WORLD BICYCLE RELIEF®

Mobility=Market Access

SMALLHOLDER DAIRY FARMERS IN RURAL ZAMBIA REPORT ON USING WORLD BICYCLE RELIEF BICYCLES TO BRING GOODS TO MARKET

Conducted and reported by World Bicycle Relief

May 2010

"We approached World Bicycle Relief because we were very confident in the quality of the bicycles. Bicycles to the farmers are the critical market link for the farmers to move surplus milk to the market. The bicycle is a tool to improve the farmers' lives financially and to empower them to make educated decisions. As farmers increase their milk yield, the sturdy, reliable bicycles will become even more valuable to the farmers. That's how you reduce poverty. This is the type of program I get excited about."

— David Harvey, Agriculture Development Advisor for Africa, Land O'Lakes, Inc.

World Bicycle Relief bicycles are used to drop off milk at the Co-operative during busy morning hours.

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ABBREVIATIONS

WBR: World Bicycle Relief
Co-operative: Magoye Smallholder Dairy Farmers Co-operative
GART: Golden Valley Agriculture Research Trust

Cecil Hankambe makes his 7 a.m. delivery to the Co-operative.

STATEMENT OF GRATITUDE

World Bicycle Relief is grateful to our partners Land O'Lakes and Harmos Microenterprise Development Project, a VisionFund institution. World Bicycle Relief conducted the study with the aid of the employees of the Magoye Smallholder Dairy Farmer Co-operative and GART. Special thanks to Cecil Hankambe and James Ndungu for helping to coordinate all of the interviews. We are also grateful to all the farmers who took the time to participate in our interviews, provide insights into the program, and, in many cases, invite us into their homes.

EXECUTIVE SUMMARY

In 2007, Land O'Lakes in Zambia was faced with a challenge. They had successfully worked with smallholder dairy farmers in rural Zambia to increase their milk yield– both through improved nutrition to dairy cows as well as investing in regional cooling stations that are a cooperative to sell to larger markets. The problem they faced was that farmers were losing as much as 40% of their milk en route to the cooling stations. While most farmers used bicycles as transportation, the quality of the bicycles was so poor that bikes were used as a cart which farmers still had to push on foot.

David Harvey, Agriculture Development Advisor for Africa, Land O'Lakes, Inc., put it this way, "We approached World Bicycle Relief because we were very confident in the quality of the bicycles. Bicycles to the farmers are the critical market link for the farmers to move surplus milk to the market. The bicycle is a tool to improve the farmers' lives financially and to empower them to make educated decisions. As farmers increase their milk yield, the sturdy, reliable bicycles will become even more valuable to the farmers. That's how you reduce poverty. This is the type of program I get excited about."

To address this challenge, WBR partnered with Zambia based microfinance institution, Harmos. Harmos offered bicycles through micro-loans to a group of smallholder rural dairy farmers in Magoye thus providing the market link for farmers to deliver fresh, unspoiled milk to the local dairy co-operative. Harmos, despite some programmatic challenges, received a 97% payback rate on the loans provided to the farmers.

Two years after the bicycles were sold, WBR conducted a study to determine the economic and social impact the bicycles had on the group of Magoye farmers. Because bicycles in rural Zambia are used as the primary source of transportation, their reliability, or lack thereof, can have a profound impact on the quality of life for farmers. Farmers consistently cited the WBR bicycle's reliability and cargo strength as major factors for their satisfaction with the bicycle, and they overwhelmingly preferred it to the non-WBR bicycle

alternatives. Illustrating their satisfaction is the fact that 100% of respondents said they would like to buy a second WBR bicycle given the opportunity.

The report results show that income for farmers was increased by an average of 6.67% mainly due to the significantly lower maintenance costs of the WBR bicycle. Milk volumes for the farmers showed a slight improvement compared to the control group, but the difference was not dramatic. Finally, because they were able to use the bicycle for so many different essential tasks around the farm and the community, the farmers strongly responded that the WBR bicycle allowed them to have a better quality of life (97%).

"Most of the farmers have now seen that they need these types of bicycles. The farmers have seen the potential in these bicycles and want to buy them."

— Co-operative Manager, 34 years old

“I have had many bicycles in my life. The way this one works for me, I would definitely buy it again.”

