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Zambia

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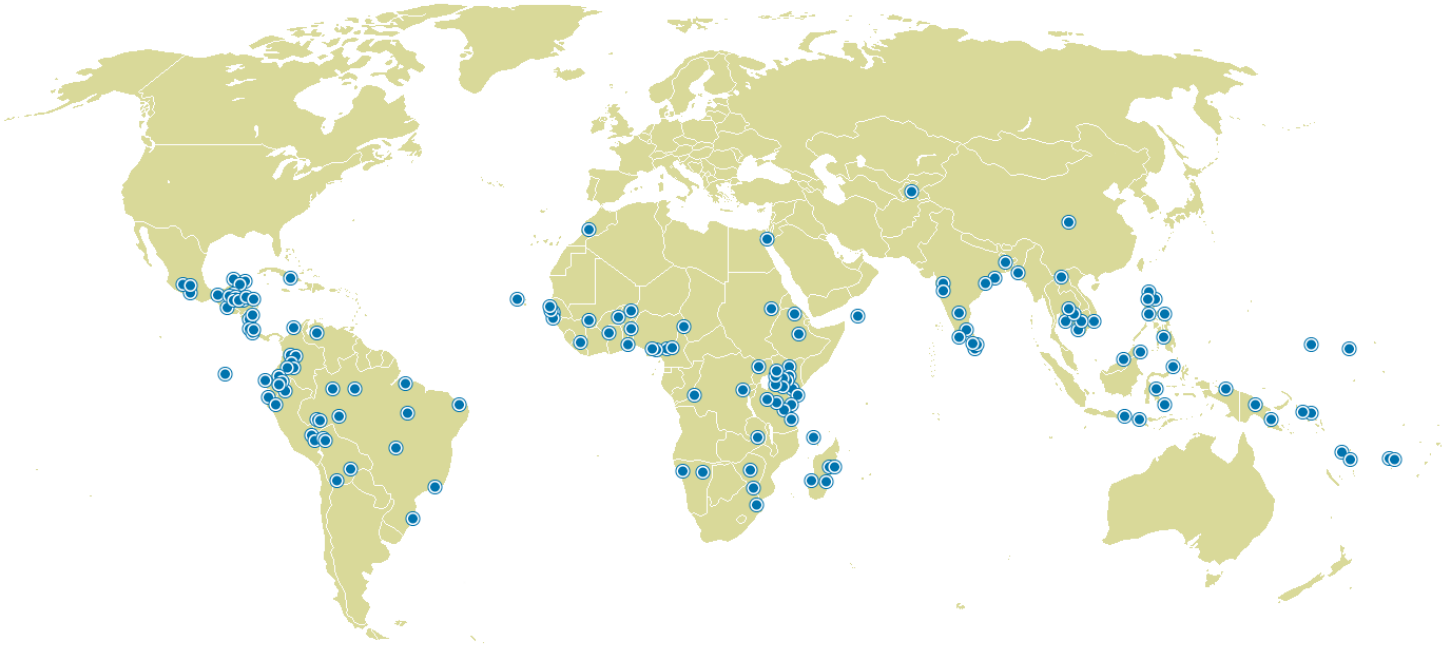
To mark its 10-year anniversary, the Equator Initiative aims to fill this gap. The following case study is one in a growing series that details the work of Equator Prize winners – vetted and peer-reviewed best practices in community-based environmental conservation and sustainable livelihoods. These cases are intended to inspire the policy dialogue needed to take local success to scale, to improve the global knowledge base on local environment and development solutions, and to serve as models for replication. Case studies are best viewed and understood with reference to '*The Power of Local Action: Lessons from 10 Years of the Equator Prize*', a compendium of lessons learned and policy guidance that draws from the case material.



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COMMUNITY MARKETS FOR CONSERVATION (COMACO)

Zambia

PROJECT SUMMARY

Zambia's Luangwa Valley is the setting for a pioneering initiative that is transforming the local economy and reducing human pressures wildlife. Led by the Wildlife Conservation Society, Community Markets for Conservation (COMACO) has brought about substantial livelihoods and conservation benefits through a producer group model of collective learning, reaching more than 40,000 farming households with training in conservation farming techniques.

Farmers are invited to become COMACO members in return for adopting a package of eco-agriculture and organic farming techniques that both reduce the environmental impact of farming and drastically improve agricultural yields. COMACO purchases farm commodities through a network of depots and collection centres, alleviating transport costs and guaranteeing a premium for organic produce through the payment of an annual dividend to member farmers. The initiative has been particularly successful in converting poachers to farmers.

