WE TRAIN RATS TO SAVE LIVES

ANNUAL REPORT 2017
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Almost two decades ago, when I heard about a project that aimed to train rats to detect landmines, I was intrigued, though like so many who hear about the project for the first time, I admit I was skeptical of its success. But with a diploma in animal training and a worthy project based in Tanzania, close to my home city of Nairobi, it seemed like a good fit, and I secured a position as a rat trainer.

I soon travelled to mine-affected areas in Mozambique and experienced first-hand the terror, heartbreak, and long-term difficulties that hidden landmines impose on struggling communities. I met people who had lost loved ones or whose own limbs were lost because of landmine accidents. And there are many more who still could not get back onto their productive land, even though the conflict had ended decades ago. They were faced with a stark choice: live hungry…or work on land that might contain landmines. This is a decision that I’m sure very few of us have to face and cannot even imagine. After this sobering trip, I returned to APOPO’s HQ in Tanzania determined to help speed up detection of these insidious weapons.

Now, 20 years later, APOPO and the mine detection rats have helped to find and clear more than 100,000 landmines and other explosive items, getting hundreds of thousands of people back on their land and their lives on track. It’s these results that motivate me to come to work every day - because the landmines are still out there.

APOPO is an inspiring, progressive, and innovative place to work. The tuberculosis detection research that began in 2002 now shows a potential to raise partner clinics’ detection rates by 40%. We’ve also investigated the rats’ potential to tackle other global issues such as salmonella contamination, search and rescue in collapsed buildings, and trafficking of threatened wildlife and rare African hardwoods.

Altogether, over the last 20 years, life for me at APOPO has never been dull. This won’t be changing soon, and I’m proud to be part of something that will save many more lives in the future. Happy birthday, APOPO!
In December 2015, the World Health Organisation (WHO) announced that tuberculosis now kills more people per year than HIV/AIDS and malaria. In 2016, there were 10.4 million new cases of tuberculosis (TB) globally, and 1.7 million of these people died. Symptoms of tuberculosis commonly include poor appetite and weight loss, a persistent cough, fever, and weakness, leaving people unable to work. Without treatment, patients usually die, and they can spread the pathogen to up to 15 other people within a year, causing a vicious cycle that’s difficult to break.

APOPO’S SOLUTION

APOPO conducts research into developing and deploying rats as a TB diagnostic tool. Results show that the rats can check 100 samples for tuberculosis in 20 minutes. The same task would take a lab technician up to four days. This allows APOPO to recheck samples collected from partner clinics at a high speed and then confirm the presence of TB in the samples indicated by the rats using WHO-endorsed confirmation methods. Confirmed results are then sent back to clinics, who oversee patient counselling and treatment. The project indicates that APOPO can increase partner clinics’ detection rates by 40%.

SCHOOLKIDS AND LANDMINES

Our school is in the middle of land that used to hide landmines that were laid to defend a military camp during the war. After the war finished, the mines were left there, but marked safe areas around the school for the children to stay secure, but we still found them playing outside boundaries or sneaking out to retrieve a ball. Thankfully there were no accidents, but many of the children’s families have been affected. This is a farming community, and it is shocking to see the serious landmine injuries that can happen to people or livestock in the fields.

A child often has to leave school to care for someone in their family who is injured. Sometimes they never return, because they have to take the place of a breadwinner who cannot work. It is very sad, because from that point, their life without even a basic education will be hard work.

APOPO, together with their partner the Cambodian Mine Action Center, have now cleared all the mines from this area. Everyone is free to travel, work, and play as they like without being terrified. I am still affected, though. Even though I know the mines are gone, when I see the children playing in the fields, I still worry.

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t APOPO, we endeavor to comply with the highest animal welfare standards. APOPO’s rats are thoroughly reliable detectors. Since APOPO began global operations, starting in Mozambique in 2009, thousands of mines have been found by our mine detection rats in areas that have been subsequently cleared manually. Internal and external quality assurance indicated that not a single mine was missed.

There is scope to release much more land by survey, thus leaving room for nature and people. Furthermore, the use of machines often results in poor quality work that requires subsequent clearing. As a result, APOPO has established a Technical Survey Dog training center in Kampong Speu, Cambodia. The center employs some of the most experienced mine detection dog trainers in the world.