— Male farmer, 77 years old

A Magoye dairy farmer is all smiles after depositing his milk at the Co-operative using his bicycle.

BACKGROUND: ABOUT WORLD BICYCLE RELIEF

World Bicycle Relief was founded by leaders in the bicycle industry as a response to the devastation of the Indian Ocean Tsunami of December 2004. World Bicycle Relief (WBR) was established to provide access to independence and livelihood by supplying quality bicycle programs to people in disaster relief situations and developing countries. Through partnership with SRAM Corporation, TREK Bicycles, World Vision and many corporate, foundation and individual donors WBR delivered 24,400 high quality, locally sourced bicycles to carefully selected men, women, and children left in greatest need in the wake of the tsunami.

Due to the effectiveness of the program in Sri Lanka, in 2006 World Vision asked World Bicycle Relief to partner with them to address an even more devastating disaster: the AIDS crises in Sub-Saharan Africa. World Vision was leading a program called RAPIDS (Reaching HIV/AIDS Affected People with Integrated Development and Support) in Zambia, where nearly 1 million children have been orphaned by the disease . RAPIDS, a consortium of six Non-Governmental Organizations (NGOs), aimed to provide volunteer community-based healthcare workers with materials and training so they could in turn provide basic healthcare and access to clinics for people living with HIV/AIDS and support for Orphans and Vulnerable Children and Youth-Headed Households.

Bruce Wilkinson, chief of party of the RAPIDS program, identified the need for bicycles early on but was unable to find a reliable bicycle that would work for the caregivers. World Bicycle Relief was brought on to identify and source quality bicycles to be integrated into the program, primarily to increase productivity and retention of trained volunteer caregivers. The expectation was that bicycles would help caregivers reach clients, reduce caregiver attrition rates, and increase clients' access to health services.

To determine where the bicycles would be sourced, extensive product and market research was conducted in Zambia by F.K. Day, the President of World Bicycle Relief. His 20 years

of experience in product development at SRAM Corporation allowed him to quickly determine that locally available imported bicycles were of poor quality; they deteriorated as soon as two weeks after purchase due to the challenging rural terrain and the heavy loads carried by users. The suppliers of these inferior bicycles had reduced their component costs and quality to the point of becoming disconnected from the end-users' need for reliable transportation. WBR assembled a team of technical experts from SRAM Corporation, the second largest bicycle component manufacturer in the world, to develop a robust bicycle with affordable components designed to withstand years of service under extreme conditions. The end product is a low-cost bicycle that can carry over 200lbs of cargo and last a generation if properly maintained. Over 23,000 of these robust bicycles were distributed during the RAPIDS program.

To support program sustainability, World Bicycle Relief developed a mechanic training program. Prior to bicycle delivery, the RAPIDS partners identified field mechanics from the communities where the bicycles were to be delivered and sent them for a week's training on entrepreneurship, marketing, basic accounting and proper repair and maintenance techniques. The field mechanics were supplied with a business skills curriculum and workbook, a bicycle which they assembled, a proper set of tools, a technical manual with only diagrams and no words to overcome language barriers, a set of overalls, and a certificate of completion. These trained field mechanics entered into a two-year service-to-own contract, were supervised by the local RAPIDS partners, and assisted at the bicycle delivery ceremonies. In all, WBR trained over 470 field mechanics to support the RAPIDS program and created a national supply chain of spare parts through continued communication with the trained mechanics.

Through the lessons learned with the RAPIDS program, WBR's model has evolved to provide comprehensive, scalable, sustainable bicycle solutions by:

- Partnering with relief organizations to provide integrated quality bicycle programs to meet their desired goals in healthcare, education, economic development and disaster relief
- Continually assessing bicycle performance in the field and working with component suppliers to improve quality and technology
- Documenting the impact of bicycles in humanitarian relief situations, communicating results, improving programs and increasing awareness

Through the experience gained with the healthcare focused initiatives in Zambia, WBR decided to expand its reach by developing a program focused on economic development. In 2007, WBR initiated a microfinance pilot program to provide working capital and loans for bicycles to selected small and vulnerable entrepreneurs, households and communities in Zambia thereby strengthening their capacity to respond to the economic, social and health impact of HIV/AIDS.