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KEY FACTS

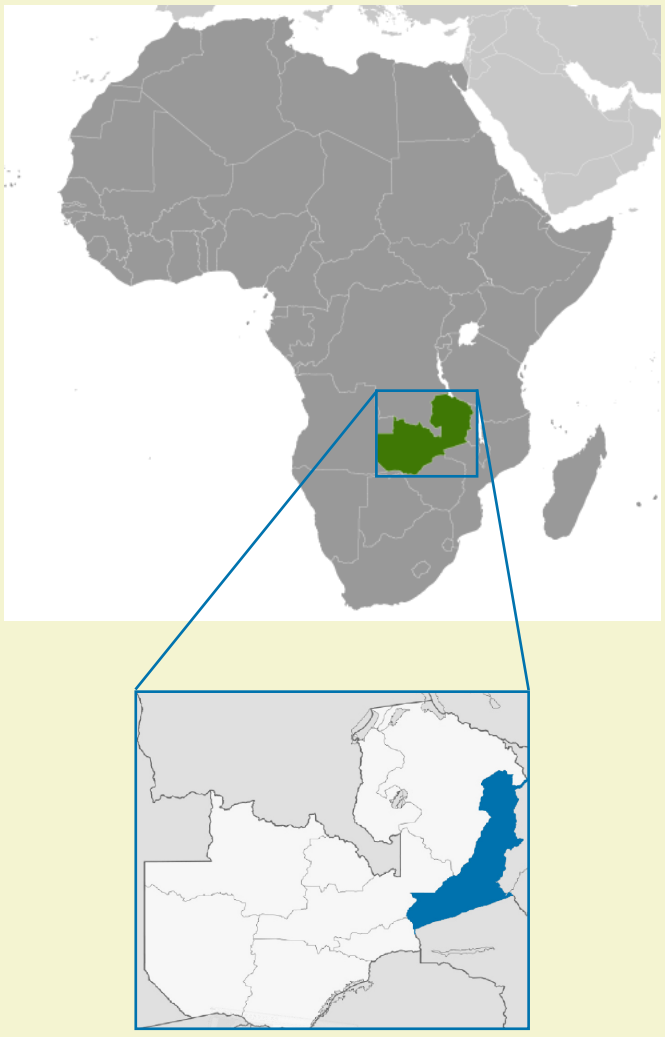
EQUATOR PRIZE WINNER: 2008

FOUNDED: 2003

LOCATION: Luangwa Valley, Zambia

BENEFICIARIES: more than 40,000 rural households

BIODIVERSITY: North and South Luangwa National Parks



Background and Context

Community Markets for Conservation (COMACO) promotes income generation, biodiversity conservation, and food security in Zambia's Luangwa Valley. The organization links more than 40,000 rural households with lucrative and sustainable livelihood options, encourages methods for improving agricultural outputs through "conservation farming", and provides access to markets.

Contrasting ecological wealth and economic poverty

The Luangwa Valley represents a critical destination for tourism in Zambia, attracting great international interest for its large mammal populations and sprawling wildlands. Annually, over 20,000 tourists visit its two main parks, North and South Luangwa National Parks, generating over USD 15 million in tourism revenues. These parks provide a relatively safe environment for over twenty large mammal species, including elephant, lion and wild dog. Surrounding these parks are community lands with human densities varying from three to more than fifty people per km2, stretching from the valley floor to surrounding plateau areas that constitute the valley's watershed. Average annual household income for these communities in 2004 was below USD 100 in all but one area, and a significant portion suffered from chronic food shortages.

Poverty, low yields and deforestation: a vicious cycle

Farming is the main livelihood activity for Luangwa Valley's residents, concentrated in alluvial soils along tributaries of the Luangwa River. Maize is the staple crop, although a variety of grains, vegetables, and fruits are grown. Trypanosomiasis has restricted cattle rearing, while reliance on hand tillage largely restricts household plot sizes to smallholder status. Traditional agricultural practices including clearing and tree coppicing are common, with cut wood being burned for fuel. Fallowing typically occurs at four to ten-year intervals. In attempts to spur economic development in rural Zambia, large-scale contract farming or "out-grower" schemes have promoted household planting of cotton and tobacco. While these schemes have been successful in brining capital to household producers, they have also contributed to Zambia's high rate of deforestation. Without chemical fertilizers, farmers have begun changing plots every two to three years, significantly increasing the amount of cleared land. Despite its small size, Zambia is second in Africa and fifth in the world in terms of highest absolute annual loss of forest area.

Deforestation and intensive farming have in turn led to decreases in agricultural productivity. Combined with periods of poor rainfall,

Table 1: Average household annual incomes for residents of Luangwa valley floor and plateau

Chief's Area	Year surveyed	Households	% food secure	Average income (USD)
Valley areas (six chiefdoms)	2001	1,065	34	$76.00
Chief Chikomeni, plateau	2004	192	42.9	$83.50
Chief Zumwanda, plateau	2004	517	63.1	$88.00
Chief Mwasemphangwe, plateau	2004	460	60.4	$137.70
Chief Magodi, plateau	2004	1,028	42.8	$90.00

Source: COMACO.

farmers' overreliance on non-food crops has left household incomes susceptible to commodity market fluctuations, and has decreased household food security. Surveys have shown that when they are food insecure, more than half of farmers in the Luangwa Valley turn to poaching, setting wire snares for wildlife. A small percentage of residents are "professional poachers," using locally made guns to hunt a variety of species. Although currently less common, elephants and rhinos were often targeted as a commercial activity by organized groups from outside the Valley. This has decimated wildlife numbers in the region. Other coping mechanisms for periods of drought include fishing and timber-felling for charcoal production.

Introduction of sustainable agriculture

These conditions were extensively surveyed by a team of researchers led by the Wildlife Conservation Society (WCS). They identified low household incomes and widespread food insecurity as responsible for the high level of poaching and snaring. In 2003, WCS introduced a producer group model for local farmers, using market incentives to encourage sustainable agricultural practices. Since then, COMACO's extension officers have trained more than 40,000 farmers in conservation farming techniques, which include dry-season land preparation using no or minimal tillage; repeated use of small basins for planting and for soil amendments such as compost; using crop residues to suppress weed growth, return nutrients to the soil, and help retain moisture, rather than burning them; and rotating and interplanting crops with nitrogen-fixing species. These practices improve agricultural yields and reduce the demand for land, thereby limiting agricultural drivers of deforestation. Farmers that apply these practices are certified by COMACO, and are typically able to move from household food deficits to food surpluses within two to three years.

By complying with these practices, farmers are also assured long-term trade benefits with COMACO. To drive this partnership, farm surplus purchased by COMACO is manufactured and sold as value-added processed products, or sold to high-paying commodity markets. COMACO generates eco-friendly products (under the brand name "It's Wild!") ranging from rice to peanut butter, cultivated without pesticides or fertilizers. These products are catered to ecotourism visitors to South Luangwa National Park, creating a direct link between the "one-acre" farmer and the best possible local market to reward good farming and land use practices. Incentives for compliance have been incorporated within this structure, initially in the form of a price premium for COMACO-certified farmers who sell to the organisation. This system has been changed, however, to a dividend that is paid to all producer groups that are certified as compliant, whether they sell to COMACO or another buyer.