In 2017, eight mine detection dogs were fully trained by APOPO, and they are now being deployed in South Sudan under the auspices of the UN. A total of 15 to 20 more dogs will be trained in 2018. This will be deployed in at least three mine-affected countries when trained. APOPO’s mine detection dogs and dogs can be leased by partner organizations.

With the unique ability to work efficiently in overgrown areas, excluding the need for manual clearing, detection dogs will result in much more land being released and huge savings in terms of time and cost. By using detection dogs, the overall efficiency of a clearance process can be doubled.

Håvard Bach has had a distinguished 26-year mine action career, with involvement in all aspects of mine clearance. He graduated from the Norwegian Military Officers Academy in 1987 and held several army positions in Norway. He headed the Norwegian engineering component to the United Nations Interim Force in Lebanon (UNIFIL). He joined Norwegian People’s Aid (NPA) in 1992 and set up its programs in Cambodia, Mozambique, and Angola.

Håvard also served as head of operational methods for the Geneva International Centre for Humanitarian Demining (GICHD) from 1996 to 2000. He then became the driving force behind major global studies on animal detection, land release, and other operational methods of survey and clearance. Håvard joined APOPO initially in 2010 and subsequently in 2016 as head of mine action. From 2011 to 2016, he was head of operational methods for the Norwegian People’s Aid (NPA).
MINE ACTION CAMBODIA

Anmerkmung: Commercial Use Permitted

A P.D.G. continued operations throughout 2017 in Isim with one exception: a team from Cambodia Mine Action Center (CMAC). Together the APOPO and CMAC teams cleared nine minefields totaling 718,689 square meters of land, which was returned to the village communities for agricultural and infrastructure purposes. This directly benefited over 1322 people who were able to finally get back on their productive land.

Early in 2017, APOPO Cambodia received a further 16 mine detection rats (MDR) from our headquarters in Tanzania. Ten of these MDRs were integrated into operations and the remaining six began work at the new Visitor Centre in Siem Reap.

After just a few short weeks, the new MDR had achieved the high standard ready for accreditation from CMAC. All 10 rats passed their International Mine Action Standards (IMAS) tests and were immediately deployed in the Siem Reap area of the province.

Throughout the year, the program was supported by the CMAC explosive ordnance disposal (EOD) team funded by APOPO. The on-call team were kept busy visiting villages and farms in the area to investigate suspicious objects that had been uncovered, mostly old explosive items such as mortars and artillery shells. At each site, the EOD team carefully removed or covered, mostly old explosive items such as mortars and artillery shells.

In the province of Malanje, APOPO moved north to Uíge province. While NPA focused its 2017 clearance efforts toward completing the province of Malanje, APOPO moved north to Uíge province to begin clearance there. Over the course of 2017, APOPO deployed its mine detection rats, supported by manual deminers with metal detectors and an armored brush-cutting machine, to two minefields in the municipality of Quitexe, Angola.

APOPO completed the first minefield in September 2017, successfully deploying its integrated system of mine detection rats, manual deminers with metal detectors, and a ground-preparation machine. APOPO and NPA identified and safely excavated 18 anti-personnel landmines, four items of small arms and ammunition (SAA), and a ground-preparation machine. APOPO and NPA identified and safely excavated 18 anti-personnel landmines, four items of small arms and ammunition (SAA), and a ground-preparation machine. At the time of writing, clearance of the second minefield is progressing well, and it is expected to be more than half cleared by the end of the year.

Toward the end of the year, APOPO was extremely pleased when CMAC signed a new agreement that will keep the partnership going until the end of 2018.

The APOPO mine action programme in Cambodia is made possible by its partners and donors, the Cambodian Mine Action Center (CMAC), the Global Development Group, Basmati and Goldman Sachs.

In 2012, APOPO engaged with Norwegian People’s Aid (NPA) and the Cambodian Mine Action Center (CMAC). They began working with communities to familiarize them with common explosive ordnance disposal (EOD) team funded by APOPO. The collaboration aims to combine the strengths of both organizations for efficient and timely operations in Angola, which began even before the peace agreement was signed in 2002. The APOPO-NPA joint effort aims to combine the strengths of both organizations for efficient and timely operations in Angola, which began even before the peace agreement was signed in 2002.

