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Zambia, Factor 20: Farm to Market

Zambia: Improving the Transportation Infrastructure through the use of Recycled Materials

Zambia, a landlocked country in East Africa, is known for its parks and safari areas filled with wildlife. Of the 15 million people that live there, the average family consists of about five people, half of which are children under the age of 15 (“Zambia Demographic and Health Survey 2007: Key Findings”). In the average household, about 52% of the family’s income is spent on food, 2% on healthcare, and 11% on education. The minimal percent spent on health care is due to inadequate funding for hospital maintenance and medicines, particularly those for AIDS, so most people do not have access to satisfactory hospitals. Little is also spent on education because both rural and urban families find it difficult to afford the fees of attending school, and some children do not attend school because of their chore and field work obligations (“Zambia”). It is more important for them to help on the field than attend school because it’s free labor for the family. The 52% of the income that is spent on food is typically spent on nshima and mealie meals, which are both staple foods made from corn (“Zambia”). Cereals make up almost two-thirds of Zambia’s diet, which makes it vulnerable to climatic shocks (“Republic of Zambia”). There is an obvious correlation between the quality of growing seasons and the amount of food available to families.

Subsistence farming, which is producing only enough to feed those who work on the farm, is still a common method of farming in Zambia (“Subsistence Farming”). Of the 3.4 million people in the work force, 85% of Zambians are subsistence farmers (Aregheore). They produce only enough to feed their family, but if there happens to be a surplus, they may trade or sell their goods at the market (“Subsistence Farming”). They grow staple crops such as maize, millets, and sorghum (Cameron). Most subsistence farmers clear, toil, and harvest their goods by using pointed sticks, hoes, or their hands, if they do not have access to large domesticated work animals. For example, a clearing technique that is used is known as “slash and burn,” where brush in plots of farmland is cut down and then the debris is burned once it dries, and the leftover ash is used as a natural fertilizer (“Subsistence Farming”). If subsistence farmers have access to large work animals, they often use oxen to plow. Then once the crops are seeded, they depend on the rain because there is no infrastructure for an irrigation system (Quinn). This is why farmers in Zambia are more susceptible to climate conditions and less likely to have a surplus than farmers with more updated equipment. With poor weather conditions, subsistence farmers can experience scarcity and even poverty because their lifestyle depends on how well their crops do. Many subsistence farmers have not adapted to new ways of farming because they cannot afford to upgrade from primitive techniques, and they don’t have proper technology to get information about new techniques (“Subsistence Farming”).

The other form of agriculture in Zambia is for commercial production, the main crops being tobacco, cotton, sugar, and wheat. In recent years, there has been an increase in large-scale commercial farms (Cameron). Their main purpose is to produce crops for sale and export. One reason why they are not as common as subsistence farms in Zambia is because commercial farming is typically found in advanced industrialized nations. There are six factors for this type of farming: location, climate, raw materials, market forces, labor, and transportation (“Commercial Agriculture”). Commercial farms move their products to market, so they need to be located by transportation systems. The climate determines what crops are grown, and the raw materials are important in producing the crops. The selling of crops is dependant on the market forces, or the supply and demand. Different labor is needed on the farm, such as planting crops and harvesting them. Lastly, transportation is needed to move agricultural products (“Commercial Agriculture”).

Zambia has great potential for agricultural development; the country's conditions support a variety of crops, which gives it the opportunity to become one of the leading agricultural suppliers in the region, yet it continues to perform far below its expected potential (Cameron). The arable land covers 47% of the country's total land but only 15% of it is under cultivation. This is due to geographical reasons, such as arable land being located far from where infrastructure is developed or where irrigation systems are in place (Aregheore). Additionally, yields have not been increasing since the 1980s, and then in the 1990s they began to reduce due to low levels of precipitation (Kimhi and Chiwele). Because of the out-of-date techniques farmers used, the problem worsened. The consequences of these declining trends include the decline in farm incomes and the deterioration in food security, both worsening rural poverty to where now over 70% of Zambians live in poverty. Agriculture is the main source of income for the rural population; with the unemployment rate of around 50%, agriculture has become not only one of the few sources of income, but a means to which families are fed (Aregheore).

