MISSION

Grow, protect, and enhance supplies of quality coffee while improving the livelihoods of the families who produce it.

IMPACT AT SCALE

WCR invests in and advocates for agricultural R&D ***to increase productivity and quality*** to contribute to the ***economic sustainability and climate resilience*** of coffee farmers. Economic and environmental sustainability are critical dimensions of sustainable livelihoods. Agricultural R&D investment, particularly variety improvement, provides impact across these dimensions at scale. Through partnership with the broader coffee community, WCR's inclusive design principles ensure innovations are ***relevant and deliver value for a diversity of farmers*** including women, men, and small and medium sized land holders.

HOW IT WORKS AND WHY IT'S URGENT

> *"Rising agricultural productivity has driven improvements in living standards for millennia. Today, redoubling that effort in developing countries is critical to reducing extreme poverty, ensuring food security for an increasing global population, and adapting to changes in climate."* —*Harvesting Prosperity*

WCR seeks to provide the greatest possible return on investment and value at a global scale. Our impact statement explains how the first half of WCR'S mission, achieved through strategic investments in agricultural R&D (and particular variety improvement) delivers against the second half—livelihood improvement—at scale.

How does enhanced productivity advance the economic sustainability of coffee farmers?

Productivity is the value of output relative to the cost of production. Improved productivity means you have achieved greater output value per unit cost. As an example, if a farmer has a rust-resistant variety that allows them to forgo spraying with fungicides, they may be able to produce the same amount of coffee for a lower cost (greater output per unit cost). Therefore, they will have higher productivity. The most common inputs for coffee farmers are labor to manage the crop and harvest (their own family labor or hired labor), nutrition for their plants (compost or fertilizer), and chemical sprays to control pests and disease. If a farmer can use fewer inputs to produce the same amount of coffee, or use the same inputs to produce more coffee, s/he will have improved productivity. Farmers with higher productivity can weather low price environments much better than lower productivity farmers; low productivity farmers not be able to cover their costs in low price environments, frequently leading to increased debt and/or a departure from farming.

For an export/cash crop like coffee, improved productivity is often directly correlated with ***improved income***, whether it's from lowered cost of production, increased production (e.g., more coffee to sell), or labor savings that allow the farmer to pursue other income-generating activities. For very poor farmers, higher incomes contribute to ***food security***. For more advanced farmers who are food-secure, improved productivity provides the income needed to invest in farm management and renovation, which enables taking advantage of upside opportunities in normal or good years. During high price years, more productive farmers can ***accumulate savings*** since their revenues more than cover their costs; while in low price years more productive farmers can meet their costs and ***avoid debt***. For all farmers, improved productivity therefore contributes to ***economic stability***, which is a critical dimension of ***sustainable livelihoods***.

> *"Handling rust costs the equivalent of one-fifth of my production per hectare. The only way you can pay the cost is with high productivity. If you have low productivity, it will wipe you out." — Farmer Luis Pedro Zelaya Zamora, Coffee Rust is Going to Ruin Your Morning,* The Atlantic

In particular, improvements to "total factor productivity" are driving agricultural growth globally—improvement in TFP accounted for over two-thirds of agricultural growth from 2001 to 2015 (up from 20 percent in the 1960s), and nearly 60 percent of the agricultural growth in developing countries.

> Rather than increasing agricultural output by expanding the amount of land, water, and input usage, most agricultural growth today comes from increasing total factor productivity productivity (TFP) of these resources, or the efficiency with which these inputs are combined to produce output by using improved technology and practices. TFP is a more complete measure of technical and efficiency change in an economic sector. It represents how "knowledge capital," or the application of new ideas (embodied in new technologies and production practices), contributes to growth. TFP growth is especially important for agriculture and its sustainability, given that the supply of land is inherently limited and use of

> labor or further expansion has an enormous environmental footprint, and use of labor and capital face diminishing returns. —Harvesting Prosperity, p. xxii

How does increased productivity lead to increased climate resilience?

For individual farmers, improved productivity year-on-year allows farmers to have greater climate resilience in two ways. Improved productivity contributes to higher incomes that allow farmers to accumulate savings in good years and reinvest in other economic activities or on the farm (irrigation, planting shade, or renovation with more climate resilient varieties, etc.). This allows farmers to ***insulate themselves against climate-related shocks and disruptions***, for example extreme or multi-year droughts, advancing pests/disease, flooding and landslides, etc.

At a regional and global scale, higher productivity also means producing more coffee from less land overall, ***avoiding land-use conversion and deforestation***, which are the major contributors of coffee agriculture to climate change (globally, land-use conversion contributes 20-25% of global carbon emissions [*Creating a Sustainable Food Future*]). Improved productivity is critical for reducing the harmful effects of land use change in coffee agriculture (mitigation). Improved productivity is therefore essential for both adaptation and mitigation of climate change.

> *"If today's levels of production efficiency were to remain constant through 2050, then feeding the planet would entail clearing most of the world's remaining forests, wiping out thousands more species, and releasing enough GHG emissions to exceed the 1.5°C and 2°C warming targets enshrined in the Paris Agreement—even if emissions from all other human activities were entirely eliminated." —Creating a Sustainable Food Future*

How does improved quality advance the economic sustainability of coffee farming?

The focus of WCR is on quality improvement at the variety level, which provides distinct opportunities in lower capacity environments. (In higher capacity environments, these varieties would also outperform others.) Improved varieties produced widely in a region can contribute to regional differentiation, ***enabling especially farmers with lower capacity to receive price improvements*** because the region itself will fetch premiums. High quality varieties allow farmers to grow a product for which they have ***confidence there is market demand***, which can be the context in which postharvest handling systems start to form to allow for additional differentiation of the product.