This local-language version is designed to bring the story of APOPO to the local community. The program also thanks its donors for their generous support, including: the Trafigura Foundation, the Anthony Thomas Johnson Foundation, the UK People’s Postcode Lottery, the Dutch Postcode Lottery, and the Cultures of Resistance Network.
Mozambique declared itself landmine-free in 2015, marking an end to decades of direct and suffering. It was the first large mine-contaminated country to be completely cleared of landmines. APOPO is proud to have been a part of this Mozambican success story, and as one of the leading organizations in mine action, has helped the country reach this milestone.

However, there is still a small residual risk of explosive remnants of war (ERW) in the country, and a reactive national response capacity has been created to address this problem. In particular, the Malhazine Complex in the district of Kamubukwane, is still heavily contaminated with ERW, beyond what the national reactive capacity can address. On request from IND, APOPO has maintained parts of its operational capacity in Mozambique throughout 2017 while exploring funding options to address this remaining task. APOPO has already cleared almost 40,000 explosive items in the area and plans to clean the last remaining area in 2018 when funding is secured.

Zimbabwe, on the other hand, is currently landmine-free. It was the first large mine-contaminated country to be completely cleared of landmines. APOPO is proud to have been part of the Zimbabwe Mine Action program, which was successful in clearing the minefield in the south of the country. The team worked hand-in-hand with local communities and the government, and spent the next year setting up offices, sourcing the mine clearance equipment, and making sure the area was safe for return.

In 2016, the Zimbabwe Ministry of Defence assigned to APOPO the clearing of a minefield in the south of the country. The team arrived in Harare in September 2017 and spent the rest of the year setting up office, sourcing the mine clearance equipment, and making sure the area was safe for return. The assigned minefield is laid in very dense belts (reportedly 5,500 mines per linear kilometer) forming a “cordon sanitaire” that runs for 37 km southeast along the border with Mozambique. The total task area is over 7,181,000 m² and is extremely remote, bordering one of the wildest national parks in Zimbabwe, Gonarezhou National Park. Gonarezhou itself is within one of the largest conservation areas in the world - the Great Limpopo Transfrontier Park (GLTP). The GLTP is part of a bold African vision to combine three unique national parks (Gonarezhou NP in Zimbabwe, Kruger NP in South Africa, and Limpopo NP in Mozambique) by removing all human barriers so that wildlife, and tourists can roam freely within the huge ecosystem covering some 35,000 km². The minefield is located in the largest wildlife corridor, an area specifically designated to allow for the free movement of wildlife between Kruger NP in South Africa and Gonarezhou NP in Mozambique. These parks boast two of the largest African elephant populations on the continent. Due to its remoteness, documentation regarding the environmental impact of the minefield is scarce. However, its location in the heart of such a conservation area suggests that the toll on wildlife must be significant. Several elephant deaths a year are reported, but while only cases involving elephants have been documented, the area is rich in other endangered mammal species that are undoubtedly affected too.

Communities are also affected on both sides of the border, and it is estimated that tens of thousands of people are heavily impacted by the landmine problem within APOPO’s area of responsibility, with occasional human and regular livestock accidents being reported. The area is extremely dry and unsuitable for agriculture, and livestock is people’s main livelihood. Zimbabwe is a signatory of the Mine Ban Treaty, under which it committed itself to being landmine-free by 2025. As global funding diminishes, this goal is under threat. However, following a peaceful changeover of political leaders, the country is optimistic for the future, and we hope to see the economic situation improve and investment once again flow back, vastly improving the funding situation. The early part of 2018 will be spent cementing connections made, and we hope to be up and running by midyear.

The APOPO Zimbabwe Mine Action program is made possible by its partners the Zimbabwe Mine Action Centre (ZIMAC) and the Zimbabwe Ministry of Defence. The program also thanks its donors for their generous support, including: the UK People’s Postcode Lottery, the Dutch People’s Postcode Lottery and the Embassy of Australia in Zimbabwe.
APOPO registered in Colombia as an NGO in 2016 and has since partnered with Campaña Colombiana Contra Minas (CCCM), the only accredited mine action NGO in the country, to provide them with assistance to develop their standard operating procedures, train their demining teams, provide monitoring of their demining operations, and provide animal detection capacity. This capacity building will ensure that the CCCM teams work safely and efficiently, learn-release methods so that time, effort, and funds are not wasted when clearing mined areas. To date, APOPO has trained 12 CCCM non-technical survey teams, and more capacity building will be provided throughout 2018. APOPO is working with CCCM to gain government approval for the introduction of the mine detection rats to increase the productivity of the CCCM demining operations.

