



INTERNATIONAL COFFEE ORGANIZATION  
ORGANIZACIÓN INTERNACIONAL DEL CAFÉ  
ORGANIZAÇÃO INTERNACIONAL DO CAFÉ  
ORGANISATION INTERNATIONALE DU CAFÉ

PSCB 122/10

28 May 2010  
English only

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Private Sector Consultative Board  
31<sup>st</sup> meeting  
20 September 2010 (09:30)  
London, England

**Global coffee quality research initiative**

## **Background**

The attached concept paper on the Global Coffee Quality Research Initiative (GCQRI) has been developed by the Norman Borlaug Institute for International Agriculture. The aim of the GCQRI is to increase overall cup quality and available volumes of specialty coffee through research interventions in origin countries, thus raising farmer returns and increasing roaster sales by stimulating higher consumer interest and consumption.

## **Action**

The PSCB is invited to consider and comment on this initiative.

**A Specialty Coffee Industry Concept Paper**

**The Global Coffee Quality Research Initiative  
(GCQRI)**

**The Norman Borlaug Institute for International Agriculture**

**March 2010**

## Background:

**The Coffee Sector:** Coffee is the most important agricultural commodity in terms of total world value. Coffee is grown on over 10,000,000 hectares worldwide of which over 70% is farmed by small holders. It is responsible for employment of over 120,000,000 people worldwide and significantly affects the GNP of 40 developing countries. The U.S., Europe and Japan consume over 75% of the world's annual production of 126 million 60kg bags and 95% of total exports. Eighty-five percent of the world's production - traditional, premium, and specialty grades - is traded on major futures and commodity exchanges, most importantly in London and New York. The other fifteen percent is purchased outright on the basis of quality through independent buyer-seller contracts.

**Specialty Coffee:** Sometimes called "gourmet" coffees, specialty coffees are made from exceptional beans grown only in ideal coffee-producing climates. They tend to feature distinctive flavors, which are shaped by the unique characteristics of the 'terroir' that produces them. The term "specialty coffee" refers to the highest-quality green coffee beans roasted to their greatest flavor potential by true craftspeople and then properly brewed and served following high-quality standards. Specialty coffees begin at "origin", the planting of particular quality-producing varieties into limited growing regions of the world. The concept of specialty includes the care given to the plant, selective harvesting, careful processing and timely preparation for export, all of which result in high coffee quality (Rhinehart 2007).

**The Specialty Coffee Sector:** The growth of the specialty coffee industry has been remarkable. Today, specialty coffees can be found in almost all beverage sales venues, from high-end-chic cafes to local gas stations and fast food chains; specialty coffees and drinks are increasing in demand and differentiation. The Specialty Coffee sector is an annual \$15 billion industry in the U.S. alone and is growing at near 5% annually. It is estimated that the US consumes approximately 1.5 billion pounds of specialty coffee per year. The rise and growth of this industry in the past 20 years is largely due to new consumer awareness and appreciation for fine coffees of high quality.

**Small-Holder Coffee Growers and Food Security:** Many specialty coffees are grown on irregular terrain in highly heterogeneous micro production regimes. These regimes tend to be populated by farm families who, because of the small size of their holdings, are able to provide high levels of management to their crops. Indeed it is the diversity of the regimes, and the care that small-holders can give to their crops, that make superior quality coffee of highly differentiated attributes possible. The structure of specialty coffee farming connects buyers to some of the world's more remote and economically disadvantaged communities. The specialty coffee sector is a potent economic force for improving the lives of small-holders and impoverished communities. These small farms are unable to sustain families through traditional food crop production. Specialty coffee production gives poor communities cash to purchase their food needs, providing the most elusive component national food security programs – buying power in poor communities.

## Situation Analysis:

**Demand Increasing:** The demand for coffees of high quality is increasing rapidly. A few years ago Specialty Coffee was confined to several large retailers and a plethora of small and medium roaster-retailer-wholesalers. However, in the last several years major restaurant chains like McDonald's, Krystal, and Dunkin Donuts have invested significantly in new specialty coffee beverage sales venues and other large companies are following suit. This recent phenomena - combined with the push into specialty coffees by larger, traditional coffee roasters like Sara Lee and Kraft - has helped elevate specialty coffee to 40% of the total US coffee market, as reported by the National Coffee Association in 2010. Global consumption trends also reflect the sector's strong growth with total world coffee consumption growing by 2% last year, with specialty coffee consumption worldwide expected to grow disproportionately faster because of the product's appeal in emerging super-economies such as Brazil, India, and China. In fact, with global demand being so high and growing so fast, high quality Arabica coffees are becoming increasingly short in supply (Ganes, Rhinehart 2009). This shortage was somewhat manifested in 2009 through increased differentials and limited availability for washed arabicas on washed arabicas, including Colombian, Kenyan, and Guatemalan coffees.

**Supplies threatened:** The huge and rapidly growing specialty coffee market is predicated by the availability and affordability of a dependable global supply of quality green coffee. The potential for supply chain constrictions of specialty coffees are especially disturbing when one considers that opportunities for production growth of specialty coffees are increasingly limited. In Latin America, for example, production is decreasing in total acreage due to property value increases and many South American countries have reached their land and labor production limits. Other countries, like Brazil, continue to consume increasing proportions of their own specialty and premium production. East Africa has potential for growth but continues to be plagued with infrastructural and socio-political challenges.

In addition to production constraints affecting the supply of quality coffees directly, the threat of global warming could also further reduce global arabica supplies in the near future. Already, the Intergovernmental Panel on Climate Change, IPCC, is predicting a temperature increase between 1.4° and 5.8° C by the end of the 21<sup>st</sup> century. A 10-20% decrease in global food crop yields is predicted by 2050 by the IPCC. Recent studies from Brazil, Mexico and Uganda show that even minimal increases in mean temperatures due to climate change will have disastrous consequences for coffee production. In some regions, climate change will reduce the area presently suitable for coffee production by up to 95%. As temperatures increase in arabica producing regions, producers will be forced to seek higher altitudes where arable land is both limited and marginal.

Finally, not only is the supply of coffee threatened through reduced land area and productivity, but the entire crop is extremely vulnerable to disastrous pandemics due to coffee's constricted genetic base. All arabica coffee production is based on using a very small number of cultivars: *Coffea arabica var. typica* and *Coffea arabica var. bourbon*,

and mutants or hybrids of those two varieties. The low genetic diversity observed within those cultivars makes the specialty coffee industry particularly vulnerable to major risk factors due to endemic and pandemic insect, disease or other uncontrollable biological factors such as what happened in the late 19<sup>th</sup> century when the *Hemelia vastratrix* fungus decimated Arabica crops worldwide. In addition, precious few wild *Coffea spp.* land races exist due to land competition issues in Ethiopia further constricting and many of accessions in the world genetic banks for *Coffea arabica* are being lost or degraded. Discovering, conserving and utilizing the genetic diversity of land races of coffee is an imperative for securing the future of the industry.