COMACO operates as a legally registered limited-by-guarantee company and functions both as an agro-food processing company and as a commodity trader. By providing this dual role, COMACO has been able to scale up its market reach to a large enough number of farmers living in Luangwa Valley to have a landscape-scale impact on both conservation and livelihoods.

Key Activities and Innovations

The individual farmer, whether man or woman, is COMACO's starting point for influencing behaviour and affecting positive change for conservation and family well-being. The process of involvement consists of producer groups, typically made up of about 15 members, which all COMACO-registered farmers are required to join. Larger producer group cooperatives represent all of the producer groups for a given chiefdom.

Peer-to-peer learning, rooted in local capacity

COMACO uses a highly adaptive farmer extension model to mobilize large numbers of unskilled farmers, some of whom would otherwise depend on wildlife snaring and hunting, to learn improved farming methods with support in the form of seed supplies and on-going training and field demonstrations. The goal is to enable the farmers to produce a surplus, typically within two to three years. This process is facilitated by peer support through the producer group model. Also supporting this process is a team of salaried extension workers and a much larger force of lead farmers: local COMACO farmers selected for their skills and who volunteer their services in training others. In exchange, these lead farmers earn a commission from the commodities sold to COMACO by the farmers they help train. The model focuses on food-based commodities, including maize, soybeans, groundnuts, millet, and a wide range of bean varieties, as well as honey.

COMACO relies heavily on its relations with communities and traditional rulers in the various chiefdoms of the Luangwa Valley. When entering an area, extension officers seek assistance from the village headman to identify those households in greatest need, as well as those most responsible for resource degradation, such as professional poachers or charcoal makers. These assessments are verified via survey, and then selected households are encouraged to participate. In practice, more households in a new area typically request participation than can be trained in a single season. The model's goal is that, within a maximum of four years, participants will be able to

support household food needs independently through increased yields from conservation farming and improved income through market access.

Bringing market access to marginalized farmers

Members of these producer groups bring their surplus to one of COMACO's 57 local trading depots, located within the farming community, to sell directly to COMACO. The transaction is a transparent exercise: prices are posted, weighing scales verify weights, and cash is paid in full in most cases. Once the depots have enough bulk commodities, a regional conservation trading centre, operated by COMACO, dispatches a truck to the depot for collection. The commodities are then processed at the conservation trading centre and moved on to markets. The manufacturing process results in high-

quality, organic food-processed products, packaged and branded attractively to compete with more established brands in retail stores throughout Zambia. COMACO's marketing strengths are the quality of the product and the human stories behind these goods. It's Wild! products are found at Mfuwe International Airport, in the region's largest settlement, in outlying towns, and in supermarkets in Zambia's capital, Lusaka.

Incentivizing conservation farming

The added value from this marketing approach provides a sufficient sales margin to sustain a range of incentives to keep farmers compliant to the sustainable farming practices that help build healthy soils and reduce the need to clear more trees. Incentives for compliance were initially provided through higher prices for certified farmers versus non-certified farmers. Using this pricing structure as the sole mechanism to maintain compliance was found to be inadequate, however. During its early growth, COMACO often lacked the capital needed for purchases at the higher prices at the precise time when the farmers needed to sell, resulting in farmer frustration, reduced compliance, and increased sales to alternative buyers. In 2010, in place of this system, COMACO introduced a "conservation dividend" mechanism to reward all producer groups that are certified as compliant, whether they sell to COMACO or another buyer. This dividend is not a subsidy but rather a true dividend: an incentive returned to members that varies from year to year. Payment takes the form of cash, seed inputs, and farm implements. The dividend is disbursed just before the beginning of the wet season (known locally as the "hungry season") when household food and financial reserves are typically low and new crops are about to be planted. In 2010, the dividend included one or more of the following, depending on local conditions: treadle pumps, beehives, and hoes. The dividend mechanism is designed to promote conservation farming compliance and the use of new technologies and, to a lesser extent, to smooth household food availability. From a business perspective, the dividend system allows the incentive to be given after the production and sale of value-added products as opposed to at the time of purchase of raw materials. The approach represents a major adaptive management adjustment.

Organization growth and monitoring

The process has developed by iterations every year, and the project has seen a continued growth of farmer members seeking access to these skills and markets. The current number of registered farmer members in the COMACO program is 32,454. The current trend suggests an annual member growth rate of about 20%. As an extreme response to non-compliance, COMACO enforces trade sanctions on communities who renege on their commitment to abandon poaching or snaring by either denying dividend payments or not bringing markets and extension services to their area.

Keeping track of this organization and key livelihood indicators of its participating farmers and their families is a major task for COMACO. Extensive socioeconomic and ecological monitoring is carried out by COMACO staff and in tandem with external researchers. From its inception in 2003, enormous progress in farmer recruitment, training, group formation, and farming results have been witnessed. While still recruiting farmers with annual family incomes of less than USD 100 and with food supplies inadequate to reach the next harvest, many of those who are members and now supported by COMACO's trade benefits have emerged with livelihoods that offer a better future for both family members and the natural resources they live alongside.

Impacts

BIODIVERSITY IMPACTS

Positive biodiversity impacts have been observed throughout the region in which COMACO works, benefitting the flora and fauna of the Luangwa Valley. These impacts have been achieved through various channels, resulting from different aspects of COMACO's work, and have been measured by the organisation's staff during aerial monitoring exercises.