APOPO also has an agreement with the Colombian navy to conduct a pilot project once the government has approved the MDR. This pilot project will train Navy personnel in the use of the MDR, undergo testing and accreditation, and conduct survey and clearance operations with the Navy. This will provide proof of performance to DAICMA (National Mine Action Authority) that the rats are a credible means of detecting landmines and will facilitate partnerships with other mine action operators in Colombia.

The current pace of landmine clearance in Colombia is extremely slow due to the improvised nature of the mine threat. These homemade landmines are predominately built from plastic and glass bottles filled with explosives and often contain very little metal. Due to the ineffectiveness of metal detectors with these minimum-metal mines in many parts of the country, manual deminers are forced to excavate their way through each minefield, slowly and carefully, digging 15-cm deep, 1-meter-wide trenches. The average productivity for a manual deminer in Colombia is between 2 and 10 square meters per day.

MDR do not encounter this problem, as they ignore metal and search only for explosive scent. APOPO is therefore seeking to partner with other mine clearance organisations in Colombia to integrate an animal detection capability with their manual deminers that will significantly increase their productivity. The faster return of formerly contaminated land will allow rural communities to generate income and once again live without the fear of these deadly weapons.

The APOPO mine action program in Colombia is made possible by its partners and donors, Campaña Colombiana Contra Minas and the Dutch Postcode Lottery.

MINE ACTION COLOMBIA

Adan Vincente Baiao,
NPA 1st Section Commander, Malele, Angola

APOPO mine action programme in Colombia is made possible by its partners and donors, Campaña Colombiana Contra Minas and the Dutch Postcode Lottery.

I have been working for the Norwegian People’s Aid (NPA) for 17 years in conventional mine action that uses machines and deminers with metal detectors. The mine detection rats (MDR) are an extremely effective add-on asset to our work. At one task site, the MDR found landmine fragments very quickly, which identified the landmine pattern so that an NPA deminer could quickly find, excavate, and destroy the landmines. Around the site, the MDR also located other dangerous explosive material such as old bullets and mortars. Although finding the landmines is important, what really helps the local people is the speed at which the MDR has been able to work. Often every single inch has to be properly searched, and this is where the MDR came into their own, helping us finish ahead of schedule. As well as allowing people back on to their land faster than they thought, that is time and money that we can now reallocate to other mine detection and clearance tasks.

People’s Postcode Lottery is our largest recurring core funder. In 2017 players raised £800,000 for APOPO.
Since our beginnings as a research project in Antwerp University in Belgium almost 20 years ago, APOPO has challenged two of the world’s most pressing concerns head on—landmines and tuberculosis (TB). To date, we have achieved modest success against these serious global issues with our scent-detection technology, helping to find and destroy over 100,000 landmines and detecting TB in more than 12,000 patients who otherwise would have been missed by local clinics. Nonetheless, we are committed to relentlessly questioning, developing, and refining that technology through multifaceted empirical research at our training center in Morogoro, Tanzania, where we also institute exemplary animal welfare and close monitoring and evaluation of our training methods. Our detection rats are bred, socialized, trained, and assessed here before they are deployed to global operational sites.

In 2016, I arrived at APOPO to help the organization focus on improving its rat detection technology through research and development. To broaden APOPO’s scientific network and expert perspective on the diverse topics addressed by APOPO's rat detection technology, we installed an R&D advisory committee of respected scientists from around the world representing a diverse range of skills and expertise. APOPO’s scientific team consults with these experts on specific matters ranging from animal scent detection and rodent olfaction to the chemical composition of volatile organic compounds, which the rats smell when detecting target substances.

Throughout 2017, we focused on building a strong research team, comprised of highly skilled students, researchers, and postdoctoral scholars who are conducting various behavioral studies aimed at optimizing detection rat training techniques through a better understanding of the rats themselves, including how they learn about the odors they smell in the world. Our efforts to build APOPO’s R&D branch maintains our productive partnerships with the University of Antwerp, Sokoine University of Agriculture, Western Michigan University, Waikato University, and the Max Planck Institute while broadening our scientific affiliations to include other global research partners.

