

Andrew Sanchez  
Carmel High School  
Carmel, Indiana  
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### **Advanced Perspective on Diverse Improvement of Ethiopian Infrastructure**

Ethiopia is the fourteenth largest nation in the world, with an approximate population of 102,374,044. 80.8% of the population is rural, and inversely 19.2% of the population is urban. Ethiopia has a Federal Parliamentary Republic, meaning elected officials represent specific districts. Of Ethiopia's total land, the government estimated that 15 percent was under cultivation and 51 percent was pasture. Principal crops include coffee, pulses, oilseeds, cereals, potatoes, sugarcane, and vegetables. The main exports from the country are gold and the aforementioned coffee (A to Z World Culture). The average Ethiopian farmer holds 2.9 acres of land, compared to the 430 acre average in America (Teshome). Geographically, Ethiopia is best described as a high plateau with a central mountain range divided by the Great Rift Valley. In regards to climate, Ethiopia experiences tropical monsoons with wide topographic-induced variation.

The average household size is estimated to be 4.8 persons (DHS Programming). Over two-thirds of all housing units were constructed of wood and mud. It has been estimated that 89% of the total population reside in substandard housing (Encyclopedia of the Nations). In Ethiopia, foods most consumed daily include millet, specifically a unique variety called teff, sorghum, and plantains. Some animal-based proteins are accessible, but the vast quantity of Muslims and those practicing the Ethiopian Eastern Orthodox religion have introduced dietary restrictions derivative of their religious practices, limiting their consumption of the aforesaid protein source. Nearly all of the consumed food in Ethiopia is produced domestically (A to Z World Culture). Additionally, food is mostly prepared according to Halal practices, derived from Islam. Food in urban areas remains scarce, as poor infrastructure dangerously limits farmers food-transference capabilities. Staggeringly, almost 80% of Ethiopia's population remain employed in the agricultural sector. The average annual salary is 69,810 Ethiopian Birr or 2,455.12 USD (Addisstandard). Primary schooling or education from ages 7-14 in Ethiopia is free, but covering the associated school expenses must be done by individuals. Many Ethiopian families struggle to afford even these costs. Even parents who are financially capable of paying for public education often choose not to enroll their children, the basis of which being a reluctance of removing a potential laborer from the farm. Although government funded, the health care service sector has chronically suffered as a result of severe deficiencies in staffing, budgets, and machinery. The government recently conceded that nearly 85% of rural inhabitants lacked access to adequate healthcare, citing a massive shortage of physicians as the primary influencer. Naturally, affordability issues become irrelevant if access to medical services proves severely lacking, as is the case in Ethiopia (Export.gov). Generally, Ethiopia has a large, predominantly rural, and impoverished population with poor access to safe water and sanitation. Improving telecommunications was not prioritized by the government until recently, and even with renewed efforts, coverage in the nation is mediocre. As for electricity, 42.9% of the population has access, and this number is rapidly improving. Access to electricity improved 300% in the last decade, with the most rapid growth taking place last year (The World Bank). A multitude of factors creates significant barriers which result in many typical families lacking necessary nutrition. As a landlocked country, Ethiopia is exceptionally susceptible to drought. Ethiopian farmers often use primitive pre-Green Revolution farming techniques which dramatically lower yields and inevitably deny people access to nutritious food. Finally, inconsistent food transportation methods mean even limited food miles result in spoiled, wasted food (University of Pennsylvania).

According to the U.S. Department of State's Country Commercial Guide, Ethiopia's surface and transport infrastructure are exceedingly weak and underdeveloped. Additionally, internet access or telecommunications in Ethiopia remains consistently underfunded and has poorly penetrated the population, with only an estimated 15.4% of the population capable of reliably accessing the Internet. The current Ethiopian administration has implemented several infrastructure improvement plans; however, they prioritized improving roads, as well as renovating airports; with the objective of which being encouraging tourism. Plans to improve renewable-energy sources exist in the form of the construction of a dam, but little haste has been allocated towards improving internet access. Persistent droughts and the nation's subsequent actions have reduced the government's priority of addressing infrastructure issues. Additionally, valuing tourist based infrastructure plans may benefit the nation's net infrastructure, but the real issues faced by rural civilians may be ignored (World Bank).