Conserving forest cover

Reducing rates of deforestation in the valley has been a primary aim for COMACO's environmental work. This has been successfully achieved through various means. Offering farmers financial incentives for growing various food crops has resulted in a reduction in cotton growing. Cotton growing typically leads to large losses in tree cover as land is cleared for cultivation. Increased crop diversification of legumes of up to 30% and improved crop rotation has allowed for the replenishment of soil nitrogen, meanwhile, resulting in shorter fallow periods and further reducing the need for smallholder farmers to cut trees.

Tree cover has also improved thanks to the reduced dependency on destructive livelihood practices, such as charcoal making, which saw trees cut for burning. In place of these high-impact income-generating activities, COMACO has encouraged the adoption of environmentally-friendly bee hives for small-scale apiculture. To date, over 7,000 bar hives and 12,000 log hives have been made by COMACO farmers. These hive varieties reduce the practice of cutting trees for their wild honey, which in turn offers an alternative to charcoal-making.

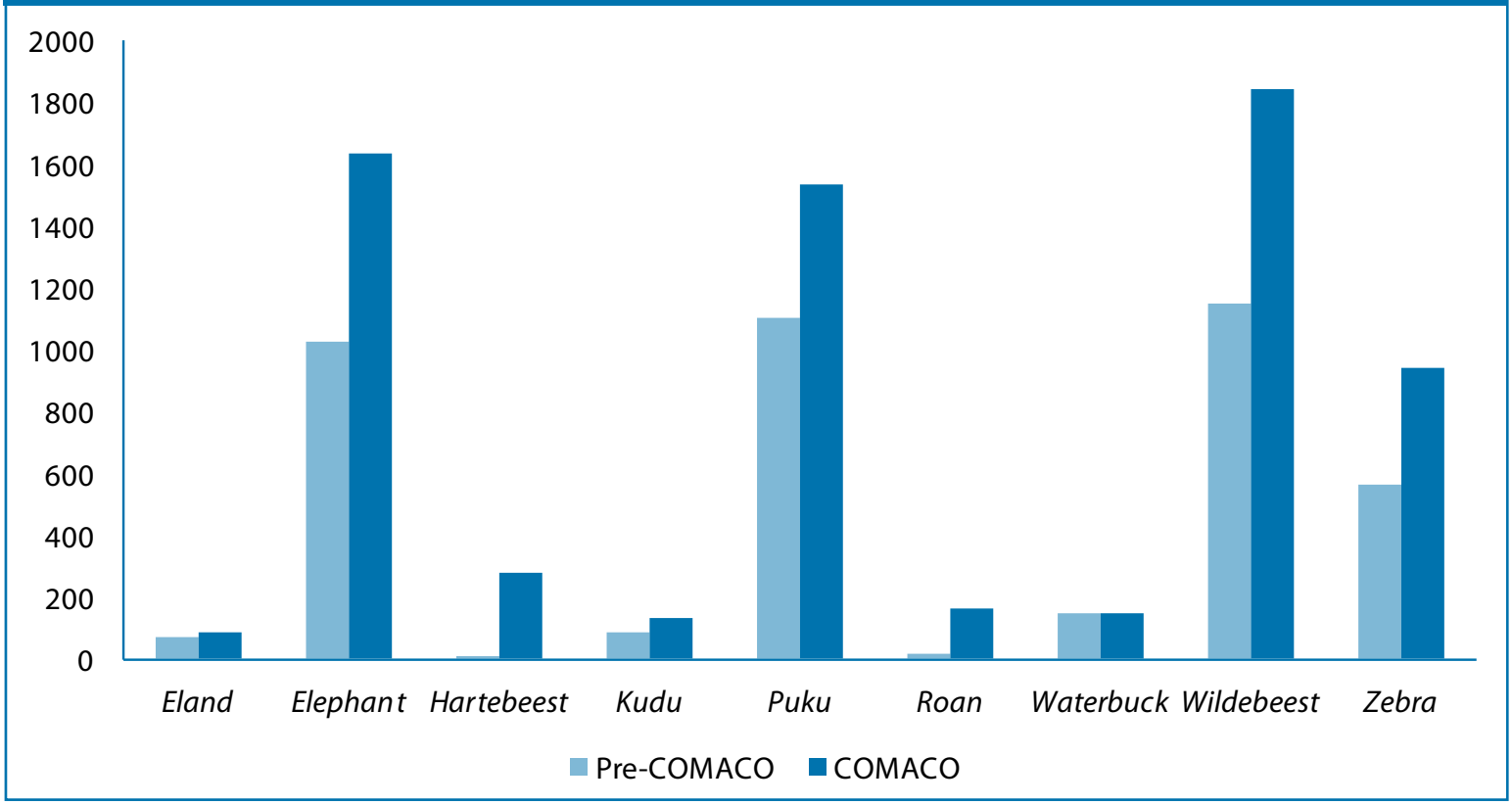
Protecting the valley's wildlife

In addition to reducing habitat loss, COMACO has attempted to conserve wildlife by reducing illegal snaring and poaching with guns.

To date, more than 61,000 wire snares and 1,467 guns have been turned in by participants. Training of poachers in alternative careers began as a pilot program in 2001, preceding the implementation of COMACO's market components, and has continued as a flagship programme for the organisation in Luangwa Valley: more than 760 individuals have completed the program to date.

Positive results from reduced poaching were observed through aerial surveys undertaken by COMACO staff in conjunction with outside researchers between 1999 and 2008. Comparing data from "pre-COMACO" aerial wildlife surveys in 1999 and 2002 against results from surveys performed on the same flight transects in 2006 and 2008 showed that populations of most species were either stable or increasing. The degree of the positive change suggests that reduced hunting pressure likely contributed to redistribution of animals back

Figure 1: Comparison of wildlife populations from aerial surveys performed in 1999 and 2002 (pre-COMACO) versus 2006 and 2008 (COMACO). Variance weighted averages are listed.