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I was fortunate to spend 10 days at the APOPO training headquarters through my role as a member of the Research and Development Advisory Committee. I was most impressed by the ingenious training methods that are used, and by the commitment to improve these methods through further research. I Was also impressed with the high level of concern for the welfare of the rats throughout their lifespan.

Professor John M. Pearce, FRS, FLSW, FBPsS

Dr. Cindy Fast holds a Ph.D. and master’s degree in psychology, specializing in learning and behavior and behavioral neuroscience from UCSD. She investigated the neurobiology of olfactory learning and perception in rodents as a postdoctoral scholar in the behavioral and cognitive neuroscience area at Rutgers University in New Jersey. In addition to a number of other accolades in her field, Dr. Fast was recently awarded the New York Academy of Sciences James McKeen Cattell Award, the most prestigious award for students of psychology in the U.S. She has more than 10 years of experience conducting behavioral research examining learning and memory and their underlying neural mechanisms with a variety of species, including rats, mice, pigeons, and hamster bees.

“Dr. Cindy Fast”

HEAD OF TRAINING & BEHAVIORAL RESEARCH

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CURRENT STUDIES

Delivering wildlife trafficking

In collaboration with Endangered Wildlife Trust (EWT) of South Africa, we are investigating the potential for detection rats to combat the illegal wildlife trade. The first step of this project is to train the rats to detect both pangolin scales and African ivory. The rats are being trained using a variety of methods. To control the rats’ behavior in the lab and the field, we are using a novel harness equipped with a micro-switch that allows the rat to directly and unequivocally “communicate” to a human handler that it has detected an odor target. APOPO designed a new harness equipped with a micro-switch for the rat to disturb the ground’s surface. For these reasons, communicating with detection rats: identifying alternative means of achieving target odors

While accurate detection of targets (such as landmines) cannot be underestimated, it is equally important that trainers feel confident in comparing the presence of training samples. This can sometimes be ambiguous or pose challenges. Because species can easily be confused with one odor or another, it is important to train the rats to communicate their scent-detection performance through their behavior. For example, in landmine-detection, APOPO’s rats are trained to scratch at the ground when they sense explo- sives. This project was supported by the UBS Optimus Foundation.

Trainer behavior impacts rat detection performance

Training/Testing

In 2017, we successfully bred and raised 67 rat pups that then underwent training. A total of 58 of these rat pups were trained for mine detection, and 23 have already met international accreditation standards; only four rats were needed to con- tinue in the training research assessing TB-detection abilities.

Does the diagnostic tool used to categorize training sam- ples influence “TB-detection rates” at all?

Rapido, participating in the TB-detection research program are typically trained with spurned samples subject to the widely used diagnostic method of smear microscopy, at our partner clinics. However, empirical evidence indicates that GeneX- pert-confirmed samples influence TB-detection rats’ abilities?

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IMPACT 2017
MINE ACTION

2,380
LANDMINES AND OTHER EXPLOSIVES DESTROYED

738,344 M2
LAND GIVEN BACK TO COMMUNITIES

38,886
PEOPLE FREED FROM THE TERROR OF LANDMINES

61,928
SUSPECT TB SAMPLES SCREENED

1,677
ADDITIONAL TB CASES DETECTED

25,155
POTENTIAL INFECTIONS HALTED
What is APOPO’s goal?

Our aspiration is to tackle TB through the deployment of the African giant pouched rat and using its remarkable sense of smell. Looking back on more than a decade of research, the list of results is substantial. Initial research began in 2002, with a successful proof of principle that rats can be trained to detect TB in human sputum samples, and in the following years, the discovery of TB-specific volatile organic compounds (VOCs), which are the source of the scent that rats detect. Since then, APOPO has further developed its scent-detection technology and evaluated the TB-detection rats’ performance and qualities under field conditions. Partnerships began with four clinics of the National TB and Leprosy Program in Tanzania in 2007. By the end of 2017, collaborators had risen to 57 local clinics in Tanzania and 14 in Mozambique, as well as 30 clinics ready to partner on the new research program in Ethiopia. Our field research allowed us to demonstrate the rats’ low cost and high speed of sample evaluation in different settings. Overall our research achieved a marked increase in TB case detection by about 40% compared to case detection at the clinics. Since the research program began, that has amounted to 12,680 additionally detected TB-positive patients (1,677 in year 2017 alone) who otherwise would have received a negative test result.

