

Assessment of the Distribution and Survival Rate of Speciality Coffee Seedlings in the Gedeo and Sidama Zones of the Southern Nations, Nationalities, and Peoples Regional State, Ethiopia

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Abstract: Coffee is one of the commercial crops grown in many countries including Ethiopia. It contributes for 60% of total GDP in the country. Eight specialty coffee varieties were distributed among farmers in Gedeo and Sidama zones. This study examines the status of these varieties managed by farmers on their field. Status was investigated against seedling survival rate and varietal uniformity with the objective of establishing specialty coffee seed source. A multistage sampling technique was applied from zonal to kebele levels of administration. Samples were taken purposively at zonal and Woreda levels. Since all Kebeles in the selected Woredas grow specialty coffee, random sampling of these units was done including specific farmer sites. Semi structured questionnaire was applied to generate quantitative data while field level observation and group discussions were conducted to elicit qualitative data. For data analysis, SPSS version 20 was used. Survival rates of the coffee seedlings were 93 and 94.5% for Gedeo and Sidama zones, respectively. Only 5.04% of the respondents planted the distributed seedlings between existing coffee varieties. Hence, 94.96% specialty coffee uniformity was achieved. Finally, it is concluded that nearly 95% of the coffee growers have met the target to serve as specialty coffee seed source in both zones. However, more studies are needed for precise judgment of the surveyed farmers as specialty coffee seed sources of a uniform variety.

Keywords: Specialty coffee, varieties, Gedeo, Sidama Zone.

INTRODUCTION

Coffee as a beverage and as a commodity has a thousand years old success story. It is presumed that eating or perhaps drying and making a tea like drink is still done in Yemen. This was the way coffee was first consumed as a beverage. But, the history of coffee actually begins in Ethiopia, where local people have been drinking it for many centuries (Wintgens, 2001).

Today, almost all coffee exporting countries consume coffee domestically and the world's annual production of coffee is roughly 9.9 billion tons (ICA, 2020). In Ethiopia for instance, well over 50% of the coffee grown is consumed domestically (Bart *et al.*, 2014). The way coffee is consumed is linked to preferences that vary. Different preferences require different product characteristics. The demand for high quality coffee with specific characteristics has led to the need for a diverse range of technologies, each of which is particularly suited to the supply of a product. This gave a momentum for the origination of specialty coffee. With particular characteristics, specialty coffee is produced under specific local condition. When thinking of specialty coffee, it is clearly not possible to envisage the equivalent of green revolution

technology where one basic technological package is used on millions of hectares to produce a standard product. (Thomas Oberthür *et al.*, 1977).

Ethiopia produces one of the best highland coffee varieties in the world and it is the major cash crop for the country. The country is a birthplace of coffee and the fourth-largest coffee producing country in the world. It is endowed with high genetic diversity and favorable ecological conditions that warrant sustainable production and supply of the finest quality coffee types (Taye *et al.*, 2016). It is almost exclusively of Arabica type, which is native to the country. It is ranked as the first Arabica coffee producer in Africa and the fifth in the world (ICO, 2014). This type of coffee plays a vital role in the country's economy and has a lion's share in earning foreign currency. Well over 35% of the country's foreign exchange is obtained from coffee export and consequently, 2% of the world's coffee supply comes from Ethiopia (Chauhan *et al.*, 2015). Due to high domestic consumption, Ethiopia is the tenth coffee exporter with 4.79% of the global share of Exporters (CSA, 2015).

Coffee is mainly produced, processed and exchanged in the Southwest, Southeast, South

and Eastern parts of the country (Taye, 2010). Coffee cultivation area is estimated to be around 800,000 hectares, and about 95% of all coffee is produced by 4 million small-scale farmers who own less than a hectare, and the remaining 5% is produced by commercial state and private farms (Berhanu *et al.*, 2015).

Since coffee is a golden product, whose value and price are increasing, attempts are being made to benefit farmers from this crop. One of these attempts, made by the research system, is to enhance the development and dissemination of high-quality coffee varieties among growers. Thirty-seven varieties of coffee were released by Jimma agricultural research center (JARC) of the Ethiopian Institute of Agricultural Research Center from 1977-2010 (Taye, 2011). Attempts have been made by JARC to foster links between the research system and coffee stakeholders (platforms), to facilitate the dissemination of improved coffee varieties, pre- and post-harvest management practices. However, successfully reaching farmers with the varieties have become a challenge due to various reasons like CBD and absence of certified coffee variety seed multipliers and distributors (Admassu *et al.*, 2008).