To establish this economic development program, WBR partnered with Zambian-based microfinance institution Harmos to pilot a 1,000-bicycle loan program specifically aimed at providing bicycle loans with a 3-6 month payback period. The pilot program had brisk sales of the bicycles and buyers were consistently repaying their loans. WBR bicycles began being used in the communities and the pilot program was a resounding success.

WBR bicycles had begun to build a reputation for being strong, reliable bicycles through both the RAPIDS program and the success of the pilot program. Word began to spread to area development agencies. In May 2008, Land O'Lakes approached WBR to allocate approximately 60 bicycles to Magoye Smallholder Dairy Farmers Co-operative, a rural milk co-operative that Land O'Lakes had worked closely with since 2004. Land O'Lakes had worked successfully with the farmers of the Co-operative to increase milk yield per cow. The next step in the dairy value chain was to ensure the farmers had a way to deliver the increased milk output to the Co-operative. The key market link for farmers to secure a consistent income and improve their economic situations was to find a reliable method of transport to deliver fresh, unspoiled milk to the Co-operative. This is where WBR bicycles fit into the equation; the bicycles were delivered to the farmers in June 2008.

As of this report, WBR has provided over 55,000 bicycles worldwide to schoolchildren, teachers, entrepreneurs and caregivers, most of whom are located in rural areas. WBR has extended its reach into all nine provinces throughout Zambia, has expanded into Zimbabwe and Kenya, and is developing plans for Mozambique, Malawi, and Uganda.

WBR initiated a study to measure the impact of the bicycle within the context of economic development for the Co-operative farmers and to review the results with the goal of improving future programming and communicating the efficacy of bicycles.

BACKGROUND: ABOUT LAND O'LAKES AND MAGOYE SMALLHOLDER DAIRY FARMERS CO-OPERATIVE

Land O'Lakes, Inc.

For 25 years, Land O'Lakes has actively participated in international agricultural and economic development through its International Development Division. Land O'Lakes' highly focused development approach builds upon training and technical assistance delivered to and through smallholder producer groups, processors and marketers. The approach works back from the market to producers by increasing quantity and quality of dairy products that augment incomes of small farmers while meeting consumer preferences.

Since 2002, Land O'Lakes has been providing technical assistance to smallholder dairy farmers, producer groups and processors to promote the growth of a competitive dairy-sector, to expand local demand for dairy products, and to reduce food insecurity of vulnerable farmers by increasing incomes at rural household level.[1]

Magoye Smallholder Dairy Farmers Co-operative

The Magoye Smallholder Dairy Farmers Co-operative was started by 10 members in 1993 under the name Small Dairy Development Program (SDDP). As the years progressed, the name changed to Bonita then to its current title. The membership grew from 10 to over 600 members today. Members range from 1km away from the Co-operative to 45km at the farthest limit.

The Co-operative currently has three coolers to store milk, two in Magoye and one in Pelusa, that are able to hold 6,000 liters of milk. The coolers were donated by Land O'Lakes while other operational aspects of the Co-operative are supported by GART, a Zambian governmental agricultural agency.

Farmers bring in a morning milking between the hours of 6:00 am and 9:30 am. The afternoon milk drop-off time is from 2 pm to 4:30 pm. Nearly every farmer delivers milk via bicycle with only

1 Dairy Development Program. Land O'Lakes, Inc., 2010.

the largest producers using an ox cart. All milk that is brought in is tested for freshness while a random sampling of milk is tested to ensure no water has been added to increase the volume. Every other day Parmalat arrives to pick up the milk and deliver it to their processing plant in Mazabuka 30km away from the Co-operative.

BACKGROUND: DEVELOPING A PARTNERSHIP

World Bicycle Relief met several times with Todd Thompson (Country Manager - Zambia) and David Harvey (Agriculture Development Advisor for Africa) to discuss partnership opportunities whereby WBR designed bicycles and, potentially, trailers would be made available to Land O'Lakes smallholder dairy farmers.