The latest diagnostic accuracy study (published in November 2017) showed that a team of rats is more sensitive than sputum microscopy when compared to bacterial culture (gold standard). It also indicated that the rats, unlike other tests, are equally successful in correctly identifying TB among people living with HIV and those without. However, the rats’ specificity, which is the ability to correctly rule out the disease, was suboptimal. Thus, further research and development is needed. In 2017 we were given the opportunity to present our results to expert audiences at the Tanzania Health Summit, and the African region and World conferences of the International Union Against Tuberculosis and Lung Disease, where our results received significant interest.
How can a technology undergoing R&D already make a difference?

Our TB-detection rats are a technology, for ‘research use’. The rats assist human samples which have already been tested for TB using conventional methods in our collaborating health centers. When a rat suspects TB in a sample that it previously tested negative, the sample will be rechecked by WHO-endorsed quality-assured labs. Upon agreement with the national TB program, a new gold-standard procedure will be implemented.

How do we detect TB using conventional methods in our collaborating health centers? Detecting cases of the disease is key to controlling TB but it can only unlock benefits when patients are then treated effectively and reliably. To make this possible we strive for adherence rates and ultimately the number of people cured.

TB DETECTION TANZANIA

In 2017 the diagnostic activities at the new Dar es Salaam laboratory and our Morogoro laboratory ran at full speed, and we doubled the number of collaborating TB clinics in Tanzania, which then orchestrate patient treatment. This is how our confirmed TB-positive results are conveyed back to the clinicians, which then arrange patient treatment. This is how our confirmed TB-positive results are conveyed back to the clinicians, which then arrange patient treatment.

We use an external quality assurance test (EQA) from the United Kingdom National External Quality Assurance Service for Microbiology (UK NEQAS) three times a year to check our performance in conventional and fluorescence microscopy. Our results are given to us by UK NEQAS and we always discuss how we can achieve improvements. It is important to maintain high standards by following the results and the results are accurate. Our results are usually very good, but this EQA test helps us make changes where necessary. As a team, we always discuss how we can achieve improvements. It is very important to maintain high standards by following the results and the results are accurate. The test helps us make changes where necessary. As a team, we always discuss how we can achieve improvements. It is very important to maintain high standards by following the results and the results are accurate. Our results are usually very good, but this EQA test helps us make changes where necessary.

In 2017 APOPO also began to pilot an innovative digital test. Operation APOPO’s Laboratory, in Dar es Salaam supported by the Human Development Innovation Fund (HDIF), Community health workers from the patient organization PHIRUKEITE conducted TB tests at home and brought them to the laboratory. Both patients and health workers document the visit with the digital tablet. This approach reduces the frequency of the required hospital visit to the patient, and aims to improve treatment adherence rates and ultimately the number of people cured.

Impact 2017

- Increase in detection rate 32%
- Additional patients diagnosed 1,244
- Samples evaluated 49,817
- Impact 2017

2017 diagnostic activities at the new Dar es Salaam laboratory and our Morogoro laboratory ran at full speed, and we doubled the number of collaborating TB clinics in Tanzania, which then orchestrate patient treatment. This is how our confirmed TB-positive results are conveyed back to the clinicians, which then arrange patient treatment. This is how our confirmed TB-positive results are conveyed back to the clinicians, which then arrange patient treatment.
The Mozambique APOPO TB program mainly covers all microscopy, TB suspect samples processed by the Government of Mozambique health authorities starting a roll out of the Tuberculosis Detection project. Based on molecular biology procedures, Xpert is recommended by international agencies for diagnosing TB. Substitution of microscopy by Xpert resulted in a lower number of samples being reviewed by the APOPO. Nevertheless, TB detection cases in the evaluated samples by the rats were 59%, and thus even higher than in previous years.

One of the most important goals since the project started in 2013 was to increase the number of patients tracked down for treatment. APOPO identifies them as TB-positive. The 24-hour results strategy implemented in 2015 allowed a larger number of additional patients to receive their results at the clinic and begin treatment. Still, it was verified that a significant number of patients are lost to follow-up through not returning for treatment after APOPO identifies them as TB-positive. The 24-hour results and microscopy by Xpert resulted in a lower number of samples being reviewed by the APOPO. Nevertheless, TB detection cases in the evaluated samples by the rats were 59%, and thus even higher than in previous years.