**Quality first:** Increases in overall coffee quality *per se* are also needed to help reverse the consumption stagnation that has plagued the US coffee industry, and continue to drive the expansive growth of specialty coffees at the top end. This segment of the industry has an important ‘pull-up’ effect, raising the quality bar and thus growing the market for the entire industry. These ‘crème-de-la-crème’ coffees are epitomized through programs like the Cup of Excellence® and other coffee competitions and auctions in origin countries. The winning high priced coffees, mostly produced on small farms in economically deprived communities, are marketed by the industry’s quality leaders and some of the coffees are finding their way into mass consumer markets like the Target®, Whole Foods®, and other grocery chains. These retailers are taking the first step in promoting fine coffees similar to the way they promote fine wines. And consumers are demanding greater volumes of these finer, high-end coffees for which they pay over \$25 per pound.

However, despite the importance of coffee quality as one of the main drivers of growth for the specialty coffee industry, very little research has been conducted to understand and increase both coffee cup quality and volumes of quality coffee needed to sustain the industry. In order to grow the specialty coffee industry, coffee quality must be better understood so that technologies and methods to improve quality can be determined and made available to key value chain players who profit from these advances. Agricultural research is needed to understand and improve the increased production of quality coffees in order to grow the specialty coffee industry.

## **Problem Statement:**

The specialty coffee industry is facing a very serious problem where volumes of quality coffee are becoming inadequate to meet current and projected needs. Regretfully, because of the geographic, economic, and social schisms that exist worldwide between coffee producing and coffee consuming countries, woefully little attention or research into addressing these foundational coffee supply problems has occurred. The eventual effects of global warming and potential threat of pandemic catastrophes only exacerbate this dire situation. In addition to volume-oriented research, the existing paucity in research on factors affecting cup quality is appalling for a \$25 billion industry whose main driver is quality and whose supply of quality coffee is becoming increasingly limited. Coffee quality improvement can be directed in part toward improving livelihoods in some of the world’s least food-secure communities.

## **Solution:**

There are only four ways in which to increase global supplies of quality coffee to remedy the current situation and sustain the industry, all the while increasing cup quality:

1. Expand the hectares under production of quality coffee in origin countries
2. Increase the yields per hectare of quality coffees in origin countries
3. Elevate and transform current commercial quality coffees into specialty coffees in origin countries
4. Develop new origins for quality coffee production

In the case of the first three solutions, agricultural research and development is needed to innovate new and appropriate technologies to increase quality and maximize volumes of quality coffee in areas where it is grown while minimizing unintentional social and environmental damages, while the fourth solution requires work with governments and private industry to develop quality coffee sectors in new origins that will benefit from progress made in the first three solutions. An effective specialty coffee agricultural research and development program – which currently does not exist on a worldwide level - is clearly necessary to alleviate the industry's supply and quality constraints by addressing these urgent issues.

## **Goal of the Global Coffee Quality Research Initiative (“GCQRI”):**

The mission of the GCQRI is to build upon and expand the global network of coffee quality research institutions and scientists that will work with the specialty coffee industry to design and execute prioritized and coordinated superlative research on key factors limiting cup quality and constraining increased volumes of quality coffee. Paramount to achieving these goals will be the strong partnerships developed between origin country research organizations, International Research Organizations and the global specialty coffee industry. Working together to conceive, conduct and extend the research results will increase revenues of farmers, profits for companies, and pleasure to consumers.

Results from research will be made freely available in perpetuity without restrictions to users worldwide through partnerships and linkages with trade and farmer associations, individual companies, host country extension agencies, processors, and exporters - as well as through classic research venues like scientific journals, conferences, proceedings, web-based platforms, and others to be determined.

## **Economic Justification:**

Economic analyses reveal strong and consistent evidence that investment in agricultural research has yielded high returns per dollar spent. These returns include benefits not only to the farm sector but also to their respective food industries and to consumers. There is a general consensus that the payoff from investment in agricultural research has been high (Fuglie and Heisey 2007). Generally, for every dollar invested in

**Table 1—Summary estimates of the rate of return to U.S. agricultural research**

Item	Studies, 1965-2005	Mean estimate	Median estimate
Social rate of returns to public agricultural research	35	53	45
Social rate of returns to private agricultural research	4	45	45

Source: USDA, ERS, using data from Huffman and Evenson, 2006 and Fuglie et al., 1996.

agricultural research on any commodity in any state or country, between \$20 and \$60 are generated to the benefit of the producer and that commodity's food/beverage industry (Table 1).

In fact, agricultural research has driven all the major farming commodity sectors since the 1800s.

The Agricultural Research community has doubled and in some cases even tripled yield per acre of the world's most important food commodities through focused research designed to do just that. The same scientific methods and approaches used to create the 'green revolution' of the 70s and 80s can be used to understand and significantly increase the intrinsic quality of the green coffee bean. Today's investment in coffee quality research will drive the industry's growth tomorrow.

Table 2 lists individual rate of returns from studies conducted on several different agricultural commodities by different authors over long periods of time. Note that despite the commodity, whether it is beef, trees or vegetables, investment in agricultural research returned high and consistent returns.

**Table 2.**

**Studies on components of the agricultural sector**

Study	Authors	Pub. year	Publication	Period		ROR estimate		
						Mid	Low	High
6	Norton & Ortiz	1992	J Production Agric	1987, state-level comp.	Beef & swine	55		
6	Norton & Ortiz	1992	J Production Agric	1987, state-level comp.	Dairy	95		
6	Norton & Ortiz	1992	J Production Agric	1987, state-level comp.	Poultry	46		
6	Norton & Ortiz	1992	J Production Agric	1987, state-level comp.	Grain crops	31		
6	Norton & Ortiz	1992	J Production Agric	1987, state-level comp.	Potatoes, cotton & tobacco	34		
6	Norton & Ortiz	1992	J Production Agric	1987, state-level comp.	Vegetables & melons	19		
6	Norton & Ortiz	1992	J Production Agric	1987, state-level comp.	Fruits & nuts	33		
23	Haygreen et al.	1986	Forest Prod J	1972-1981	Forest products	25	14	36
22	Bengston	1984	Forest Science	1975, state-level comp.	Forest products	21	19	22
19	Smith et al.	1983	J NE Ag Econ	1978, state-level comp.	Beef & swine	22		
19	Smith et al.	1983	J NE Ag Econ	1978, state-level comp.	Dairy	25		
19	Smith et al.	1983	J NE Ag Econ	1978, state-level comp.	Poultry	61		
21	Schmitz & Seckler	1970	Am J Ag Econ	1958-1969	Tomato harvester	42	37	46
17	Peterson	1967	J Farm Econ	1915-1960	Poultry	23	21	25
20	Griliches	1958	J. Poli. Econ	1940-1955	Corn	38	35	40
20	Griliches	1958	J. Poli. Econ	1940-1957	Sorghum	20		

ROR = Rate of return. Most studies assessed productivity change over a period of years. "State-level comp." refers to studies that compared productivity among States at a point in time against past research expenditures in those States. Contact the authors for a complete set of references.