Through these discussions, WBR and Land O'Lakes identified the Magoye Co-operative as a target location for the bicycles. WBR and Land O'Lakes then jointly engaged the Co-operative's Board of Directors for approval as well as Harmos to provide financing for the bicycles since most of the farmers would be unable to pay for the bicycle in one cash payment. The result was that selected dairy farmers, who met the criteria set forth by the Co-operative and Harmos, would be given the opportunity to purchase a WBR bicycle through a loan extended by Harmos and guaranteed by the Co-operative. Harmos and the Co-operative entered into a Memorandum of Understanding (MOU) with the following conditions:

Pricing

All bicycles required a K155,000 ($31) down payment. The down payment covered the administrative costs of the Co-operative (K20,000 or $4) and Harmos (K15,000 or $3), the transportation costs for WBR (K20,000 or $4), as well as part of the purchase of the bicycle (K100,000 or $20). The price of the bicycles was set at K500,000 ($101) with a monthly financing rate of 4.25%, or K17,000 ($3.50) per month. Farmers had the option to pay in three monthly installments (total cost of K606,000 or $123) or in six monthly installments (total cost of K657,000 or $133).[2]

2 Exchange rate used as of 5/10/2010, 1 USD = 4,940 ZMK. In June 2008, the exchange rate

Terms and Conditions

- The Co-operative ensured that every borrower was a fully paid up member of the Cooperative
- The Co-operative and the Harmos Credit Officer jointly assessed each applicant
- The Co-operative guaranteed the bicycle loan of each member borrower
- The Co-operative collected down payments of K100,000 on each bicycle and remitted to Harmos MED Ltd by cheque or bank transfer prior to disbursement of bicycles
- The Co-operative collected K20,000 transportation fee on each bicycle loan and remitted to Harmos MED Ltd prior to disbursement
- The Co-operative collected K15,000 administration fee on each bicycle loan and remitted to Harmos prior to disbursement of the loans.
- The Co-operative remitted to Harmos Med Ltd all monthly installments on all bicycles in full.

Micro-financing Results

Harmos provided a total of $7,596 in loans to the farmers at the Co-operative for the 59 bicycles. Fifty-six of the loans were paid in full while three loans remain unpaid, totalling $231. This resulted in a 97% repayment rate on the loans. Challenges arose with the transfer of money from the Co-operative to Harmos. The Co-operative agreed to guarantee the money and pay in six monthly installments. Instead, the Co-operative paid as their members were able to with the result being that the $231 balance is outstanding to this day despite the guarantee in the Memorandum of Understanding. In this regard, Harmos did not enforce the terms agreed upon in the MOU.

OBJECTIVE OF THE EVALUATION

The objectives of the evaluation were to measure the impact of an improved, reliable bicycle:

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was around 1USD = 3,395 ZMK which would equate to total cost of $178 for three month financing and $194 for the six month financing.

1. when used as a tool by rural dairy farmers to increase their income through the transportation of milk and dairy farming related activities
2. when used as a tool to improve general farm and community life

Specifically, the goals of the evaluation included determining if provision of a bicycle:

- improved farmer income
- improved access to farm necessities
- improved farmer connection to the community
- improved quality of life

METHODOLOGY

WBR analysed data provided by the Co-operative regarding daily milk drop-offs as well as conducted interviews directly with the farmers. Interviews were conducted both on-site at the Co-operative and at the homes of the farmers, whichever was more convenient for individual farmers.

A farmer creates a modified side saddle to hold his milk jug and increase the amount he can carry to the Co-operative.

All interviews were conducted orally. Interviews were conducted by a joint team of two WBR employees with one Co-operative employee assisting to translate into the local language, Tonga. Prior to completing the interviews, WBR trained the Co-operative employee acting as translator in order for the employee to become familiar with the instruments, discuss translations, conduct mock interviews, and pilot the instruments.

Study Site

Magoye is a rural farming town 30km outside of Mazabuka, a district center in Southern Zambia. The town of Magoye, population of less than 5,000, is a small community with dairy farming being a central part of the local economy. The Co-operative has a main branch, Magoye, and a satellite location where milk can be dropped off, Pelusa, that is approximately 15km away. The Magoye Smallholder Dairy Farmers Co-operative was chosen for this study because the group has homogeneous socio-demographic characteristics that make data across the group relevant and comparable. Furthermore, the Co-operative had detailed records to provide historical data on the farmers.