Source: Lewis, D., et al. 2011.

into game management areas. Previous reports suggested that several large-bodied ungulates were in decline from 1979 to 1996. Because these species are desirable targets for poaching and are particularly sensitive to it, the stability of eland, hartebeest, kudu, roan, waterbuck, wildebeest, and zebra populations is noteworthy. Stability of the elephant population is also of special importance, given the recent local history and focus for regional tourism.

The relative impacts of COMACO's poacher transformation program, snare removal, improvements in the efficacy of the Zambia Wildlife Authority (ZAWA), and other anti-poaching efforts are unclear. (Social surveys of professional poachers indicate that multiple arrests and convictions are insufficient to deter most from returning to poaching.) However, independent evidence from ZAWA's patrol reports shows that despite seasonal and yearly fluctuations, an overall downward trend in snares recovered from national parks and game management areas was observed by consistent patrolling efforts over time. These findings suggest that COMACO's snare removal provided benefits to wildlife in the areas in which its participants live.

SOCIOECONOMIC IMPACTS

Alongside impressive ecological benefits, COMACO has had substantial measurable impacts on the social and economic welfare of the valley's farming households. These impacts have been seen primarily through increased household incomes from selling commodities to COMACO and improved household food security due to improved access to seed supplies and agricultural practices. COMACO's

model has also acted as a vehicle for other positive social impacts, by facilitating access to health advice, and reinforcing important socio-cultural institutions.

Combating hunger and income poverty

The typical farmer who joins COMACO produces a net deficit of food – the household runs out of food before the next harvest – and has little or limited access to markets. A pre-COMACO household

livelihood baseline survey for Luangwa Valley residents in 2000 revealed annual household incomes averaged USD 79 and depending on rainfall, as many as 60% of valley residents were not food secure, forcing many to rely on wildlife snaring to help meet their food shortfalls. Current household income data shows households that have transitioned out of a food deficit to a food surplus status thanks to implementing COMACO conservation farming practices now earn an annual average of approximately USD 220, a sizeable increase compared to 2000 average levels. The combined value of income and increased household food production represents a net annual household income of approximately USD 300 for the average COMACO-certified farming household.

COMACO undertakes data collection at each depot to record the name of the farmers selling to the organisation. Approximately 52% of registered farmers are women. On average, over 10,000 farmers sell their surplus commodities to COMACO each year, and over 90% are COMACO-registered farmers. The 10,585 farmers who sold to COMACO in 2010 represented about 30% of total COMACO members, however, suggesting that the remaining 70% are still in the process of moving from a net food deficit into a surplus.

In 2010, farmers received approximately 3.74 billion Zambian Kwacha (ZMK), or ZMK 387,530 per individual (USD 86). This represented around 40% of a family's total annual income; the actual percentage could be considerably higher when considering both husbands and wives for individual households can sell their crops separately to COMACO. Incomes from selling commodities are also boosted thanks to COMACO's policy of buying farm produce through collection depots. Through its 57 depots and various transport assets, COMACO is in most cases able to collect farmer commodities as a service, which saves farmers from having to bear these costs. In some rural areas where COMACO does not operate, these transport costs can represent as much as 20% of the value of the commodity.

Pricing incentives and dividend distribution offered by COMACO has

greatly increased farmer interest in growing the selected food crops that COMACO buys and in most cases turns into value-added products, while improved agricultural productivity has allowed for increased crop yields and crop diversification, leading to greater food security and higher incomes. COMACO farmers are able to generate far higher incomes from household farms. In 2010, farmers could

Table 2: Numbers of households growing grain or cassava in 2000 compared to 2009 for valley areas in COMACO East

	cassava	maize	millet	rice	sorghum
Year: 2000; 1059 sampled (random, pre-COMACO)					
Chifunda	0	337	50	76	11
Chikwa	4	103	37	8	4
Lower Lumimba	0	242	0	26	114
Upper Lumimba	1	300	7	33	39
Totals:	5	982	94	143	168
%:	**0.4%**	**92.7%**	**8.9%**	**13.5%**	**15.9%**
Year: 2009; 3202 sampled (COMACO farmers)					
Chifunda	76	443	49	319	49
Chikwa	61	783	185	650	99
Lower Lumimba	86	208	0	198	173
Upper Lumimba	58	1428	27	1040	163
Totals:	281	2862	261	2207	484
%:	**8.9%**	**89.4%**	**8.2%**	**68.9%**	**15.1%**

Source: COMACO.

make ZMK 1,040,000 from growing rice on a plot measuring 50m by 50m, representing a 300% increase from pre-COMACO prices. The same plot size would earn farmers ZMK 684,000 for groundnuts, a 270% increase; ZMK 324,000 from soy beans, a 180% increase; and ZMK 890,000 from beans, or a 200% increase.

Crop diversification for food security and resilience

Production of rice has increased by 300%, groundnuts by 270% and soybeans by 180%. The number of rice growers has increased five-fold, which correlates with the three-fold increase in commodity price since 2000, while cassava growers have increased over ten-fold. Most importantly, the number of different food crops contributing to income has increased from 10 to 16. The increase in crop number is attributed to the introduction of three additional legumes – sugar beans, soybeans and cowpeas – to improve soil quality. This greater diversification of household food crops has allowed for greater food security and resilience in the face of unpredictable weather patterns. Since severe flooding in 2007, additional emphasis has been placed on crops able to withstand or mitigate effects of flooding and drought such as cassava and sweet potatoes. In this way, the model differs from out-grower schemes, which are typically highly focused on single crops.