To come up with this challenge, the center has taken sole responsibility of multiplying and supplying basic coffee seeds (JARC, 2015). Since there is no organized entity engaged in multiplication and dissemination of improved coffee varieties accessing new varieties in this crop by farmers was limited and annual production of seeds by the research and the informal seed system. Neither private nor public enterprises are engaged in producing and trading certified coffee seeds and seedlings (Taye *et al.*, 2016). For effective provision of improved coffee varieties to farmers, EIAR in collaboration with the agricultural bureaus of SNNPRs and the Oromia regional states designed a program to establish certified farmers in growing and provision of specialty coffee seeds (Taye *et al.*, 2016). For this purpose, coffee varieties released by Jimma Agricultural Research Center were provided for research centers to

establish the collaboration and ultimately reach these farmers through their respective bureaus of agriculture.

A total of 3.6 million specialty coffee seedlings were multiplied by JARC and distributed to farmers in Limu, Gedeo, Sidama/Yirgacheffe, Wolega, Hararge zones. But, as part of the effort to reach farmers with improved specialty coffee varieties in southern Ethiopia, Wondo Genet agricultural research center took the responsibility of multiplying and distributing specialty coffee varieties released by Jimma Agricultural Research Center. As a result, the center multiplied and distributed a total of 3.1 million seedlings to Gedeo and Sidama Zones and some parts of west Arsi-zones (Taye *et al.*, 2016). However, no information exists on the status of specialty coffee variety seedlings distributed to the south by Wondogenet Agricultural Research Center. The aim of this research activity is therefore to fill this information gap on the status of specialty coffee varieties in the hands of farmers in Gedeo and Sidama Zones. This is to ultimately identify them as seed sources of specialty coffee varieties to other growers thereby helping improve the performance of the informal coffee seed system in the studied zones.

Statement of the Problem

So far, 149 varieties of specialty coffee were developed by JARC. Out of these, 8 were selected and released for further investigation. These varieties were 1377, 971, 974, 85257, 85238, 9718, 9722 and 979. Though these varieties were selected as focal points of coffee research, their performance and status have not been evaluated so far. Yet, monitoring and evaluation on the status of the distributed specialty coffee varieties have not been done by any of these collaborative institutions (i.e. JARC, WGARC and the regional bureaus of agriculture).

To have a clear picture on the performance of specialty coffee seedlings under farmers' management, this research was found significant. In addition, it is expected to

provide a baseline data on which specialty coffee variety had a wide range of acceptance in the study area.

Objectives

- ✓ Analyze the current status of specialty coffee seedlings in terms of seedling survival rate and uniformity of varieties raised on selected farmers' plot.
- ✓ Show the distribution of crops grown with specialty coffee.
- ✓ Assess whether the distributed coffee seedlings were planted as per the objective of the center or not

LITERATURE REVIEW

Coffee as a beverage and as a commodity has a thousand years old success story. It is presumed that eating or perhaps drying and making a tea like drink is still done in Yemen. This was the way coffee was first consumed as a beverage. As a beverage, only Ethiopia and Brazil use coffee for domestic purpose. Today the world's annual production of coffee is roughly 115 million tones.

The way coffee is consumed is linked to preferences that vary. Different preferences require different product characteristics. The demand for high quality coffee with specific characteristics has led to the need for a diverse range of technologies, each of which is particularly suited to the supply of a product. This was the first occasion which gave momentum for the origination of specialty coffee. With particular characteristics, specialty coffee is produced under specific local condition. When thinking of specialty coffee, it is clearly not possible to envisage the equivalent of green revolution technology where one basic technological package is used on millions of hectares to produce a standard product. (Thomas Oberthür *et al.*, 1977).

Coffee production in Ethiopia is critical for its economy. Around 25% of its population depends on coffee production, directly or indirectly for their livelihood. The country produces one of the best highland coffee varieties in the world and it is the major cash crop. Its coffee is almost exclusively of the Arabica type, which is native to Ethiopia.

Coffee area is estimated at about half million hectares, and about 98% of all coffee is produced by peasants on smallholdings of less than a hectare, and the remaining two percent is produced by commercial (state and private) farms (Dereje *et al.* 2003).