If a rural family is unable to grow the necessary crops for a year's supply of food, their relative isolationism and lack of external income limits their ability to acquire the food they need. Urban populations often are not provided the necessary amount of fresh produce as a result of poor roads. A direct result of poor infrastructure, hunger, is indiscriminate in regards to gender. Sickly elderly experience more anguish from a lack of food than younger populations. Lack of nutrition, especially in small infants, is well documented to stunt growth and this is no different in Ethiopia. The U.S. Agency for International Development estimated that 38% of children under the age of 5 suffered from stunted growth, and 24% of all children are undernourished. Those of a certain socio-economic status nearly all suffer at an equal rate. What this means simplified is minorities, and indigenous people will be affected by food scarcity equally and dependently on their financial status. Refugees, however, are almost all of a middle to lower socio-economic standing, and as a result often suffer disproportionately in regards to the rest of the population. Poor infrastructure has little discernible impact on the environment.

The proposed solution would result in Ethiopia auctioning off its exclusivity rights to telecommunications, then using the subsequent profit to improve road infrastructure and create a direct-message platform that allows farmers to communicate directly with the government, access useful farming information and apply for micro-grants for improving land in the form of tax breaks. Implementation of this solution solves many issues in the nation, however, at its most fundamental level, it increases access to food, increases internet access, and ultimately protects food security. Firstly, in order to increase telecommunications and internet access, the privatization of the telecommunications industry is necessary. The Ethiopian government has complete control over the single telecommunications company in the nation currently. Allowing a foreign, or domestic entity to control telecommunications, earning the right to do so after outbidding other companies, would allow the government to spend newly acquired funds on other infrastructure projects. This inflow of capital would lead to the development of a direct-message styled platform for farmers and the government, and this has three key advantages. Firstly, the open flow of information would allow the government to better understand the current status of annual crop yields, and better plan based on this information. An accurate understanding would provide invaluable for the government, and enable them to react in the instance of famine or other crisis accurately. Secondly, for farmers, a plethora and consistent access to cutting-edge technology, and more potent knowledge will indefinitely increase crop yields. Currently, the agricultural practices of many areas are incredibly primitive, mostly in regards to monoculture products. Increasing farmers' knowledge of modern practices would likely prove infinitely valuable. The government would initially educate farmers about agricultural practices such as crop rotation and integrated crop and livestock. By rotating crops, farmers reduce the strain on their soil, consequently increasing its vitality and boosting crop yields. Integrating livestock and crops would also benefit the soil. Natural fertilization results from animal interaction with plants, and Ethiopia has a massive grazing animal population. Introducing integrated fields further increases crop yields and is highly attainable with the implementation of an educational medium. Through the use of electronic communication, the newfound government agencies responsible for educating farmers would be able to reach even the most

rural benefactors. Finally, direct communications enable The Ethiopian government to provide extra-income to farmers to improve their lands. The Ethiopian government owns all of the land used by farmers, and as a result, farmers pay taxes on land every year. The government would allow citizens to spend tax money on agricultural improvements, such as new irrigation, machinery, or even barbed wire in order to modernize agricultural practices. This new internet-based service would only increase in the magnitude of impact as time passes, as the telecommunications industry would rapidly expand under the management of an organization that concentrates on its growth.

The second necessary infrastructure project standing proposed is improving roads and transportation. In Ethiopia, this can be accomplished by increasing the consistency of roads and increasing the means by which to transfer food, or more directly the functioning capacity of the trucking industry. For roads, the implementation of warm-mix asphalt, as opposed to hot asphalt, would greatly benefit Ethiopia's infrastructure. Hot asphalt is usually prioritized because of its resistance to rainfall; however, Ethiopia receives low annual rainfall, meaning hot asphalt is not a necessity. Warm-mix asphalt is around \$3 more expensive per ton; however, it only must be heated to half that of hot asphalt when placed. This initial \$3 loss is recuperated when factoring in energy costs. Warm-mix asphalt is also more durable than hot asphalt, is better for the environment, and safer for workers because of its less extreme heat, and limited fumes (Rodriguez). For trucking capacity, subsidizing the trucking industry as a government infrastructure entity, or allowing trucking companies to receive significant tax breaks and interest-free loans would increase the capacity of the trucking industry. The government could also, or alternatively offer free trucking license classes. By doing so, more truckers will be employed, rendering the nation more capable of transporting food from farm to destination. Traditional issues of food transportation are best addressed by reducing food miles, or the distance food travels before consumption. Increasing crop yields has a direct, linear impact on decreasing the distance food must travel, so the aforementioned proposition also solves these issues.