Since it's a landlocked country, transportation is important for the haulage of goods in Zambia, but especially in remote areas, farmers find it difficult transporting their produce to the market, causing most perishable food such as tomatoes, onions, leafy vegetables to rot away ("The African Farmer: Problems facing Agriculture"). Transportation is not only important for delivering produce, but it's important for importing materials such as pesticides and fertilizers (Hanzawa). Even for subsistence farmers, who don't usually need to transport their produce, transportation is important for access to information and economic development. There is an obvious relation between the quantity and quality of transport infrastructure and the level of economic development (Rodrigue & Notteboom). Also, in order to diversify the economy away from mining, Zambia has started developing farm blocks ("Zambia's Challenges). One of the things they can be sustained by is good roads. Farm blocks provide jobs and are important to the economy, so it is important to sustain them by improving the road systems.

In Zambia, there is an estimated 2,000 km of main roads, plus access roads that link main roads. Access roads are the roads that transport produce from farms to the market (Mulenga). Importing and exporting greatly depends on these roads, which is why it is important to improve their condition. One reason roads have worsened is because of the overloading of trucks (Meeuws). Overloaded vehicles combined with lack of road maintenance causes higher vehicle operating costs, higher transportation costs, and longer traveling time (Mulenga). The roads and vehicles are linked; the overloading of trucks affect the conditions of roads, and in turn, the poor conditions of the roads cause wear and tear on vehicles' tires. Also, because of the quality of the roads, transportation cost is high, contributing up to 60% of the cost of certain materials (Meeuws). This has caused the economy to suffer greatly for both its external and internal trade.

In 1994, the National Roads Board was established to finance the maintenance of roads. The main role of the NRB is in managing and determining how Road Fund money should be spent to make sure that the money spent benefits the road user (Jhala). The urban and main roads receive 60% of the disbursement for road maintenance while access roads only receive 40% (Meeuws). The problem with this is that the access roads are the ones used to transport materials, not the main roads. Under the budget guidelines, priority is given to maintenance of roads in good or fair condition. Second priority is given for emergency repairs to arterial roads that are in bad condition but are necessary to fix to improve accessibility (Jhala). The strategy used by the National Roads Board is to improve and maintain a network of priority roads over a 10 year period. Instead of spreading the limited resources, the NRB has chosen to focus on certain roads because they believe it will have a bigger impact. To bring the roads back to a maintainable state and keep them in good condition, it is costly; maintenance costs alone are estimated to be between \$40 million and \$90 million (Jhala). Unfortunately, funding of road maintenance has not been as consistent as expected. A large portion of the Road Fund has been used for the financing of rehabilitation works in Lusaka City instead. Evidently there is a cultural problem, so the NRB plans on tightening up contract administration and monitoring programs to screen out future contractors who are not interested in

performing (Jhala). This cultural problem may be due to the fact that contractors find other beneficial investments, so the importance of improving Zambia's road systems should be addressed. Additionally, there has been some improvement with the overloading of trucks when Zambia commissioned an electronic weighbridge ("Zambia Commissions an Electronic Weighbridge"). It helps by doubling the amount of vehicles being cleared, compared to weighing them manually ("Zambia: New Electronic Weighbridge Vital").

The U.S. is currently working with Zambia to promote economic growth and food security through agriculture, improve opportunities for health and education, fight HIV/AIDS, strengthen democracy, provide clean water and improve sanitation, and promote regional peace, security, and stability ("U.S. Relations With Zambia). Zambia's economy relies heavily on mining, construction, and urban commerce, so the agriculturally dependent are suffering. USAID is utilized to strengthen growth in the agricultural sector. The current USAID projects include: The Better Life Alliance GDA, Food Security Research Project III, Mawa Project, Production, Finance, Improved Technologies Plus (PROFIT+), Development Credit Authority Agreements, Feed the Future Zambia Policy Strengthening Project, and Africa Rising Agriculture Research and Development Project. These programs are aimed to help subsistence farmers to produce enough for their family and have a surplus to take to market ("Agriculture and Food Security").

Additionally, the World Bank's Board of Executive Directors approved a \$200 million credit for Zambia to improve selected rural roads in six of Zambia's ten provinces. The remaining four provinces will be financed by the government. The Improved Rural Connectivity Project will benefit 460,000 people living in rural areas since about 7.5 million rural residents have no access to the road network in the country. Only 17 percent of the rural population live within 2 km of a good road in Zambia ("Zambia: World Bank Approves \$200 Million").