Source: USDA, ERS, using data from Huffman and Evenson, 2006, and Fuglie et al., 1996.

## Precedent Insights:

Although these studies mainly deal with diverse food crops or livestock, the underlying agricultural research principles used to increase yield and qualitative traits remain the same. Yield is an easily quantifiable variable - much like coffee quality scores - with significant variability and therefore offering considerable room for improvement. Agricultural research conducted on quality traits in food and beverage commodities has been amazingly successful, with the evidence showing how research has improved flavor and other quality traits in other food and beverages. Highly advanced and extensive agricultural research has been invested in quality traits of other food and beverage commodities, greatly improving consumer satisfaction, continual growth in economic return and employment across interrelated sectors of the industries.

However, sometimes there are genetic linkages between yield and quality traits causing negative correlations such that an increase in quality would be associated with an equal decrease in quantity. This is not the case with Arabica coffees as Montagnon and colleagues showed in 1998 where they studied the genetic correlations between the yield and several quality traits, including fat content, sucrose, trigonelline, caffeine and cup tasting components. Their results revealed that Arabica coffee yield and cup quality traits are independent. This result is paramount to the GCQRI, meaning that quality variables can be increased simultaneously with productivity variables.

In summary, agricultural research has been shown to produce significant and high rates of return for all commodities where economic studies on ROR have been conducted with very few studies revealing negative rates of return from agricultural research on most food and beverage. As such, risk appears to be very low for investment in coffee quality research.

## Proposed conceptual model for the GCQRI:

The establishment, organization, and coordination of a global research program that funds research on scores of themes with hundreds of coffee scientists at origin countries working with hundreds of scientists at cutting-edge international research institutes is a complex affair. Fortunately, an effective and efficient model has already been used with excellent results for commodities such as beans, sorghum, millet, peanuts, fish, livestock, and pulses. These programs are known as Collaborative Research Support Programs, or “CRSPs”. Over the past 20 years they have been recognized as effective, long-term, international collaborative research models that have delivered significant and high returns on their research investment dollar.

The CRSPs are long-term, multi-disciplinary research programs to address the problem of food insecurity and malnutrition in developing countries. The CRSP model is the result of enlightened legislation (Title XII of the Foreign Assistance Act and updated by the “The Famine Prevention and Freedom from Hunger Act of 2000”) and remarkable development insights by the founding fathers of the partnership between the US Agency for International Development (USAID) and U.S. Universities. CRSPs empower host country institutions to address recognized agricultural issues and constraints through



the creation of new technologies and knowledge, while also developing capacity and competence which in the long term results in self-reliance in the area of agricultural technology; The principal partners in the CRSPs are scientists from international research institutions and universities working in collaboration with scientists in developing country universities, national and international research centers, the private sector, and NGOs.

The Norman Borlaug Institute for International Agriculture based at Texas A&M University has been involved in CRSP research and management for 20 years, and has been selected by the GCQRI's co-founders as the Initiative's Managing Entity ("M.E."). Their experience with the traditional CRSP model, major public-private partnerships, superlative applied research and the Global Specialty Coffee sector has allowed them to modify the CRSP model and tailor it expressly for increasing, improving and protecting the global quality coffee supply. The Borlaug Institute is dedicated to using advanced science to reduce hunger. Raising the food buying power of rural families and communities throughout agricultural production, processing and marketing enterprise is fundamental to ending hunger.

Central to the Borlaug-modified CRSP model for coffee research is placing the coffee industry squarely into the model as the program's principal driver and assessor. In this way, the program is assured to develop relevant research themes designed to increase the supply of quality coffees for the growth of the entire industry and to keep the programs on track to reach those objectives. This will be achieved through several modified program committees, boards, and evaluation panels as discussed below.

## **Establishment of the GCQRI:**

Establishing an effective global research program is a complex and time-consuming process that involves two major phases. The Genesis Phase is charged with developing the program and its ongoing budget. The Operational Phase is charged with conducting the research while allocating the budget according to the Global Plan:

**1. Program Development Phase:** This initial phase entails the effort necessary to set-up the GCQRI research-industry network and develop the 'road map' or Global Plan that will deliver the expected results. **This first phase is called the "Genesis Phase".** This effort will be coordinated by the Borlaug Institute working in direct and harmonious relation with the Specialty Coffee Associations of the world, select members of the specialty coffee industry, and institutional stakeholders. This phase will require about one year of effort and will cost approximately \$375,000 (see elaborated Genesis program and budget in Funding section below). The deliverable from this phase is a comprehensive Global Coffee Quality Research Program ready for operation once long term funding is obtained.

**2. Program Operation Phase:** This five-year second phase entails the actual funding and execution of the CGQRI. **This phase is the actual CGQRI.** Near the end of its first five year phase, a major evaluation will be conducted to revise and re-calibrate the program as necessary to better meet the needs of industry in another five-year iteration or

research cycle. The structure and operation of the CGQRI in this phase is elaborated in the following sections. Total funding for similar agricultural research programs is between \$1.5 and \$4.0 million dollars per year.

## **GCQRI - Research objectives and guiding principles to ensure program success:**

The overall goal of the Initiative is to increase and protect coffee quality while simultaneously increasing the supply of quality coffee through the execution of the following three objectives, all to fuel a dynamic industry that directly affects the livelihoods of over 100 million people:

1. To examine the effects of genetic, agronomic, processing, and post-harvest factors on the quality of coffees over origins and time in order to increase quality and volumes of specialty coffee, thus increasing prices to producers, prices to roasters and pleasure to consumers.
2. To build the capacity of coffee origin countries to conceive and execute ongoing top-notch coffee quality research that will result in increased cup quality and volumes of quality coffee from that origin with the goal of creating a self-sustaining, competent, dynamic origin country coffee research institution.
3. To reach out and freely extend research results to scientists, processors, importers, exporters, roasters, consumers and most importantly to producers, in order that the research delivers the expected productivity, premiums, quality, sales, and marketing results.

The key to achieving the objectives of the program is the following set of principles from the Borlaug Institute. These principles are the results of years of managing and conducting collaborative research and programs around the world on many different food and beverage commodities.