Implementation of this plan is heavily reliant on the government of Ethiopia. Firstly, a willingness to surrender the exclusivity rights of telecommunications is fundamentally crucial to this plan. Increasing internet access is discretionary to the purchasing company, but the economic opportunity will prove to be enough stimulation for action. After this, Ethiopia must properly allocate its newly acquired resources, as underfunded programs would be crippled in terms of productivity. The benefit of Ethiopia's exclusive control, however, is the government is responsible for managing all improvements. Maintaining liability of improvements enables Ethiopia to act in its interests, as opposed to a potentially bias international organization. The government is encouraged to contract Ethiopian companies, and by doing so financially benefiting Ethiopian companies and individual citizens. Community members, specifically farmers, also massively factor into the success of the proposed plan. Communications between the government and farmers are two-way, meaning farmers must demonstrate an alacrity towards interacting with the government. Mentalities of lifelong subsistence farmers could prove difficult to change; however, they are malleable for two reasons. Firstly, a single farmer in a community receiving increased crop yields as a result of communicating with the government would incentivize its adaptation by other farmers. Secondly, historical precedent demonstrates that younger generations are more willing to adopt new technology. Therefore, the younger farmers and the next generations of farmers would likely have no pronounced stigmatization against technology. One realistic criticism for this plan is questioning if low-income farmers would spend money on phones. Saylor '16 addresses this problem, however, by demonstrating that people in developing nations acquire cell phones and other technologies for two reasons. Firstly, she states, they view cell phones as a necessary tool for business, but also survival. The proposed solution in Ethiopia would only exaggerate this perception. Secondly, she states that electronics pricing, particularly cell phones, are more competitive in developing countries as opposed to developed countries. When considering these two facts, the criticism that farmers would not purchase cell phones can be largely ignored. Mexico's diversified approach to infrastructure may be a good model to base Ethiopian growth on, albeit changes must be made. Mexico, over the last few years, has auctioned

exclusivity rights to gas and oil exploration fields. This has massively increased infrastructure funding in the nation, with the government pledging to add \$600 billion to infrastructure projects over the next few years. This plan demonstrates the effectiveness of auctioning off government entities, and the possible return<sup>22</sup> a government can expect to receive from implementation of a similar plan. Mexico's primary areas of focus for infrastructure improvements include energy and roads (Ochoa). Ethiopia would invest the subsequently gained funds differently, but Mexico still serves as an appropriate benchmark for Ethiopian improvements.

Funding for these improvements would be provided via the transfer of previously government sanctioned business to the private market. Empirical data supports the effectiveness of this plan. China's government-sponsored investments totaled nearly \$200 billion in 2011 when adjusted for inflation in Africa alone. Of these investments, 90% went towards infrastructure projects (Wolf). Historical precedent exists, and the control over a massive and rapidly growing market such as Ethiopia would prove enticing and likely warrant a sizeable investment from a foreign entity. In regards to the fiscal implementation of this plan, the actual majority of the expenses would not be on app development, with experts estimating it would only cost around \$50,000-\$60,000 (Shah). Instead, resources would be spent on the creation of a government branch responsible for the management of the communications with farmers, as well as ensuring information flow through the app remains consistently updated. For the implementation of warm-mix asphalt, specialty machines are required to pour the asphalt. The government has multiple options to incentivize companies to purchase these new machines but should choose a plan that results in the exclusive usage of warm-mix asphalt. Holistically, the proposed solution would be highly sustainable for the country. Firstly, the two proposed agricultural solutions, crop rotation, and crop-livestock integration are both sustainable, as neither warrants the use of chemicals or intensive agricultural practices. Warm-mix asphalt is similarly beneficiary as its general properties result in fewer energy resources being devoted towards roads. The limited fumes associated with warm-mix asphalt means less toxic chemicals dispersed in the atmosphere.

Nine million. That is the approximate worldwide annual death rate for hunger. Of these 9 million, 99% are estimated to live in developing nations. These numbers serve as a powerful reminder that even in an era of unprecedented technological and human achievement, an incomputable amount of real people still suffer and die. As individuals, it is each human's moral responsibility to desire positive change; however, many lack the opportunity to do so. The Ethiopian government is capable of radical change through which tangible impacts will manifest, the attainment of these benevolent repercussions exclusively relegated to the fulfillment of the above proposition. To vanguard the prosperity of Ethiopia's untold posterity, this plan serves as the transcendent advantage. As a government, Ethiopia's only true obligation is to its citizens, and strict guidance to the plan delineated above will satisfy the government's eternal covenant with its populace.

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