Data from various sources including interviews, independent studies, and comparison of demonstration and control plots support the positive impact COMACO is having on improving farm yields. Contributing to this success are three major factors: market incentives, seed inputs provided on a seed-recovery loan basis, and year-round extension support.

Market and non-market incentives: The market incentive model has been improved by iterations. In 2010, 27,673 COMACO ID cards were issued to registered farmers. These ID cards were used to reward farmers compliant with COMACO conservation farming techniques with slightly higher commodity prices compared to non-COMACO farmers at collection depots. 2010 marked the first year in which COMACO also conducted a compliance inspection and scored farmers according to a list of criteria. The highest scoring producer groups were rewarded with a conservation dividend in place of the price premium on commodities.

Another incentive for compliance currently under consideration is to provide school fee loans to families who are compliant with conservation farming and have a good track record of selling commodities to COMACO. Repayment would be in the form of crops sold to COMACO at harvest time.

Improve seed availability: Seed availability and seed diversification are major constraints to achieving food security for small-scale farmers living in remote areas of Luangwa Valley. COMACO has worked to overcome these challenges. The organisation contributes an annual 150-250 tons of seeds to its farmers; approximately half of this amount comes from COMACO's own revolving supply of seeds recovered from its loan-receiving farmers.

Farmer-to-farmer extension: Complementing this support is a community-based farmer extension system that builds on the local support of over 639 lead farmers and 57 certificate or diploma-holding salaried extension staff members who live locally. With the use of 225 demonstration training sites, on-going field days, and visual aids, farmers are taught the following techniques for conservation farming:

- home-based fertilizer-making with compost and bio-char,
- mulching,
- crop thinning,
- weeding techniques,
- crop rotation,
- minimal or zero-tillage techniques,
- pot-holing,
- ploughing techniques to remove hard-pan and increase root penetration,
- inter-cropping with agroforestry,
- water management, and
- planting densities.

Use of organic fertilizers, including bio-char

For the 2009-2010 farming season, based on a sample of 17,376 farmers, 81.7% of COMACO farmers complied with key elements of the conservation farming approach, including the use of home-made compost or bio-char fertilizer to grow their primary food staple, maize. The increase in yields compared to plots in which conservation farming or composting was not used varies from 30% to over 200%. The approaches advocated by COMACO also decreases dependence on expensive inputs such as chemical fertilizers, herbicides, and pesticides. This represents a major household saving of between 10-20% of total annual income.

Bio-char in particular has been an important conservation farming technique introduced by COMACO. Its potential for carbon sequestration and increasing agricultural yields makes it an attractive investment from an environmental and economic perspective. Comparison of COMACO and non-COMACO farmers by Cornell University (USA) showed that COMACO farmers had more carbon in their soils on average than their counterparts.

Collective learning through producer groups

An important strategy employed by COMACO in its work has been its producer group model. All COMACO-registered farmers are required to be members of a producer group. These groups are subsequently organized into producer group cooperatives, providing environments for collaborative learning and training. By the end of 2010, all of the producer group cooperatives on the eastern side of Luangwa Valley that had received training were legally registered; during 2011, those on the western side are undergoing the same process.

As well as being vehicles for sustainable agricultural extension, producer groups have been used to provide information on health to farming parents. Meetings of producer groups act as peer forums

in which members discuss topics such as family planning, hygiene, and reproductive health alongside sustainable farming practices. These discussions are facilitated by the use of 'Better Life Books', consisting of 21 loose pages of illustrated lessons covering a range of livelihood skills, including farming practices, fertilizer-making, poultry rearing, and bee-keeping, as well as hygiene and family health topics. The books promote better parenting practices and encourage participation of girls in school.

Empowering women and strengthening institutions

An emphasis on women – 52% of registered farmers are female – is a positive aspect of the model, given cultural gender differences and the growing number of households headed by single women. In 1992, 18.7% of rural households were headed by women, versus 25.4% in 2007 (Zambia Demographic Health Survey, Central Statistical Office.)

As membership of COMACO has grown, producer group cooperatives have engaged a wider spectrum of Luangwa Valley communities. In particular, traditional village rulers and Community Resource Boards have been involved in supporting COMACO's work. The latter are community-based organizations overseen by the Zambia Wildlife Authority (ZAWA) to promote participatory management of natural resources by communities. This engagement of important community institutions has underpinned sustainable resource decisions taken in many cases. For instance, community leaders have taken an active role in convincing poachers to lay down their guns. In recent years, chiefs and community leaders have assisted with the identification and persuasion of hundreds of poachers to undertake training provided by COMACO.

Chief Mwasemphangwe of Chipata District, meanwhile, has banned the commercial sale of charcoal in her area because there are better livelihood alternatives now offered by COMACO. In another case, Chief Nyalugwe has resettled over 100 families from an area where charcoal making had become a major source of livelihoods to an area where these families are able to register as COMACO farmers. Several chiefs in Serenje District have rejected attempts by investors to create large tobacco farms in their areas, instead promoting COMACO's approach for local farmers.

Village institutions have also acted as mediators in cases of widespread poaching. Chief Tembwe's area was threatened with a COMACO trade sanction due to high levels of poaching reported by the Zambia Wildlife Authority. A COMACO representative travelled to meet with local leaders to explain COMACO's policy; these leaders were able to convene public meetings and poaching levels were subsequently dramatically reduced.

POLICY IMPACTS

As COMACO has become better established in the Luangwa Valley area, opportunities for collaboration with district and provincial authorities have increasingly emerged. This has led to COMACO having a substantial impact on conservation policy in Zambia's Eastern Province.