1. Research will be long-term, funded through grants or cooperative agreements between the Management Entity and a lead institution representing a group of partner research institutions.
2. Research proposals will be selected in open competition according to the bidders' research team's ability to address the identified constraints detailed in the RFP from mandates produced in the CRSP Global Plan.
3. Most research will be carried out within the origin countries with cup quality being evaluated by both US Industry and appropriate host country organizations through standards established by the SCAA and CQI.
4. Each country project will develop the human and institutional capacity of research organizations in the countries where the research activities are conducted. The institutional relationships established between International and host country institutions are intended to be enduring and to transcend whatever the life of the program is.

5. Research partners will employ a “holistic approach” in their research design and implementation, working collaboratively among several institutions, drawing on the expertise of several disciplines to solve identified constraints to agricultural problems, taking advantage of favorable agronomic and economic relationships among other enterprises in farm communities and enhancing environmental services.

## **Structural model for the CGQRI:**

A large multi-disciplinary research program involving many different research institutions, countries, and industry partners must have appropriate governance and structure in place in order to operate effectively. There are five different functions needed to adequately address management and governance structure that are listed and briefly defined below:

### **1. The Board of Directors (BOD)**

The BOD is the guiding body of the CGQRI. It will be composed of select specialty coffee industry and agricultural research leaders.

### **2. The Management Entity (ME)**

The ME is the coordination unit for the entire program and works with the BOD. The daily operation of the ME will ensure that GCRQI goals and objectives as outlined in its global research plan are executed according to plan and within the budget contained in the assistance agreement document.

### **3. The Technical Advisory Group (TAG)**

The TAG will assist the BOD ensure that the GCQRI research programs are scientifically sound and poised to deliver the expected results. The TAG will assist the ME develop and evaluate the RFP grant process and the M&E.

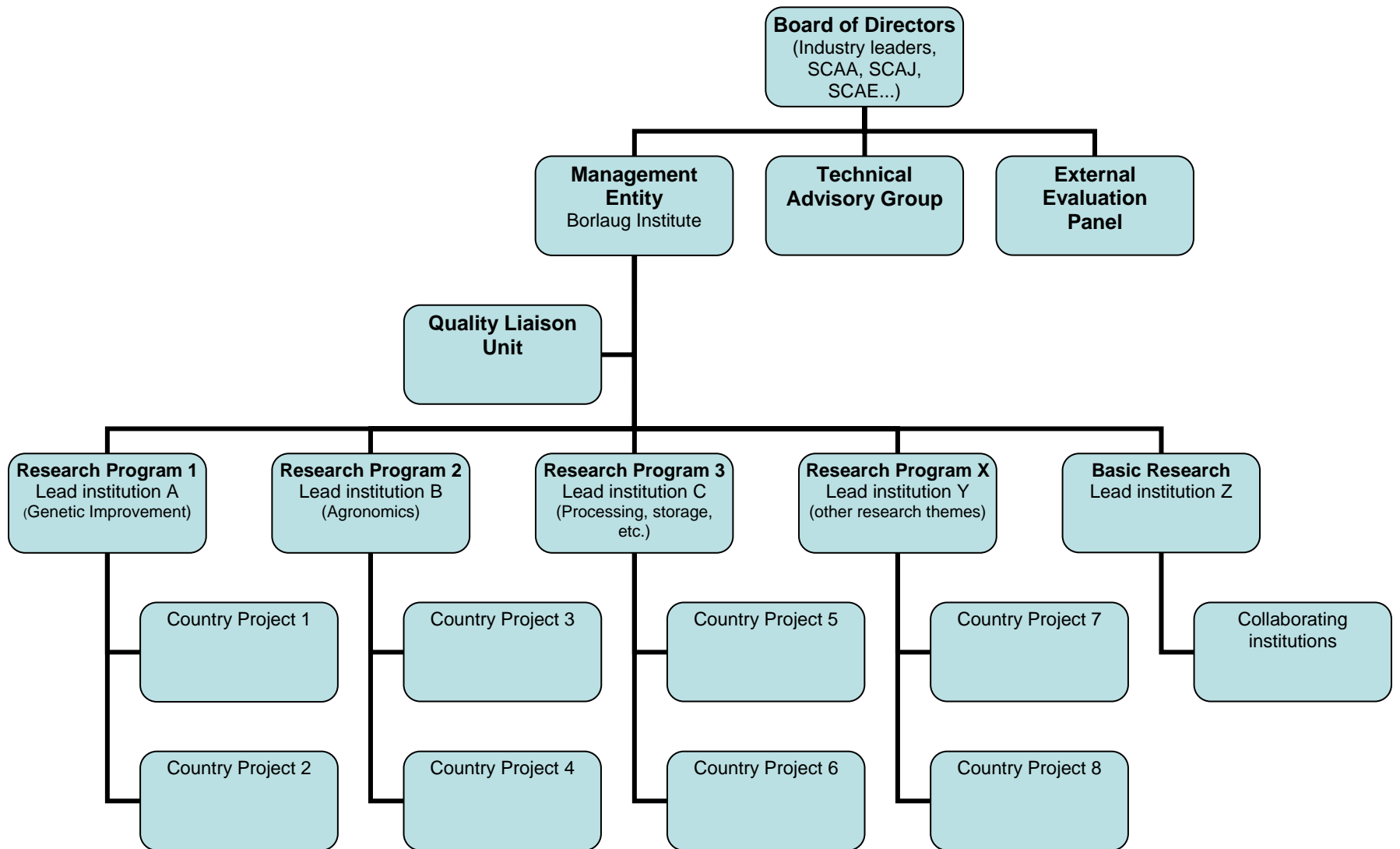
### **4. The External Evaluation Panel (EEP)**

The EEP is the independent auditing unit of the BOD. It will be composed of independent experts from appropriate technical disciplinary backgrounds, experience, and regional knowledge to ensure excellence in program content and achievements.

### **5. The Quality Liaison Unit (QLU)**

All research performed under the GCQRI must properly assess quality as a dependent variable in the research experiments. The QLU will assist the ME interface all research performed with proper quality evaluations conducted by industry expert panels to ensure that quality is properly and appropriately evaluated to meet industry needs.

# The Global Coffee Quality Research Initiative Management Structure



## Estimated costs and funding possibilities:

In order to set up this GCQRI and begin program execution, there are two major funding challenges that must be addressed:

**1. Genesis funding:** As discussed above, the Genesis Phase is necessary for program set-up including the development of the research network, institutional linkages, Memorandums of Agreement, conduct of the Global Planning Workshop, production of the Global Research Plan by theme and region, and setting-up the Management Entity.

This one year effort is responsible for the following deliverables:

- a. The conduct of a Global Planning Congress to produce the road map of what research themes will be conducted by whom in which locations for how long and to what end.
- b. Setting up the GCQRI governance organs, committees and programs.
- c. Development of program budget and accounting policies and mechanisms.
- d. The production of the 5 year Global Plan or road map.
- e. Developing all Requests For Proposals and the committees to evaluate the research proposals.
- f. The development of all legal documents, Memorandums of Agreement, and policies.
- g. Determination of all lead and collaborating institutions.
- h. Determination of host country partners.
- i. The configuration of all institutional linkages and funding mechanisms.
- j. Leading the promotional campaign for long term research funding through a commodity check-off program or other means.