Ethiopia is the birthplace of coffee and the fourth-largest coffee producing country in the world, despite its status, the country's specialty coffee potential is largely untapped. (USAID, 2007). Consequently, the country has made great efforts towards the production of specialty coffee. As part of the effort, Wondo Genet agricultural research center has multiplied a total of around 3.10 million specialty coffee seedlings to farmers in Gedeo, Sidama and some part of the west Arsi-zones. In the meantime, assessing the status of specialty coffee seedlings distributed in 2010 and 2011 was found to be important (*ibid*)

1.1. Coffee Production Systems in Ethiopia

Coffee is believed to be originated in Kaffa zone of Ethiopia. Different scholars also believe that the name 'coffee' was given after its origin Kaffa. There are four coffee production systems in Ethiopia. These are: Forest coffee, Semi- Forest coffee, garden coffee and plantation coffee. Each production system is discussed as follows:

2.1.1 Forest coffee

Coffee grown in this system is found in the south and south western part of Ethiopia. It is predominantly found in Bale, West Welega, Bench Maji, Kaffa, Metu and Jimma areas. These areas are the origins of coffee Arabica. Forest coffee is self-sown and grows under the shade of natural forest trees. It is from this category of coffee production system that different attributes of coffee quality like: Aroma, flavor, disease resistance and high yield are selected. This category accounts for about 10% of the total coffee production in Ethiopia.

2.1.2 Semi- Forest coffee

This production system is also found in the south and southwestern part of the country. Producers in this system select thin forest

shades so as to allow adequate sunlight for the plant still maintaining shades. Farmers usually slash weeds associated with the coffee once in a year to facilitate the growth of coffee beans. This category accounts for about 35% of the total coffee production system in Ethiopia.

2.1.3 Garden coffee

This category is found in the vicinity of farmers' residences. It is widely practiced in the southern and eastern part of the country. These areas include: Sidama, Gedeo, South and North Omo, Harerge, Welega and Gurage Zones. It is planted in low density plantation environment, with 1000-1800 trees per hectare. The farming area is mostly intercropped and fertilized with an organic matter. Garden coffee production accounts for around 50% of the total coffee production system in Ethiopia. Now days this system is being widely adopted in different regions of Ethiopia. It is specially being diffused in Bench Maji and Kaffa zones of south west Ethiopia.

2.1.4 Plantation coffee

Plantation coffee is grown on plantations owned by a state- or privately-owned firm. It can also be grown on some well managed smallholder coffee farms. This production system recommends agronomic practices like; proper spacing, improved coffee seedlings, proper mulching, manuring, weeding, shade regulation and pruning. In most cases, state and privately owned coffee plantation sites are known to apply chemical fertilizers and herbicides.

Plantation coffee accounts for about 5% of the total coffee production system in Ethiopia. There are two types of plantation coffee: these are local coffee and specialty coffee. Since the main objective of this report is to show the yield potential of specialty coffee /its varieties/ under farmers' management, more points are discussed under this topic:

The term 'Specialty coffee' was first coined by Erna Knutsen. It was first put in to use in the issue '*Coffee and tea trade journal*'. Knutsen used the term to describe coffee beans of the best quality in terms of flavor and

grown in special microclimate. Specialty coffee is usually used to mean a gourmet, or premium coffee. According to the specialty coffee association of America (SCAA), coffee which scores a grading of 80 points and above out of 100 points scale is termed as specialty.

Specialty coffee is defined as a type of coffee variety coming from a defined production environment that leads to distinctive characteristics of the coffee. The distinctive features of specialty coffee varieties are defined in terms of three facets, these are: The production environment; cup level quality (taste) and product market share.

The intrinsic quality of specialty coffee depends on multiple factors including; the growing environment, genetics, crop management, post-harvest processing activities and storage. Special characteristic of the soil is the major factor affecting the taste quality of specialty coffee. Therefore, specialty coffee growers should identify suitable environment in which a particular coffee variety is grown. They should also add value to their product and provide the market with a differentiated product rather than a single commodity.