If the road system were to be improved, the high transportation costs would be reduced, and it would allow transporting produce to markets cheaper and faster. Even though subsistence farmers don't usually sell their produce, they still need the roads to take their surplus to market and to transport materials. Also, with better infrastructure, information about how to improve their crop production can be communicated easier. Commercial farmers, on the other hand, use roads for both import and export. Their business is largely affected by the high costs of transportation. Reducing transportation costs would benefit both commercial and subsistence farmers. Along with improving the conditions of the roads, it would be beneficial to develop a better infrastructure, so farmers would not be isolated. Not having access to roads in good conditions is partly why only 15% of the arable land is being cultivated. Overall, there are many reasons why improving the road system is beneficial for both commercial and subsistence farmers. Transportation has many different importances, so improving the roads would not improve just farmers' lives. When transport systems are efficient, they provide economic and social opportunities. When transport systems are deficient, there can be missed opportunities economically and even a lower quality of life (Rodrigue & Notteboom).

The weather can also have a big impact on the road system. During the rainy season, which is from November to April ("Zambia - Weather and Climate"), the flooding of the roads makes it difficult, or even impossible, to travel. The roads that are greatly affected by flooding are gravel and dirt roads (Meeuws). Since most roads are gravel and dirt, flooding has a severe effect on transportation. These roads cannot withstand large amounts of rain since they are not constructed to properly drain. Because of this, there is not much that road maintenance can do once the flooding occurs. The only solution is to shape the roads, so they are able to drain properly. To do so, the road should be given a crown, which means it has a higher center than its sides. This allows the water to drain off into the ditches or surrounding landscape (Walker). To make the crown, a tractor or truck with a blade can be used. Also, since ditches are typically the primary outlet of drainage, they should have a flat bottom to handle the

most water (Walker). This is an inexpensive and temporary solution that could be implemented by the National Roads Board.

Giving dirt and gravel roads a crown shape provides a temporary fix to help with flooding. However, the shape has to be maintained for it to fulfill its purpose. A more permanent solution would be to develop some gravel roads into asphalt roads because these are very strong and can withstand hard and bulky transportation (“What are Roads made out of?”). An inexpensive way of making asphalt can be from using recycled roofing shingles. In Missouri alone, more than 276 million pounds of roofing shingles are dumped into landfills each year (“Introducing Roof to Roads”). Discarded roofing shingles could turn construction waste into a renewable resource, and they can be recycled in several ways. They can be added into hot mix asphalt to pave permanent roads, mixed aggregate to form a base for new roads, and used as road patch repair (“Introducing Roof to Roads”). Recycling roofing shingles offers many benefits, including environmental ones. It increases the life of pavement, reduces fatigue cracking, increases resistance to wear and moisture, decreases susceptibility to rutting, reduces dependence on virgin liquid asphalt and new aggregate, and allows us to reuse materials rather than bury them in landfills (“Introducing Roof to Roads”). This project would help both the U.S. and Zambia because recycling roofing shingles helps landfills in the U.S. from getting filled, and it improves the transportation systems in Zambia.

To be more successful in improving and maintaining Zambia’s roads, the National Roads Board should divert some of their focus from the main roads to the access roads because they account for the highest amount of roads, and they play a large role in transporting goods and materials. If the access roads were maintained properly, it could reduce the cost of transportation greatly for farmers. The NRB has been making improvements and repairs to the road systems, but there has been no solution for the access roads that are inaccessible for farmers. The ideas of diverting focus to the access roads, the temporary fix of dirt and gravel roads, and the “Roof to Roads” project could be suggested to the National Roads Board as solutions.

Zambia is a country that has always experienced high unemployment and poverty levels; over the years, there has been no real increase or decrease. Although there are many factors that affect the economy and how farmers are able to provide for their families, one factor that can be addressed is transportation. It has an effect on a farmer’s ability to deliver materials and goods. There are currently organizations set up by the U.S. to promote agricultural growth in Zambia and improving the transportation system could do so. With a proper system, they can be delivered faster and at a cheaper rate. To create a better transportation system with asphalt roads, recycled roofing shingles can be used. It provides an inexpensive solution to making asphalt roads and even offers environmental benefits.

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