Sample Size and Data Collection

There were a total of 59 bicycles distributed to the Co-operative. However, 12 individuals received two bicycles and one individual had her bicycle stolen the day after she received it. This created a total potential respondent pool of 46 unique individuals that have had use of the bicycle for the full 22 month period.

Daily Milk Volume Data

WBR obtained daily milk volume data from the Co-operative.[3] Milk volumes were available for all WBR bicycle recipients as well as all other Co-operative members (control group). The daily milk volumes begin in January 2007 and conclude in March 2010 for all the Magoye Co-operative farmers who brought milk to the main branch.

3 The data files provided by the Co-operative contained a virus. WBR performed a random sampling of the daily and monthly milk volumes to verify the data was accurate and complete. No exceptions were found.

To examine impact, a year prior to the bicycle purchase was compared to the year immediately following the purchase (June 2007 to May 2008 vs. June 2008 to May 2009). For nine farmers who brought milk to the satellite drop-off, data was only available from January 2007 to December 2008. For this group, the six months after the purchase were compared to the same six month period of the previous year to account for the cyclical nature of milk production (June 2007 to December 2007 vs. June 2008 to December 2008).

Interviews

Of the 46 potential respondents, 35 individuals (76%) were interviewed. Attempts were made to contact all farmers via telephone and messages left at the Co-operative; however, WBR was unsuccessful in coordinating interview times with 11 potential respondents. Two main reasons contributed to being unable to interview the remaining 11:

1. School Break: School children were on break during the data gathering period which allowed the adult farmers to send them to deliver the milk to the Co-operative. This made it difficult to arrange interview times with the adults who purchased the bicycles and limited the number of interviews that were able to be completed on-site at the Co-operative.
2. Harvest Time: Many of the farmers were either busy working their fields or had travelled to the nearby town, Mazabuka, to deliver their harvest.

"I use the bicycle to help care for my three grandchildren who lost their parents, my son and daughter, to AIDS. I also use it to help care for two farm hands that help around the farm."

— Male farmer, 65 years old

Given that a preponderance of the group was interviewed, WBR believes this sample set is representative of the group as a whole.

Three respondents did not have bicycles prior to the WBR bicycle thus were unable to answer questions regarding prior bicycles. For these questions, 32 responses are used for the data that is presented.

RESULTS OF THE STUDY

Demographic Results

All individuals who purchased bicycles were the head of the household. In line with traditional Zambian culture, these individuals were older men who were responsible for caring for their immediate families and in many cases, extended relatives and their farm hands. There was a single exception where the female was the head of household as her husband, the former chief, had passed away. On average, respondents care for 9.5 individuals and live 5.5km from the Co-operative. Also, 29 of 35 respondents travelled to the co-operative daily via a non-WBR bicycle prior to receiving a WBR bicycle with the remaining respondents, six, walking to deliver their milk each day. Three of those individuals had non-WBR bicycles but did not use them for dairy purposes.

> "I use the bicycle to help care for my three grandchildren who lost their parents, my son and daughter, to AIDS. I also use it to help care for two farm hands that help around the farm."— Male farmer, 65 years old

> "I care for a large family [20]. I care for my children, grandchildren, and a family that is temporarily staying with us. The bicycle is very important to help me care for all of these people."— Male farmer, 69 years old

Respondent Demographic Informations	
Average Age	55.3 years old
Gender	Male: 34 Female: 1
Total people in family	11.9 individuals
People they care for	9.5 individuals
Distance to the Co-operative	5.5 kilometers

Overall Bicycle Satisfaction Results

Perhaps most indicative of overall satisfaction, 100% of respondents reported they would like to purchase a second bicycle. Overall satisfaction with the bicycle was very high with 86% of respondents reporting that they were "very happy" with the bicycle. The five neutral responses cited high initial cost and difficulty finding spare parts as reasons for their response. Also, nearly all respondents reported that the bicycle allowed them to have a better quality of life (97%) while 100% of respondents reported that the WBR bicycle made life around the farm easier for them. Two years after purchasing the WBR bicycle, all 35 respondents (100%) were still using their bicycle.

"I would love to buy a second bicycle!"