Collaboration with government authorities

District and provincial authorities' efforts to address growing environmental concerns in the province have helped to build partnerships with COMACO and the communities it works with. A steering committee headed by the Province's Permanent Secretary is currently leading these efforts and has targeted COMACO villages as case studies where the benefits of collaboration can be demonstrated. One such example of collaboration is in Lundazi and Nyimba districts, where District Forestry officers have worked with COMACO and selected communities to support combined strategies to reduce charcoal-making.

Zambia Wildlife Authority (ZAWA) routinely meets with COMACO staff to discuss their joint conservation initiatives. One area of collaboration has been in working with farming communities to reduce human-wildlife conflict, teaching methods such as blasting elephants with chilli smoke to protect crops. ZAWA also attaches officers to COMACO to help facilitate certain components of the poacher transformation program, in which poachers identified by communities learn and adopt alternative livelihoods with market support from COMACO.

Collaboration with district and provincial authorities is seen as key to the sustained success of conservation efforts in the Luangwa Valley. District authorities in Chama have worked closely with COMACO to design a new "Community Park": a protected area that would bring benefits to the surrounding communities, including access to COMACO markets. This model has also been proposed with relation to Zambia's status as a pilot country for REDD+ activities: REDD-related income could be used to create protected "carbon parks" managed by participating communities that have been sensitized to conservation through engagement with COMACO.

Supporting the COMACO model: "scaling-up"

A major challenge for COMACO is to maintain small-scale farming in game management areas, but reduce the risk of small-scale farmers becoming larger commercial farms, which would pose a greater threat to wildlife habitats. As COMACO continues to target and reward small-scale farmers with best practices and markets, ZAWA could also reward the same farmers with incentives to maintain farm plots within a limited maximum size to receive a share of wildlife revenues. This would give farmers two income streams, from farming and wildlife, both tied to conservation.

There is much national attention being paid to "conservation farming" as a low-cost solution to higher farm yields and improved soil management in Zambia. COMACO is often referred to as a success story for its wide-spread adoption of "conservation farming", compared to other areas of the country where adoption levels are relatively low. The presence of markets that reward compliance is seen as the key feature in the COMACO model.

Sustainability and Replication

SUSTAINABILITY

COMACO's business model has been widely documented as a case study for sustainable agricultural enterprises. While the project initially relied on financial and technical support from its partner organisations, and in particular Wildlife Conservation Society, its economic and social strengths have enabled the organisation to become increasingly less reliant on external support over time.

Financial sustainability

COMACO aims to become financially self-supporting. The tactical plan to achieve this has been to increase the scale of operations to meet required thresholds for contracts of value-added products and commodities in larger urban and export markets. Data for conservation trading centres that are generating value-added products show progress toward a break-even point, with the percentage of sales revenue to total operating expenses increasing from 31% to 79% between 2008 and 2010. These data include administrative costs of expenses of the distribution centres. Contract data also show that COMACO is providing rural households with access to high-value urban and international markets. Other attempts to connect rural communities with these markets – such as the Luangwa Integrated Resource Development Project – have not achieved a great deal of success. The lack of road and rail infrastructure in the valley makes such access difficult, and no other large-scale food-processing equipment exists in the area to provide a comparable value chain. The largest contributions to total sales are made up of items requiring relatively little processing, such as rice and ground maize flour (used to make the staple dish, *nshima*.) Honey has the highest profit margin; bee-keeping is heavily promoted for this reason as well as for its ecosystem benefits.

Key interventions underpinning long-term success

Processing standards are maintained at a high level, ensuring that COMACO-produced goods can reach high quality markets. In 2005, facility improvements and intensive staff training in hygiene, safety, and quality control allowed COMACO to obtain Hazard Analysis and Critical Control Points (HACCP) certification. COMACO products consistently pass quality and safety testing at the University of Zambia's food laboratory. These steps are essential to COMACO's certification as a vendor for large-volume contracts of high-energy protein supplements with the World Food Program and Catholic Relief Services, as well as sales to regional hospitals, schools, and commercial markets.

External support has helped in improving the quality of products. Additional research has decreased breakage of rice and improved packaging of peanut butter to improve quality and shelf life. These changes have enhanced COMACO's ability to negotiate contracts with urban supermarkets. Retail sales are now complemented by sales on the Zambian Agriculture Commodities Exchange.

Partner organisations have also helped to facilitate the development of additional products. Training of a food technologist and additional extrusion equipment donated by General Mills has enabled COMACO to process goods such as food bars and poultry feeds. Diversification has proven difficult because of limitations in water and electrical infrastructure, however.

Business development; obstacles to growth

COMACO has been able to expand significantly in recent years. New conservation trading centres in Serenje and Chinsali became operational in 2010. In addition to increasing scale, the growth in the number of these centres has allowed for specialization; for example, extrusion processing is performed at Lundazi. The costs associated with expansion are sizeable investments. As of March 31 2010, COMACO's capital expenditure grants totalled ZKW 3,532,727,637 (approximately USD 740,000 at then-current exchange rates), an increase of ZKW 98,271,408 (approximately $21,000 USD) over the

previous year. COMACO's expansion was made possible by support from several sources, most notably the Royal Norwegian Embassy.

Infrastructure deficiencies remain a challenge to continued long-term business expansion as well as product diversification, however. An example of these limitations comes from a conservation trading centre established at Feira. Although this was desirable from a conservation perspective because of its proximity to the Lower Zambezi National Park, the centre shifted to another facility at Nyimba in 2009 due to high transportation costs, restricted varieties of local commodities, and lack of reliable water and electricity. Nyimba has more reliable utilities and direct access to the major paved highway running to Lusaka, although it required substantial investment in 2008–2009 to accommodate the new functions and scale.