While postharvest handling of coffee can have significant effects on quality and price, the ability of farmers to capture economic returns from these types of improvements require that they have access to systems that enable the segregation and maintenance of quality-differentiated coffee at origin (e.g., good roads, accessible and high-functioning mills—all of which vary greatly by country). Otherwise, high and low quality coffee may be commingled at aggregation points and the opportunity for a differential will be lost. Additionally, improved post-harvest handling practices can incur significant increased costs to achieve (for example, labor for selectively harvesting only red cherries), which can

exceed the price premium. Post-harvest quality improvements are critical to advance economic sustainability goals in coffee, but variety improvement is a ***rising tide that lifts all boats***.

How does agricultural R&D investment, particularly variety improvement, provide economic and environmental sustainability impacts at scale?

Across an entire economy, R&D is critical for driving economic transformation at scale, meaning it can ***impact millions of farmers***. The potential for transformational impact is highest in low-income countries where there are many more smallholder farmers. There is widespread global agreement that increasing agricultural productivity of food crops is the essential instrument to promote development in low-income agriculture-based countries. In exported cash crops, export revenues generated from coffee exports offer highly indebted countries the opportunity to use those funds to import capital goods to catalyze growth in other segments of the economy.

> *"Growth in agriculture reduces poverty more than growth elsewhere in an economy, especially in countries in the earlier stages of structural transformation…. This is because growth in agricultural productivity leads to higher incomes, promotes nonfarm jobs, and enables people to move out of agriculture over time." —Harvesting Prosperity*

The large-scale economic benefit of agricultural R&D investments in coffee are achieved precisely because successful farmers become more productive, and less successful farmers transition out of coffee farming and move off the farm to pursue other opportunities, including greater opportunities working along the coffee value stream (logistics operators, warehouses, etc).

Coffee has the potential to be a key ***driver of economic transformation in a number of low-income countries, in particular in east Africa and Asia, where there are millions of smallholder farmers*** who stand to either benefit or exit from coffee production (in Latin America, those transitions have mostly already occurred yet pockets of poverty continue—non-agricultural R&D will be required to address poverty in these communities). Given the economic structural transformation that will come to many coffee producing countries in the next 10-15 years, strengthening national breeding program capacity to produce new, more productive, climate resilient varieties is paramount to the long term sustainability of the industry dependent on these origins.

Why is variety improvement the best investment for economic and environmental sustainability impact at scale?

For a global organization like WCR, variety development is resoundingly the most strategic investment.

First, crop varieties are ***an essential source of resilience against shocks and stresses***—such as drought, high heat or disease—for lower-resource farmers. Improved varieties can allow farmers who are unable to implement other management options to save their crops. For example, if there is a significant drought and farmers can't irrigate because water is being conserved for direct human use, trees with drought tolerance will survive to produce the following year and the farmer won't lose

his/her economic assets. In a severe leaf rust epidemic, a farmer who is unable to afford fungicide may lose all or most of their harvest for multiple years; but a farmer with disease resistant plants will survive the shock.

Beyond merely helping farmers to survive shocks, varieties are also critical to helping farmers become and remain successful through increased productivity. To improve yield, farmers first need to optimize inputs and management practices, then increase productivity through genetic improvement (e.g., better varieties). Varieties can offer high yields and provide stable performance in many production areas thus ***can be rolled out at scale across a country*** (a hallmark of improved varieties is the selection of candidates that perform well across multiple environments). The agronomic management of coffee is highly localized and research/recommendations on optimized interventions will necessarily be more tailored to regions within a country. Once agronomic management is optimized, as in agriculture in industrialized societies, ***productivity increases over the long term rely on the continual creation of new coffee varieties*** that can produce more coffee with fewer or a fixed level of inputs. With greater wealth in the coming decade, more farmers will optimize their farm management. Continued success after agronomic optimization will be through new varieties. But because variety development is a 10-30 year process, it is urgent that coffee producing countries build stronger breeding pipelines now to assure their future competitiveness and sustainability.

> *The generation and dissemination of new technologies [is the most important driver of productivity growth], which requires stepping up national research efforts. Yet, in many of the poorest nations, a serious research spending gap has emerged precisely at the time when the challenges faced by agriculture are intensifying." —Harvesting Prosperity*

How does inclusive design ensure innovations are relevant and deliver value for a diversity of farmers?

Involving the users of new technology in its design is called inclusive design. It is contingent on including not just the most visible or easy-to-access users, but users who are broadly representative of the full spectrum of users. At WCR, this includes both sets of "end-users": farmers—men and women, and small and medium land holders—as well as roasters. Inclusive design ensures relevance. Varieties designed with the input of those who will be both growing the plants and roasting the beans are much more likely to respond to the needs of those end-users than varieties without this input. ***Varieties that respond to farmers' and roasters' needs are more likely to deliver value and benefits to their users.*** Inclusive design also leads to both ***trust and stability***—when a farmer knows that a variety is demanded by buyers, and when buyers know that a variety meets farmers' needs—both sides are more likely to feel secure in their transactions.

What are the (inevitable) caveats?

No single organization can create the kind of change required to truly make coffee sustainable in the coming decades. There is much work to be done -- on enhancing national R&D programs; removing regulatory and policy bottlenecks to variety innovation and adoption, natural resource conservation,

and agricultural development; increasing investment; and expanding access to farmer training, credit, and risk-management tools, among other things. Coffee agricultural R&D efforts need to be placed within a context of comprehensive agricultural, rural, and structural transformations. The kind of broad impact sought by the industry, by coffee nations, by farmers, and by consumers will depend on intensely collaborative, interlinked activities from the private sector, governments, and civil society—of which industry-driven, precompetitive coffee agricultural R&D will be one urgent, essential part.