— Male farmer, 69 years old

Overall Bicycles Satisfaction Responses						
Question	Agree		Neutral		Disagree	
Would you buy a second WBR bicycle?	35	100%	—	—	—	—
People they care for	30	86%	5	14%	—	—
Distance to the Co-operative	34	97%	1	3%	—	—
The bike makes everyday life around the farm easier	35	100%	—	—	—	—

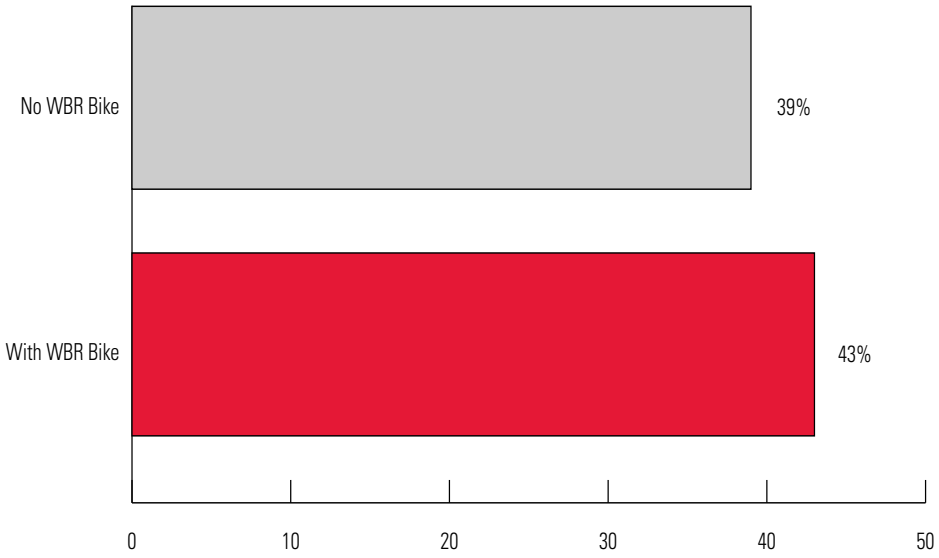
"When you have a good thing like the bicycle, it's something to make you happy."— Male farmer, 35 years old

Income Based Results

Milk Volumes

WBR compared milk volumes of individuals who did not receive a WBR bicycle (control group) against individuals who received a WBR bicycle to determine if using a WBR bicycle increased milk production.[4] The results showed individuals who received a WBR bicycle were four percent more likely to increase their milk production.

Percentage of Co-operative Farmers Increasing Milk Volumes



Although a slight increase in milk volumes was evident from the data, the lack of a dramatic increase was not unexpected according to David Harvey, Agriculture Development Advisor for Africa, Land O'Lakes, Inc.

4 The analysis compared milk volumes prior to receiving the bicycle against volumes after the bicycle was received in June 2008. Both groups had individuals without any milk volumes prior to the cutoff date which did not allow for an analysis to determine if volumes increased. This was mainly due to individuals not being members of the Co-operative yet. The control group had 232 individuals of 617 that did not have prior milk data reducing the comparison sample size to 385. The WBR bicycle group had six individuals of 46 that did not have prior milk data reducing the comparison sample size to 40.

"A minimal increase does not surprise me. [Land O'Lakes] has helped increase milk yield 100% in our time, but output is still low. The average cow is now producing 8 liters per day with many of the indigenous cows producing less. This volume does not produce a significant surplus for the farmers to sell. However, as milk volumes continue to increase, having a reliable WBR bicycle will be critical to bring that milk to the market."

Per Mr. Harvey's assessment, many farmers do not produce enough milk to meet the cargo limit on their non-WBR bicycles.

"The bicycle doesn't need to be repaired often. We don't have to put money into fixing it up."