Methodology

Description of the Study Areas

The current study was conducted in Sidama and Gedeo zones of SNNPR. The two zones are located at 275 and 369 km from Addis Ababa respectively. Sidama zone is located at 80 15' N latitude and 340 15' E longitudes. Gedeo zone is located at 90 km from Hawassa town while Sidama is inclusive of Hawassa. Gedeo shares its boundary with Sidama. It extends south as a narrow strip of land along the eastern escarpment of the Ethiopian Highlands into the Oromia Region, which borders the Zone on the east, south and west. Gedeo shares its northern boundary with Sidama. Dilla town is an administrative center Gedeo zone. Other towns include Yirgacheffe, Fisahagenet, Chelelektu, Gedeb, Wonago and Bulle. It is bordered in the south, west and east by Oromia Region. Sidama zone borders Gedeo in the north.

Sample Size and Selection

A total of 1110 farmers and 15 non sample respondents were selected purposively i.e. farmers who have transplanted and grown specialty coffee seedlings and contact persons who have a stake in the distribution of these seedlings were chosen. Purposive selection of the indicated Zones, Woreda, and Kebeles were made on the basis of adopting specialty coffee seedlings from WGARC. The selection of villages and farm sites was also made at random. In addition, nonsample respondents such as Development Agents and extension

workers from the coffee, tea and spice coordination were chosen and contacted at different levels of aggregation in the NARS framework. These were at zonal, Woreda, kebele and village levels. Depending on the time and other resources at the researchers’ disposal, sample size was determined at any point between 20- 25% of the total population. Consequently, a sample size of 22.2% was fixed in this survey. The diagram presented hereunder shows the steps followed in the selection of 1110 farmers:

Table 1. Total sample size determined for the survey

Name of Zones	Number of Woredas	Name of Woredas	Number of Kebeles	Total Number of farm households
Gedeo	1	Kochore	11	400
		Dale	31	445
		Shabadino	11	46
		Aleta Wondo	12	40
		Loka Abaya	9	22
		Bona Zuria	6	10
		Dara	4	5
		Aleta Chuko	5	83
		Sidama	8	Wondogenet
TOTAL	9		93	1101