These first-year costs are estimated to be roughly \$375,000.

The above scope of work will be the responsibility of the program administrator from the Borlaug Institute and one full time assistant. As seen in the budget below, roughly half the total cost will be to conduct the week-long day Global Planning Congress where 60-75 coffee industry and research leaders meet to hammer out exactly what the program does, where, with whom and for whom. Other expenses include necessary travel to origin regions and countries within regions by the program Administrator and Lead Institution Principle Investigator in order to set up research protocols, memorandums of agreement and other legalities. Due to the complex nature of the industry-research-origin country network, a significant communications budget will also be necessary as well as minor supplies and publication costs. All effort will be made to reduce costs through the use of higher-tech communication venues as well as through cost savings and sharing.

Cost savings will be made through participant cost sharing and negotiations with the Borlaug Institute. For example, the Borlaug Institute has offered the above services without any indirect or overhead costs resulting already in a \$75,000 savings (shown below). Any remaining funds would be put into the funding of research activities.

<b>Illustrative GCQRI Genesis Phase Budget</b>		
<b>Expense item</b>	<b>Description</b>	<b>Total cost</b>
<b>Salaries</b>		
Program administrator	.75 FTE	<b>\$100,000.00</b>
Assistant	1.0 FTE	<b>\$50,000.00</b>
<b>Offices, Administrative Services, and Overhead</b>		
		<b>\$75,000.00</b>
<b>Travel</b>		
4 Regional origin trips	Administrator plus Lead Institution	<b>\$50,000.00</b>
4 US based trips	Admin/Lead	<b>\$10,000.00</b>
<b>Communications</b>		
		<b>\$10,000.00</b>
<b>Supplies</b>		
		<b>\$5,000.00</b>
<b>Global Planning Congress</b>	60 leaders from Research and Industry	<b>\$150,000.00</b>
<b>Subtotal of First-year "Genesis Phase" Projected Costs:</b>		<b>\$450,000.00</b>
<b>Less: Overhead &amp; Indirect Cost Absorption by The Borlaug Institute</b>		<b>&lt;\$75,000.00&gt;</b>
<b>TOTAL</b>		<b>\$375,000.00</b>

Already several companies have been supportive of the initiative and have offered financial support to cover some of the Genesis Funding costs. It is hoped that total Genesis funding can be reached by or immediately after the SCAA's Symposium on April 15, 2010.

**2. Long term research program funding:** Assuming Genesis funding can be obtained to put the program together in the most efficacious manner for delivering expected results and benefits to the industry, the next and most important challenge is to establish a funding mechanism to finance the research activities over a 5-year phase. Based on experience and data from other commodity CRSPs, a minimum of \$1.5M per year is needed to execute limited research in 5-10 countries and cover the management and

coordination of the program. A more appropriate target figure for Global Coffee Research is around \$4M per year or \$20M over the first 5 year project phase.

In most US commodities, a levy or commodity check-off is applied to the sale of a farmer's product at the farm gate to generate funding for research on, and promotion of that commodity. In fact, over \$1 billion per year is raised by commodity check-off funds which are operated by the US Department of Agriculture. Other checkoff organizations operate under state authority or organizations of commodity producers and/or processors, like the Sugar Association, that operates promotion programs independent of any state or federal authority.

This type of funding has logical implications for the specialty coffee industry. Most importantly, implementing a initial voluntary checkoff program for specialty coffee is probably the most equitable way of funding the proposed research initiative since a company's contribution and benefit would be proportional to the volume of coffee they sell.

Commodity checkoff programs are primarily cooperative efforts by groups of suppliers of agricultural products intended to enhance their individual and collective profitability. In the case of the specialty coffee industry, the inverse would be true, where coffee buyers/companies would shoulder the funding burden but they will also reap the majority of returns in terms of sustained company profitability and commodity security.

The term "checkoff" refers to the collection of a fee and comes from the concept of checking off the appropriate box on a form, like a tax return, to authorize a contribution for a specific purpose, such as the public financing of election campaigns, or, as in this case, the financing of programs to enhance coffee quality, increase volumes of quality coffee and to raise producer incomes. In the specialty coffee industry, the 'checkoff box' would be found on an amended Green Coffee Contract, which is the current trading instrument most commonly used in the purchase of green coffee destined for the specialty coffee market. Generally, in most commodities, the funds collected by checkoff groups are used primarily to expand demand (both domestic and foreign) through both generic advertising efforts and the development of new uses of the associated commodities. Although many checkoff programs also fund research intended to reduce production costs and/or enhance yields, the share of their total budgets spent on research is generally much smaller than the share spent on demand-enhancement activities. In the case of the specialty coffee industry, a very minimal checkoff rate could be applied since our goal is focused to fund an annual \$3M research and development program.

The volume of specialty coffee sold is approximately 15M bags or two billion pounds per year (personal communication Rhinehart) and if a checkoff rate on the Green Contract of one half of one US cent (\$0.005) per pound is applied, the fund could yield as much as \$10M per year, or more conservatively \$5 M. Clearly, a fraction of one cent per pound has the ability to fund the R&D program and yet cause little 'pain' to those companies involved in funding the program. It will be useful to start the voluntary check-off at \$0.005 in order to assure a strong start-up of the program, and possibly provide a

reserve. The check-off can later be reduced if it appears prudent. It would be easier to reduce it than to try to increase it in the case of shortfalls.

Contributions to the earliest US commodity check-off programs were voluntary. These voluntary programs, however, were plagued by the problem of free-riders, which motivated the supporters of some programs to pressure state, and later federal, legislators to provide them with legislative authority for mandatory checkoff contributions. Despite these problems, the voluntary model may still be most appropriate in the specialty coffee sector - at least initially - since there is no way of enforcing a 'levy' and most specialty buyers adhere to a very progressive and socially responsible set of trading practices.

The Borlaug Institute and several renowned Agricultural Economists from Texas A&M who have long term experience in commodity check funding set up, monitoring and evaluation, are working with key specialty coffee industry leaders to fully assess the possibility of this funding venue. It will be the responsibility of this team support and guide the efforts of the industry to secure long term program funding under the Genesis Phase.