— Male farmer, 36 years old

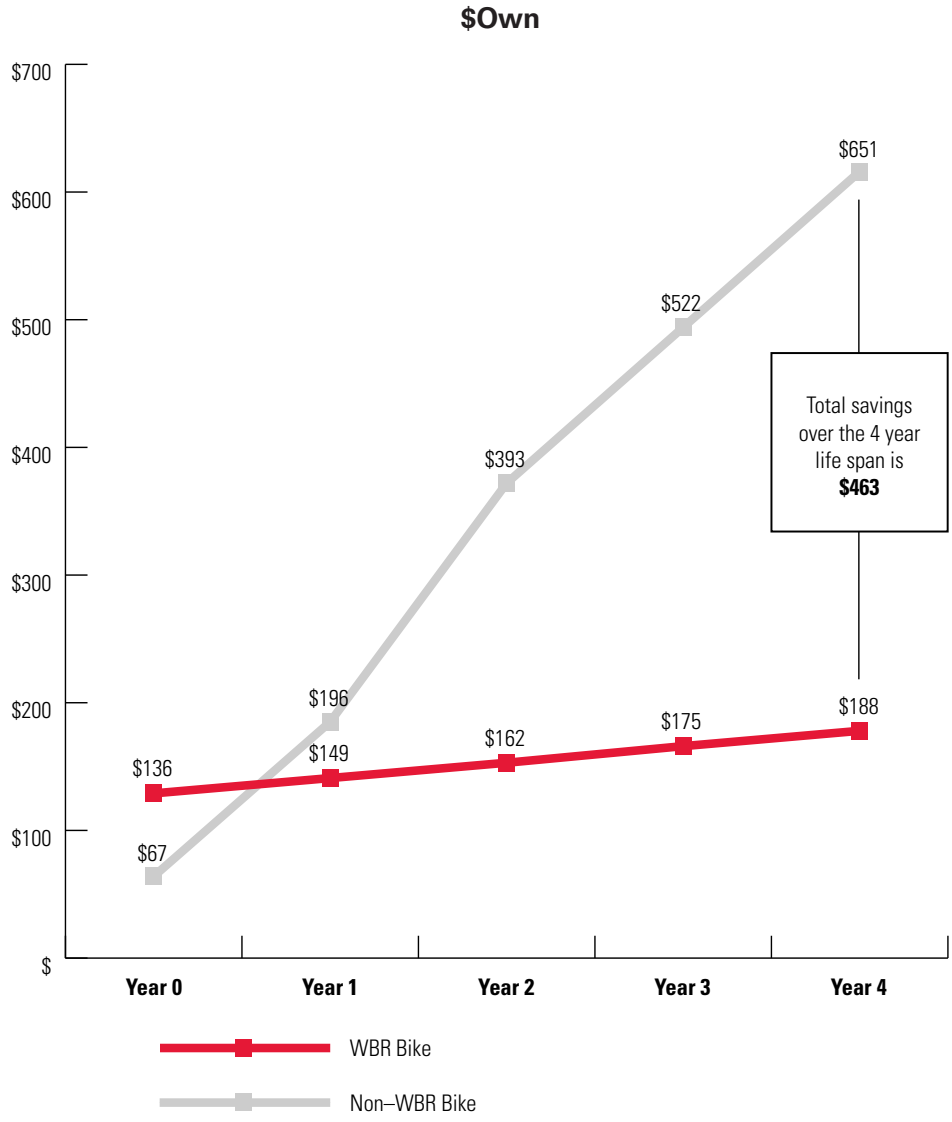
However, as they improve their milk yields, they will reach that limit, and the WBR bicycle's value will be multiplied.

Cost Of Ownership — Quantitative

To understand the total cost of ownership, respondents were asked to give financial details on the purchase cost of previous bicycles they had owned as well as its monthly maintenance costs. Respondents were also asked the monthly maintenance costs of the WBR bicycle.

The results showed that despite the higher initial purchase price of the WBR bicycle, it provides a significantly lower cost of ownership over the lifespan of the bicycle. Maintenance costs of non-WBR bicycles were reported to be 10 times higher than with the WBR bicycle. This resulted in the WBR bicycle having a lower total cost of ownership after only eight months and significant savings over the four-year estimated lifespan of the bicycle.[5]

5 Four-year lifespan for the WBR bicycle is the WBR organizational estimate developed through prior field experience with the bicycles.



Notes:
(1) Total cost of ownership was calculated by summing the purchase price and average monthly repair costs as reported by the respondents. The average lifespan of the Non-WBR bicycles was reported as 25.7 months. Therefore, a second bicycle purchase is added into the cost at the end of Year 2 for the Non-WBR bicycle.
(2) Initial WBR bicycle cost includes the cost of financing. An average cost of financing was derived from data provided by Harmos. This amount was then applied to the standard WBR bicycle price.
(3) Exchange rate used was a calculated 2 year moving average of 1 USD = 4,676 ZMK from 6/1/2008 to 5/31/2009.