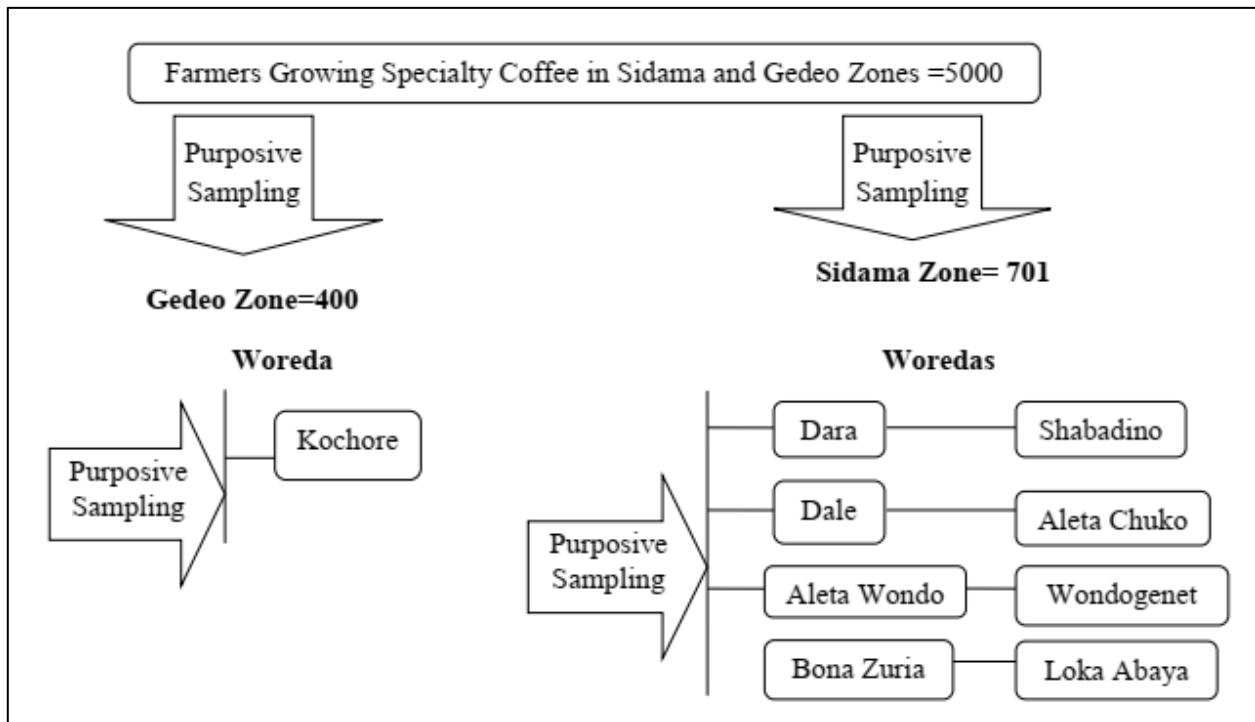


Fig 1. Sampling frame of specialty coffee growers in Sidama and Gedeo Zones

Data Types, Sources and Methods of Data Collection

Both qualitative and quantitative data were collected for the study. A semi structured questionnaire was developed and applied to generate quantitative data while field observation, personal interview and group discussions were conducted to elicit qualitative information. Data was collected in the areas of seedling survival rate, cropping system and problems occurred in the process of transplanting specialty coffee seedlings. The semi structured questionnaire, field observation, interviews and group discussions made with the farmers were primary sources of the specialty coffee data. Extension experts, supervisors of DAs and SMSs were contacted from the zonal bureaus of agriculture and rural development.

Method of Data Analysis

Data generated for the study were analyzed using simple descriptive statistics. Data was analyzed in terms of percentage distribution, minimum, maximum and average yield under farmers' management. SPSS version 20 was

used to run the analysis. Analysis was specifically made in the areas of varietal distribution of specialty coffee, frequency/percentage of other crops grown with specialty coffee and survival rate of the seedlings. Qualitative analysis was also made by observing the freshness or wilting status of the seedlings. In addition, reinvestigating types of crops grown by sample farmers and their distribution was enumerated using tables as shown below

Results and Discussion

Major Crops Grown in the Study Zones

To understand the nature of specialty coffee varietal plantation on farmers' plot, It was found necessary to identify the types of crops commonly grown by farmers in both zones as an indicative of existing crop based farming systems. This gives highlight on how these specialty coffee varieties are planted on farmers' plot. The type of crops commonly grown in both zones is shown below

Table 2. Major crops grown with specialty coffee in Gedeo and Sidama Zones

Crops Grown	N	Total area (ha)	Mean
Specialty coffee	1110	237.365	.22393
Local coffee	52	460.078	.42614
Maize	755	195.512	.29533
Enset	960	369.043	.41747
Haricot Bean	501	68.964	.18101
Banana	92	4.437	.07273
Teff	54	13.112	.32781
Wheat	36	6.450	.18429
Barley	68	19.125	.30357
Avocado	30	6.071	.33728
Sugar cane	27	6.216	.27026
Sweet Potato	108	17.122	.16786
Yam	75	7.884	.11594
Chat	78	25.813	.33964
Red Pepper	6	.550	.11000
Bean	41	7.863	.20160
Godere	4	.015	.02625

Source: Own survey result, 2005

Distribution of Participants based on Sex of Household Head

Number of farm households participating in the study is delineated based on sex of household heads from which one

representative participant, who is head of the household, is selected. The distribution of survey participants based on sex of the household head is shown in table 3

Table 3. Sample household's distribution based on sex category

S/No	Zones	Men household heads	Women household heads	Total
1	Sidama	678	23	701
2	Gedeo	369	31	400
	Total	1047	54	1101

Survival rate of specialty coffee varieties

The current study has identified the distribution of all varieties released by Jimma Agricultural Research Center WGARC in Awada Sub-center. Based on this, the proportion of each variety adopted by farmers was calculated. Qualitatively, field observation

showed that most individual farmer plots, have well managed specialty coffee seedlings than those observed in some schools and cooperatives not included in the current study. Table 4 shows the percentage of coffee seedlings survived on different farmlands of households in Sidama and Gedeo Zones

Table 4. Survival rate of specialty coffee seedlings in percent

S/No	Zones	Sample Size	Min	Max	Mean
1	Gedeo	401	25%	100%	93.0%
2	Sidama	709	68%	100%	96.5%
Total	1110	-	-	-	

Specialty coffee seedlings which were distributed among farmers in the surveyed areas of were revisited and evaluated for their survival rate. As a result, their average survival rate was 93.04% and 96.53% for Gedeo and Sidama zones, respectively. Freshness of seedling leaves was observed on the field by coffee experts and technically used to determine seedling survival rates. Thus, the number of seedlings with all leaves fresh and not wilted was designated as "survived seedlings" and "Not Survived" or not in a good condition when there is one or more leaves wilted. Based on this parameter; the proportion was determined and result obtained as shown in