**3. Alternative or complementary long term funding:** Other ways to fund the long term research activity involve some configuration of the following strategies:

- a. Large company direct funding: Several large and progressive companies provide complete funding for the program. The problem with this funding strategy is that logically, the donor companies would have control of research direction and benefit distribution.
- b. Because the goals of this initiative are consistent with the goals of USAID, and other foundations and donors, i.e. to support economic growth and to reduce poverty through the generation of knowledge and technologies important to the development of agriculture and natural resources of developing and transition countries, it is likely that some partial support for this program can be obtained from those organizations to complement Industry funding. Examples of organizations that have congruent mission/objectives are:
  - The Bill and Melinda Gates Foundation
  - The USAID/GDA Program
  - The ICO/CFC Grant program
  - The Specialty Coffee Associations of A, E and J
  - The Rockefeller Foundation
- c. One possible downside associated with this funding venue would be that 'Industry' could lose some control over the process of setting up its own R&D program.



- d. SML company funding: Small, medium and large companies are all presented with the program and its potential benefits and requested to donate funding levels commensurate with their company's size. A problem with this model will be the large transaction costs associated with collection, processing, and management.

### **General operational mechanism to fund research:**

1. Funds are received by the Borlaug Foundation - a 501 (c) (3) tax-exempt organization - and placed in a dedicated account. These funds are immediately considered in the US as a charitable donation, and will have positive tax implications for donors.
2. The Global 5 year Plan identifies the broad research themes, constraints and areas for research as stated above and the budget to conduct the work.
3. The ME develops Requests for Proposals with the TAG that are sent out to Research Institutions who have expressed interest in conducting this type research from previous involvement in putting the GCQRI together or based on their capacity.
4. Funds are released to the 'lead' institution that competitively wins the bid for that particular research theme.
5. The lead institution then partners with other institutions as necessary and works with the origin countries and institutions involved.

### **GCQRI - Research goal and objectives elaborated:**

**Goal:** The goal of the initiative is to increase and protect coffee quality and the supply of quality coffee to fuel a dynamic industry that directly affects the livelihoods of over 100 million people while minimizing unintentional social and environmental damages.

**Objectives:** The following description of objectives is **intended to be illustrative** to give the reader an idea on the kind and types of research that would be conducted under this program and its importance to the advancement of coffee quality and the attainment of higher volumes of quality coffee. The actual themes listed are only indicative of the work that may eventually be conducted once industry and scientific leaders develop a global research plan as discussed above in the Genesis Phase.

#### **Objective 1.**

*To examine the effects of genetic, agronomic, processing, and post-harvest factors on the quality of specialty coffees over origins and time in order to increase quality and volumes of quality coffee, thus increasing prices to producers, profits to roasters and pleasure to consumers.*

This objective encompasses the bulk of the hard, scientific research that will be conducted under this program. Likely broad research-theme categories from which specific research will be planned collaboratively with international and origin country institutions and scientists are as follows:

**Coffee Genetics:** Quality enhancement through genetic research and breeding is a longer term objective since varietal creation can take up to 20 years to produce a new, higher quality, adaptable, disease resistant variety. Newer biotechnological techniques have been created and can be used to more rapidly create new, higher quality varieties but the time required will still be several years until newer varieties, hybrids and clones reach the producer. Specific research areas might include:

- Support to certain quality aspects of the coffee genome project i.e. Identification of ‘quality attribute’ genes within the *C. arabica* species using genetic markers
- Germplasm collection and evaluation for quality attributes
- Renovation of world *Coffea arabica* gene banks
- Coffee Breeding for Enhanced Quality Attributes: Working with origin breeding programs to develop new quality varieties with disease resistance and high yield potential

**Agronomy:** Although the effects of different agronomic practices on yield and pests are very prominent in the literature, very little has been done on the effect of different agronomic practices on coffee cup quality. In addition, because of the huge amount of environmental effects and genotype x environment interaction for agronomic variables, this type research must be conducted in multiple origins at multiple locations in order to develop meaningful recommendations. Illustrative research themes in this area might include the following:

- Determination of ‘best agronomic’ practices for highest cup quality coffees: mulching, organic manure, pruning, etc.
- The effect of soil fertility, spacing, slope exposure, altitude, shade, picking-process time, etc. on coffee cup quality
- The effect of diseases and insect damage on coffee cup quality
- The development agronomic systems for the reduction of major coffee flavor defects and taints
- The effects of ‘crop stress’ factors on coffee cup quality

**Processing:** Dry, semi-pulped, and fully washed processing have significant effects on cup quality. These processes must be reviewed in light of coffee cup quality. Results from research in this area can be used directly by processing centers in respective origin countries for primary processing. Research on dry processing technologies and its effect on quality will be used by dry processors at respective origins. Below are some illustrative research themes in this area:

- The effect of types of yeast and different times in fermentation on coffee cup quality
- The effects of cherry maturation on coffee cup quality
- Effect of processing methodologies on coffee quality
- Evaluation and development of pulped natural processing for differentiated and specific quality traits
- The effect of different drying methods and equipment on coffee quality
- The identification of improved dry and fully washed processing methods and equipment on coffee cup quality
- Identification of defect markers in green coffee so defective beans with taints like potato, etc. can be eliminated.

**Storage and shelf life:** The ability to store green coffee indefinitely without degrading its quality attributes would radically change the specialty coffee industry. Research in this area can and will have rapid and huge effects on the coffee industry. Some research themes in this area would most likely encompass the following areas:

- Basic biochemical engineering research on green coffee
- The effect of new packaging materials for green coffee in storage on cup quality
- The effect of agronomic and processing treatments on coffee quality longevity
- The effect of different storage gas, low temperature, or vacuum regimes on quality and quality longevity

**Appellation development and identification of causal factors determining taste attributes:** Geographical indication leads to higher value-added products through product differentiation based on guaranteed quality; it protects consumers because it provides officially certified information regarding product attributes; and it enhances and preserves the identity and cultural heritage of the region. It also provides a wealth of information and a uniform platform for roasting companies for use in marketing.

The development of coffee appellations is critical for the growth of the specialty coffee industry. Coffee is being increasingly cherished for its diverse and unique taste profiles by connoisseurs and consumers alike. Although light years away from the wine industry, as a beverage, coffee, is remarkably similar to wine and thus well suited for appellation development. It is also through appellation development that research on taste attribute determination can be logically conducted in order to better understand the factors and interactions that produce certain taste attributes. Appellation development also provides a high degree of traceability, back to the farmer, for food safety and quality

remuneration purposes. Finally, this research venue will provide detailed information for roasters to use in their marketing campaigns as well as result in increased understanding of underlying causal factors determining coffee's taste attributes. Some of the possible topics to illustrate how this research might be oriented and conducted include:

- Development of appellation models using GIS and descriptive cupping techniques
- Continuation and enhanced work on the Global Coffee Appellation project
- Taste attribute geographic boundary determination
- The use of physical measurements on coffee quality determinations
- The use of remote sensing in the establishment of appellation systems

**Roasting, packaging, storage, grinding, and brewing of quality coffees:** By the time the roasting company receives their green coffee supply, most of the quality variability has been fixed. Despite low quality variability at consumer destination, final cup quality can be changed radically through roasting, storage, grinding, and brewing variability. Research into different roasting techniques, cooling techniques, machines, packaging gas exchange, storage and brewing methods can have a huge impact on final consumer acceptance of the product. This area of research will produce results in quality improvement for roasting companies and for consumer education programs on buying and brewing specialty coffees. Some illustrative research themes might include:

- New technologies for increasing shelf life of roasted coffee
- Determination of different roasting profiles for accenting specific taste attributes

## **Objective 2.**

*To build the capacity of coffee origin countries to conceive and execute top-notch coffee quality research that will result in increased cup quality from that origin with the goal of creating a self-sustaining, competent, dynamic origin country coffee research institution*

As mentioned earlier, coffee is grown mainly in tropical, high altitude countries around the world. Many of the origin countries producing quality coffee have coffee research programs that are challenged in terms of infrastructure and resources and therefore produce little viable peer-reviewed type research. Some origin countries do not yet have full-time PhD coffee researchers. Others have PhD researchers but no resources to conduct research.

