing methods used by producers. However, concordant with the results of this study, Ferguson (2006) elaborated that coffee is a complex product with attributes that emerge from a combination of characteristics displaying a rich variability of individual types that cannot be totally decomposed. In accordance with this suggestion, Harar, Yirgachaffe, and Sidama brands have been already discriminated based on the distinctive characters (flavour and taste) of those origins (types), thereby inducing the international registration of these coffees to be recognised as property rights of Ethiopia. This has given the country the opportunity to get premium prices (Prodolliet, 2004; MoARD, 2008).

As a normal practice, coffees that got grade 1 to 3 in the preliminary assessment undergo a specialty assessment for cup quality to determine the potential of the coffees. Accordingly, the fact that the evaluation of 67 out of 70 unwashed coffee samples by the Ethiopian Commodity Exchange (ECX) for specialty showed only 7% of the samples fitting the specialty grade 1 (Q1), 40.1% the specialty grade 2 (Q2) and the remaining 48.6% fitting the commercial grade 3 leaves a lot to be desired, when compared with the high percentage of the coffee samples fitting the specialty grade category according to the evaluation done based on the methods of Efico. Thus, based on the results of the specialty grade evaluation, the perception by the exporter (ECX) (Ethiopia) and importer (Efico) (Belgium) showed distinctions in that Efico was able to separate 94% of the samples in specialty grades in contrast to the amount done by ECX for the same replicates of coffee samples, which amounted only to 47%. This means ECX has been underestimating the specialty coffee grades in the country, resulting in lower payment to the primary producer (farmers) and the country as well as inability to discover new specialty coffees in the country. This signifies that ECX should revise and re-invigorate its procedure of grading specialty coffees in the country.

5. Conclusion

The results of this study have demonstrated no significant variations in most of the preliminary and specialty coffee quality attribute scores among the locations. Furthermore, four more specialty coffees were identified, namely, Kabo, Kossa, Gore, and Anfilo. The results of the study have also revealed an enormous difference in the testing rigour between Efico and ECX methods. Thus, the Efico method identified that about 75.7% of the coffee bean samples fitted specialty grade 1, but only 18.6% fitted specialty grade 2 (premium grade), and 5.7% fitted specialty grade 3 (commercial grade). However, for the same coffee bean samples, the ECX method identified that only 7% of the samples fitted specialty grade 1, but as much as 40.1% fitted specialty grade 2, and as much as 48.6% fitted specialty grade 3 (commercial grade). This implies that the grading of Ethiopian coffee for premium prices as well as the potential of obtaining new specialty coffees could be improved by using better coffee cup quality testing methods such as that of Efico rather than the current possibly rudimentary and inferior ECX methods. Further studies involving multi-year and multi-location sampling and better coffee bean cup quality testing methods should be conducted for enhanced grading of coffee beans as well as to discover new specialty coffees, thereby boosting foreign exchange earnings and livelihoods of coffee farmers in the country.

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