The intercropping practice follows a pattern of growing specialty coffee varieties with local coffee, maize, haricot bean, teff, barley and other crops. Table 2 shows the percentage, mean and total area coverage of crops grown with specialty coffee. On one particular site, researchers have noted an exemplary *farmer*

innovation depicted by intercropping *Enset* plant with specialty coffee. The farmer explained that *Enset* is helpful as it retains more water in its stem. The retained water can be used by the intercropped coffee at times of water shortage. Participants of the same field visit added that intercropping *Enset* plant with coffee should be supported by better shade tree and space management so that maximum yield can be retained. Another component of indigenous knowledge considered as *farmer innovation* was the application of local coffee variety as a shade to the new specialty coffee seedlings. The practice is locally known as 'Sigsago'. Although it is not recommended as an approach by Wondogenet Agricultural Research Center, the practice was widespread among growers in the study areas. Through discussion, it was understood that farmers apply intercropping not to lose their local coffee varieties and tend to mix-up coffee varieties for the same reason. These old coffee varieties are also used as shades for the new ones, which might also be of a different

variety. Thus, farmers tend to mix-up varieties when they have not prepared a separate plot to up root and replant old coffee stocks or early planted varieties. They also do so when they lack any means to purchase and use seedlings of shade trees

Distribution of Specialty Coffee Varieties

Specialty coffee varieties released and distributed to farmers were as listed below, with variety 1377 being the most commonly found among the surveyed farmers.

Table 5. Names and distribution of specialty coffee varieties in the zones

	Variety Name	Frequency		Percent
Single coffee varieties	971	18		1.6
	974	20		1.9
	979	32		2.9
	1377(<i>Angafa</i>)	606		55
	9718	42		3.8
	9722	102		9.2
	85238	180		16.5
	85257	45		4.05
Mixed coffee varieties		56		5.04
Total		1101		100.0

The above result on the analysis of specialty coffee varieties grown in the zones shows that the 1377 specialty variety was adopted most (55%), followed by 85238(16.5%), 9722(9.2%), 85257(4.05%) 9718(3.8%) 979(2.9%), 974(1.9%) and 971(1.6%) respectively. 1377 variety locally known as “*Angafa*” was released for the first time. It was also the most frequently adopted specialty coffee variety. According to the discussion made with participants of the field visit, this variety is characterized by high productivity and disease resistance. In the table above the term “mixed coffee varieties” refers to two or more of the above varieties grown on the same plot. It also indicates the frequency/percentage of coffee plots on which local coffee is grown together with one or more of the above

varieties. The current study result revealed that the mean survival rate of specialty coffee seedlings in both zones is more than 90% indicating a good survival rate under farmers’ management. In addition, it can be observed that the average survival rate of specialty coffee seedlings in Sidama zone, is more than the one reported in different Woredas of Gedeo. With the exception of mixing local coffee variety with others on one plot of land, observed on 5.04% of the observations, other parameters such as spacing and shade tree application were successful and applied as per the objective of WGARC. Hence, on different plots, researchers have observed good seedling quality and growth status like in the picture below:



Fig.1. Farmers demonstrating their specialty coffee seedlings

CONCLUSION AND RECOMMENDATION

Generally, result of the above analysis showed that majority of the coffee varieties were in a good status in terms of seedling survival rate and varietal uniformity. The survey result also gave lessons for field practitioners to investigate how intensively specialty coffee varieties are managed by the adopters in the two zones. The difference in the percentage of specialty coffee varieties adopted by the samples is attributed to the time of introducing these varieties at the farm gate. This was exemplified by *Angafa* specialty coffee variety which was released first and adopted the most in both study areas. Uniformity and survival rate of specialty coffee varieties is specifically attributed to the variety type adopted. In this particular survey, the bases for selecting farmers as sources of specialty coffee varieties were uniformity of specialty coffee plantation establishment on their plot based on an expert assisted on farm observation and survival rate of seedlings planted. This is just a naive assumption that farmers would genuinely source seeds of specialty coffee varieties only from their visited farm plot. However, due to uncontrollable circumstances, they may have access to sources of other varieties and could possibly tend to mix. Hence, more parameters are still needed to be sure of the seed purity obtained from farmers who maintained uniform coffee varieties on their plots and have evidenced good survival rates during the study.

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