In order to level the playing field, build the capacity of origin countries to conceive and execute coffee quality research that will result in higher quality coffees and premiums paid to growers, the GCQRI will make special efforts to build the capacity of our partner institutions. In this way, not only does meaningful research on coffee

quality get conducted and reaps benefits back to industry, but after 5-10 years of working together in this collaborative mode, the origin research institution matures and continues to conduct research without the assistance and expense of the international institution. This objective has far reaching implications in terms of global sustainability of the coffee industry as it levels the playing field between consuming and origin countries. As such, a large and important part of corporate social responsibility is shouldered to the benefit of origin country development, all the while, meaningful and profit generating technologies are being produced. Key to this objective will be training of origin country scientists through research linkages with the international partner institutions.

### **Objective 3.**

*Outreach and Extension: To ensure that research results are accessible to scientists, growers, processors, importers, exporters, and roasters in order that the research produces the expected productivity, quality and marketing results*

Far too many times, research has been conducted with potential and significant benefits to producers, industry and consumers but simply never leaves the research laboratory or station. In order to ensure that research funded under this program results in industry growth through research results application, several information venues will be used and all existing venues will be linked.

First of all, from the get-go, all research proposals seeking funding from this program should identify their target user groups for information dissemination to those 'primary' users. This may or not require additional funding and will be evaluated during the proposal evaluation process. In this way, the dissemination of research results becomes a responsibility of the researchers and dependant on the type of research.

Although the structure of this objective will have to be vetted among partners, it is clear that the following venues will most likely be used:

- First and foremost the research results need to reach the producer if Industry is going to feel the intended effects in quality and productivity. As such, a tailored 'outreach' program will be developed for each country where the research is conducted to ensure rapid distribution and incorporation of new technologies, varieties, practices and post harvest methods.
- Creation of unique Global Coffee Quality Research Website where all research conducted under this program will be published with some kind of interactive user-researcher platform. This site could then be used by CoffeeResearch.Org and ASIC.ORG to enhance their sites. In addition to quality research funded under this program, the site would maintain a comprehensive and accessible database of all coffee quality research performed through constant database searches, alert systems and word of mouth.

- User targeted bulletins where special research results would be interpreted for respective specific user groups like roasters, E. African producers, dry processors, etc. This might be a color bulletin in native languages for a new organic insecticide or IPM strategy.
- Program Annual Report and Highlights
- Annual user conference where researchers present their results in an industry setting like the SCAA, SCAE, and SCAJ conferences so that specialty coffee companies and other stakeholders can stay updated with all progress and assist in guiding the research for greater impact

### **Expected Program Impact:**

The potential positive impacts of a well conducted and focused global research program on coffee quality and quality coffees are overwhelming.

Although program costs might seem high to some at \$1.5-\$3.5M/year, they represent less than 0.013% of total annual sales of specialty coffee in the US alone. Another way to look at it is to think about only one global research result that might lead to a \$0.05/lb quality premium, e.g. a technology that ensures the preservation of intrinsic quality over varying temperature, humidity and time regimes. If only half the coffee producers received that premium, it would mean nearly a 25% revenue increase for millions and millions of coffee producers worldwide. It would also mean that roasting companies could charge higher prices for a guaranteed quality product for an extended period of time without losing key taste attributes. Using a conservative yardstick, it is expected that the total return to the industry would be several times over that of the cost over the entire life of the GCQRI.

Although theoretical, there are also hundreds of potential technologies awaiting discovery to increase value across the supply the chain, all the while enhancing the experience of the coffee consumer and driving the market for specialty coffees upward.

#### **Producer impact:**

The producer is the steward of coffee quality. Once the coffee cherry has been picked from the tree, the intrinsic quality of the green bean can no longer be improved upon; it can only be either maintained in pristine condition or degraded through the hundreds of manipulative events that occur before the final beverage is produced. As such, the producer must figure very importantly in any benefit from this program. Most of the research to be conducted under this program will be conducted at specialty coffee origins. In order for most research results to have an effect on coffee quality coming from that country, the producer must reap some benefit. Direct monetary benefit through price increases and access to new markets for coffees improved by the research intervention is the most assured way of achieving rapid quality increases. Other indirect ways of benefiting producers come through research that has implications in lowering the cost of production like labor saving technologies. Research capable of significantly increasing producer income that benefits producers will include the themes mentioned under objective one, varietal research, agronomic research and appellation research.

**Roasting company impact:**

Roasting companies will benefit from this program in several different ways:

- Volume increases: The program will result in greater volumes of high quality coffees thus thwarting the impending future shortage. This will occur through 1.) An increase in the proportion of specialty coffee to ordinary coffee at many origins and 2.) An increase in acreage of coffee at many origins since specialty prices will remain somewhat higher and more stable than “C” coffee attracting more producers to grow it
- Product differentiation: Greater and more flavor diverse volumes of coffees will be produced with exceptional quality attributes. As research discovers more and more methods and technologies to produce higher quality coffees, progressive producers will seek to employ these technologies to attract increased prices.
- Marketing information: Increased access to more detailed descriptions of the terroirs and producers of fine coffees and greater and more relevant standard descriptors of those coffee profiles. Although most of these results will come through the development of coffee appellations and events leading up to those developments, increased interaction between roasting companies and host country research institutions under this program will also tend to expand the roaster’s knowledge base for use in marketing campaigns and other consumer driven demands.

**Consumer impact:**

Consumers are the ultimate beneficiary group and the market driver. The rapid growth of the specialty coffee market is largely due to consumer demand for high quality coffees. Consumer awareness and appreciation of quality traits continues to grow and to become more refined. Coffee origins are now known and certain flavor attributes are increasingly becoming recognized and associated with different origins. Just like the wine sector, consumers will continue to seek finer coffees with greater, more defined taste attributes. The research conducted by this program will produce higher volumes of higher quality coffees and thus provide consumers with greater knowledge, choice and volume of those coffees they seek.