With the average farmer who received a WBR bicycle earning $137.08 per month[6] from their milk production, this reduced cost of ownership increased their income by 6.7%, or $9.15 per month.

> "You spend less on the maintenance, you become more profitable."— Male farmer, 70 years old

Over the span of four years, the $438 of increased income would allow a farmer to purchase one head of cattle or have approximately one-half of the purchase price of a dairy cow saved.

"On the old bicycle, I couldn't carry 40 liters of milk. On this bicycle, 40 liters is like it isn't there."

— Male farmer, 60 years old

Cost Of Ownership — Qualitative

To understand how the WBR bicycle compared to non-WBR bicycles, respondents were asked to answer a series of questions comparing the two. The WBR bicycle was overwhelmingly favored in every category. Overall, 100% of respondents agreed that the WBR bicycle is significantly better than the non-WBR alternative.

> "You can compare this bicycle to many different types. [The WBR bicycle] is simply much better."— Male farmer, 80 years old

6 Milk volumes used in the prior analysis were multiplied by a weighted average per liter payment to derive monthly earnings. The Co-operative uses a tiered payment system based on shares where individuals with zero to two shares receive 1,800 ZMK per liter while individuals with 3 or more shares are "vested" and receive 2,200 ZMK per liter. The manager of the Co-operative noted that the split between vested and un-vested farmers is approximately 50/50 which equates to a weighted average of 2,000 ZMK per liter being paid out.

Respondents also noted the bicycle was significantly more reliable (94%), less prone to failures (94%), and cheaper to maintain (91%).

> "The old bicycles break down so much. Now farmers get here and don't worry about having spoiled milk."
> — Co-operative Manager, 34 years old

> "If you fell down with the [non-WBR bicycle], it would break into pieces. This WBR bike is much stronger."— Male farmer, 38 years old

Furthermore, respondents noted that the bicycle was significantly better at carrying cargo than a non-WBR bicycle. This allows the farmers to carry more milk to the Co-operative as well as more goods to the market.

Lastly, respondents felt the bicycle provided quicker transport because they did not have to be so cautious about avoiding bumps when riding it. On average, respondents reported reducing travel time by 34 minutes per roundtrip, 39% less total travel time, to the Co-operative which allowed them more time to spend tending to their crops.

> "It took me 50 minutes [one way riding] before. Now I ride in 15 minutes and don't break down."— Male farmer, 38 years old

Responses Comparing WBR Bicycle vs. Non–WBR Bicycle

Question	Agree		Neutral		Disagree	
WBR bike is significantly more reliable	30	94%	2	6%	—	—
WBR bike has significantly less failures	30	94%	1	3%	1	3%
WBR bike costs less to keep it working well	29	91%	2	6%	1	35
WBR bike can carry significantly more cargo	32	100%	—	—	—	—
WBR bike provides quicker transport	27	84%	1	3%	4	13%
WBR bike is significantly better	32	100%	—	—	—	—

Farm And Community Life Based Results

Although the main purpose of the bicycle is for milk delivery, the bicycle plays an important role in the everyday lives of rural farmers in Zambia. The bicycle is the primary form of transportation for most of the farmers and is important to daily farm and community life activities. Respondents were asked a series of questions to understand how they had used the WBR bicycle to make their lives easier over the past month. The respondents use the WBR bicycle for a variety of activities to tend to their farms as well as stay active within the local community.

Mr. Trywell Himoonga, age 72, and his family with their WBR bicycle.

"The bicycle has been very strong. We use it every day and for many things."— Male farmer, 41 years old

"The bicycle helps in every way and every part of our life." — Male farmer, 56 years old

CONCLUSIONS

Quantitative data showed a significant cost of ownership decrease with the WBR bicycles. Milk volumes did not see a dramatic increase, but overall the economic situation of the farmers was improved. Qualitative data also showed that farmers were using the bicycles for a broad range of everyday farming activities and were a key component in increasing the farmers' quality of life.

Overall conclusions are that WBR bicycles improved farmer income, access to farm necessities, farmer connection to the community, and quality of life. The study showed that the WBR bicycle is a valuable tool for a rural farmer to interact with the community and improve his/her economic situation.

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