The key strength of the COMACO model is its highly adaptive nature. Beginning on a small scale in 2003 with the development of a producer group organization, COMACO is currently restructuring into a stand-alone business entity and continues to evolve through an iterative, adaptive process. For example, food relief from the World Food Program initially assisted the transition of food-insecure households to the use of conservation farming. Over time this temporary food aid was phased out, initially resulting in decreased food security for some participating households. Food aid is no longer associated with the model, yet numbers of participating households have continued to rise steadily as COMACO has expanded its farmer training and organization, demonstrating that its sustained impact was not contingent on external assistance.

REPLICATION

"Scaling-out"

COMACO has demonstrated an impressive rate of internal replication since its inception, increasing to a total of over 30,000 registered farmers by 2010. The table below shows the rate of increase between 2009 and 2010 for COMACO's conservation trading centres and producer groups, and gives projected figures for 2011. The overall growth rate of registered farmers from 2009-2010 is over 17%.

This expansion has been possible through the high level of investment in establishing new conservation trading centres and depots, and the adaptability of COMACO's peer-to-peer learning model. In pursuit of its economic goals, the organisation continues to expand, and in 2011 has begun to offer market benefits to participants on the western plateau. Expansion is intended to provide protection to the core national parks on all sides.

PARTNERS

- Wildlife Conservation Society
- General Mills
- World Food Programme
- Zambia Wildlife Authority
- Zambia's National Farmers Union
- Government of the Republic of Zambia
- Cornell University
- CARE International
- UNDP Global Environment Facility Small Grants Programme recipient, 2008
- UC Berkeley Haas School of Business
- Catholic Relief Services
- Royal Norwegian Embassy

Table 3: COMACO member growth, 2009-2010

Commodity Trading Centre	*Year*	*Number of registered farmers*	*Year*	*Number of registered farmers*	*Producer Groups*	*2010/2011 (projected)*
Lundazi	2009	6,592	2010	6,778	500	12,000
Chama	2009	4,298	2010	6,178	408	8,000
Mfuwe	2009	7,048	2010	7,857	511	12,500
Nyimba	2009	5,763	2010	5,974	274	11,000
Serenje	2009	1,889	2010	2,279	106	5,000
Chinsali	2009	2,083	2010	3,388	89	5,000
Total		27,637		32,454	1888	53,500

Source: COMACO.

FURTHER REFERENCE

- COMACO website: http://www.itswild.org
- Lewis, D., Bell, S. D., Fayc, J. *et al.* 2011. Community Markets for Conservation (COMACO) links biodiversity conservation with sustainable improvements in livelihoods and food production. Proceedings of the National Academy of Sciences (PNAS). August 23, 2011 vol. 108 no. 34. http://www.pnas.org/content/108/34/13957.full.pdf+html

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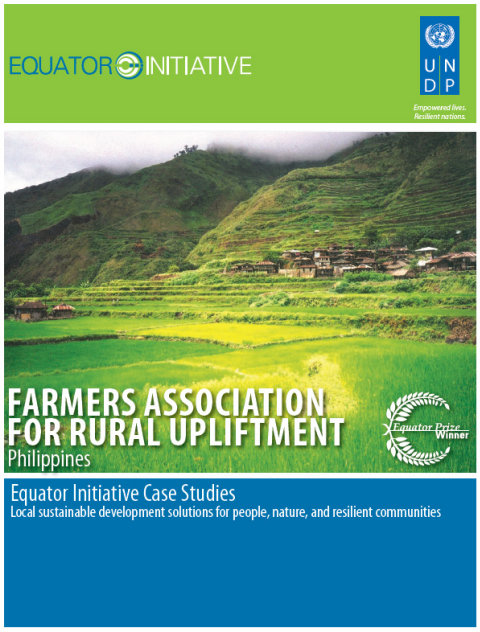

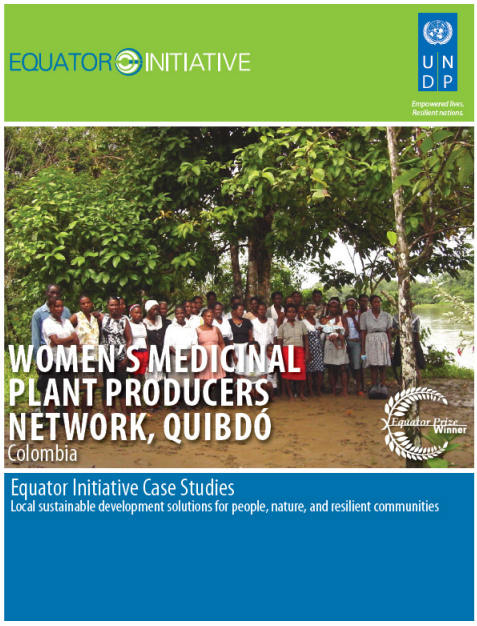

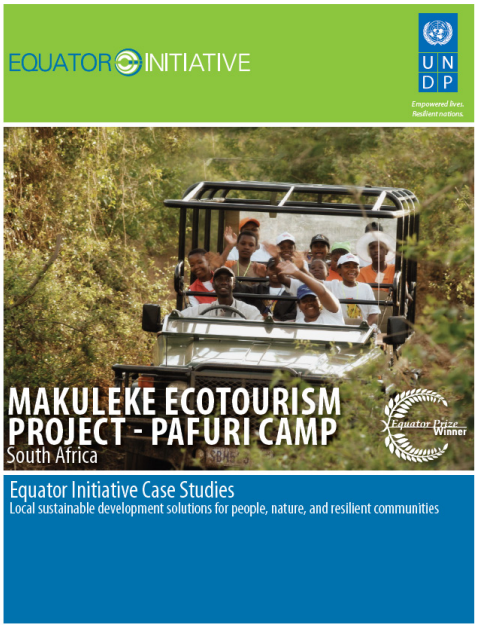

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