**Program Partners:**

The program intends to involve all coffee origins in some way or another. There are 34 producing countries of arabica coffee. Of those, 28 are experiencing significant challenges in maintaining or developing their coffee research infrastructure. This program intends to assist the 28 countries develop their capacity through partnering with those coffee origins and international research institutions where research infrastructure is strong and vibrant.

Key partners in building and implementing this Global initiative are illustrated below:

**Champion Institutions:** These institutions will be responsible for the development of the Global Plan and for the coordination of the program.

- The Specialty Coffee Associations of America, Europe and Japan
- The Norman Borlaug Institute for International Agriculture
- CIRAD

**Lead Institutions: International collaborating institutions who have strong coffee research programs or Horticulture, Engineering and Agronomy departments with experience in similar quality issues on taste attributes in food industries:** These institutions and others who express interest will be responsible for linking with challenged origin country institutions to conceive research proposals under the global plan and conduct the research in a collaborative mode with the less challenged origin institutions.

- Indonesian Coffee Research Institution
- The USDA Coffee research program in Puerto Rico
- CIRAD
- EMBRAPA-Brazil Agriculture Research
- The Colombian, Guatemalan and Costa Rican Coffee Research Institutions
- The Indian Coffee Research Institution
- CIAT and other interested IARCs
- US Land Grant and other Global Universities and Research Institutions

**Origin Country/Regional Institutions:** These institutions will be either lead or host institutions for the conduct of research under this program.

- Anacafe
- CATIE
- CIAT
- ZAMARANO
- CENECAFE
- The Kenyan Coffee Research Institute
- ASARECA Coffee Research Network
- Other origin country coffee research institutes in Africa, Indonesia, India and Latin and South America
- EAFCA

**Other International Institutions:** These institutions will normally be involved in the conception and some of the execution of the research as appropriate.

- The International Coffee Organization
- ACE
- ASIC
- CQI
- International Agriculture Research Centers, IARCs, like CIAT in Colombia



- CAB International
- NCA
- SAG
- COSIC

## Observations on coffee supply and coffee quality research:

**Coffee Cup Quality:** Coffee quality is determined by a host of factors including soils, altitudes, exposure, origins, variety, tree husbandry, cherry maturity, and a plethora of post harvest factors including processing methods, storage methods, and shelf life in green form. Once the green bean ends up at roasting companies in consuming countries, virtually all of the intrinsic quality variability has been fixed. A roaster can not 'add' quality to the coffee; she can only 'preserve' it and present it to consumers in its best 'state'. A roaster can accent certain taste attributes and placate others through roasting skills and art, but she can not change the intrinsic quality of the green bean that was preset in the country of origin from where it came.

Coffee quality is not a subjective variable but can be quantified and thus objectively evaluated. And because quality can be quantified, it can be used as the dependent variable in scientific research designed to improve quality which forms the basis of this proposal.

**Measuring Quality:** The SCAA developed the industry's first quantitative coffee quality scoring method in the early 1980s which has become the industry standard around the world in some form or another. The method involves standardized procedures for green coffee preparation, roasting, brewing, and tasting. Taste is broken into five categories: Aroma, Body, Acidity, Flavor, and Aftertaste. Each category has a scale from 1-10 and the coffees are judged based on the cupper's score in each category which are then averaged to fit a 100 scale. Coffees cupped by experienced industry professionals receiving scores higher than 80 are generally defined as specialty coffees. Coffees scoring between 70 and 80 are considered to be premium coffees and coffees scoring under 70 are considered traditional or commercial grade coffees.

The Coffee Quality Institute ("CQI") has built upon the SCAA standards by extending them worldwide through origin cupper trainings and by development of their Q Coffee System for establishing independently verified quality scores for discreet lots of coffee.

The Alliance for Coffee Excellence ("ACE") has also established a successful set of cupping protocols widely used at origin for the Cup of Excellence® ("COE") competitions to identify and market the "Best Of" coffees from many important coffee origins.

Whereas some specialty coffees are bought and sold outright based upon their quality scores, most specialty, all premium, and all commercial grade coffees are sold based on the international commodity board "C" market price. The "C" price is typically modified up or down through the application of a 'differential' which is based primarily a subjective reflection of the coffee's intrinsic quality and its relative supply versus demand.

Although the SCAA/CQI or ACE/COE scoring tools are very useful for quantifying quality, newer descriptive methods, borrowed from other food and beverage industries, are being investigated for even more refined quality measures which will be very useful for research purposes. Indeed, in order to improve quality, it must first be defined and the components of quality understood through scientific research.

**Coffee Quality Research:** Amazingly, when the key words ‘factors’, ‘affecting’, ‘coffee quality’ are used in a universal academic database search seeking research conducted relating to coffee quality and factors affecting it, only 62 articles are found. Different key word configurations can yield different numbers of research papers but no search configuration produced more than 200 research papers which is astonishingly meager for a multi-billion dollar industry that depends on that variable.

The Borlaug Institute is in the process of conducting a comprehensive quality coffee literature review of all coffee quality research conducted from all over the world. In general, this review reveals three important facts that underline the general thesis of this proposal:

- There is frighteningly little research conducted on factors affecting coffee quality with the aim to improve or sustain that quality.
- Of what research there is, it can be seen very clearly how it can be used to increase and sustain coffee quality to the benefit of growers, processors, roasters, and consumers.
- The lack of unbiased, low error, universal industry quality standards and evaluation procedures hinder inferences made from quality research and therefore must be addressed as a priority.

Because of the youth of the specialty coffee industry and its disparate nature, there has been precious little R&D conducted on coffee quality. In addition, governments typically invest in research on commodities that yield benefits to the producers of that commodity in that country. However, because there is little coffee produced in the industrialized-consuming world, governments of industrialized-consuming countries have not invested in research on coffee. On the other hand, most of the countries that do produce coffee are poor and have not invested significantly in coffee research. Richer producing countries like Brazil, Vietnam, Colombia, and a few others have made investments in research but mainly to increase productivity since higher yields mean higher returns to farmers and to the country’s foreign exchange earnings. Very little research has been conducted on factors affecting coffee quality. The time is upon us now to embark on the resolution of this situation through the creation of a global research program, driven by industry, to increase the volumes of quality coffee needed to grow and sustain the industry.

## **The Way Forward:**

This concept and proposed program will be presented at the SCAA Symposium on April 15<sup>th</sup>, 2010. It is anticipated that some Genesis Funding will have been committed before the Symposium with the remainder sought during and immediately after the Symposium. This

funding will allow the Borlaug Institute and key industry stakeholders to develop the Global Plan and simultaneously seek and structure long term program funding. Actual research program implementation is expected to begin sometime before June 2011.