To tackle this issue, and following the example of the APOPO Tanzania TB program, a pilot program was conducted between June and November of 2017 in two clinics in collaboration with Associação Kenguelekezé, a community-based organization in the city of Maputo. This involved patient identification at the time of sample delivery to the laboratories for TB testing and subsequent tracking of those not returning for results after more than two days. The pilots were a success, as activities were able to find up to 93% of all additional patients identified by APOPO, with 86% of them initiating TB treatment (the remaining had either died or refused to be treated).

In June and November of 2017 in two clinics in collaboration with Associação Kenguelekezé, a community-based organization in the city of Maputo. This involved patient identification at the time of sample delivery to the laboratories for TB testing and subsequent tracking of those not returning for results after more than two days. The pilots were a success, as activities were able to find up to 93% of all additional patients identified by APOPO, with 86% of them initiating TB treatment (the remaining had either died or refused to be treated).

In this new phase we will change our confirmation technology from LED fluorescence microscopy to Xpert, thus contributing to the efforts of the government of Mozambique to implement this methodology in the highest number of cases.

The Mozambique APOPO TB program is funded and partnered by the Government of Maputo, the Instituto Nacional de Saúde (INS), the Maputo City Council Department of Health and the Mozambique Health Directorate. Our main operational partner is Kenguelekezé.

The entire year was dedicated to building the APOPO testing facility in the premises of AHRI, procurement and installation of equipment, staff recruitment and training, laboratory activities. The project will be in full swing by mid-2018 in both the enhanced case and active case finding set ups.

In the Ethiopian APOPO TB program is funded by Skoll Foundation and Ethiopian, health, AIDS, Foundation and partnered by Armauer Hansen Research Institute (AHRI), the German League Against Tuberculosis and Lung Disease, Global Fund, the Ethiopian Ministry of Health, the Ethiopian Federal Prison Administration Commission, the Ethiopian Red Cross Administration, Ethiopia and Addis Ababa City Council Health Bureau.

The three years of active case finding research aims to screen 52,500 prison inmates and staff in 35 prisons across Ethiopia.

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The APOPO Foundation, which opened in Switzerland in 2015, aims to support the organization’s overall global activities by strengthening its network and financial resources. The office facilitates direct tax-deductible donations for Swiss donors and aims to further engage its local audiences in support of APOPO’s life-saving activities worldwide. Based in Geneva, at the forefront of international mine action efforts and international health, we pursue a role of liaison with both existing and potential partners and donors in Switzerland, identifying opportunities for joint communication and events to foster long-lasting partnerships, as well as increasing engagement with international players such as the Global Fund, WHO, GICHD, and UNDP.

In 2017, the APOPO Foundation continued to support the global fundraising effort of APOPO in Switzerland and further afield, bringing its total funds raised to over CHF 500,000. The Foundation also intensified its promotion of rat detection technology by taking part in a number of conferences and panels at the invitation of International Schools, the United Nations, and the Swiss Confederation, among others. Dedicated to support the groundbreaking movement of the Sustainable Development Goals (SDG), the Foundation was thrilled to see the mine detection rats featured in the demining section of the “SDG Stories.” This is an interactive platform created by the Perception Change Project (PCP) of the United Nations in Geneva (UNOG) that reinterprets traditional stories through the prism of the SDGs and is dedicated to informing the public around those issues.

In October, the Foundation had the honor to host a 20th-anniversary celebration in Geneva, an inspiring event designed to reflect on APOPO’s 20 years of impact, and we warmly thank the organization’s supporters everywhere.

MARI KURAISHI, CHAIRPERSON, APOPO U.S.

“AT GlobalGiving, I am surrounded by stories of innovative grassroots organizations on a daily basis, but APOPO’s detection rats always stood out. I look forward to seeing APOPO’s impact and global reach grow as the organization gains traction within the mine action community and innovates into new areas. Live HeroRAT exhibits at zoos will allow us to demonstrate to thousands of potential supporters how quickly the rats detect landmines. We hope this will inspire people to discover innovation in unexpected places. Just like the founders did at APOPO.”

INSPIRING PEOPLE

INSPIRING PEOPLE

APOPO U.S. OFFICE

APOPO U.S. aims to support the organization’s overall global activities by strengthening collaboration with U.S.-based operational partners. The office continues its direct tax-deductible donations for the U.S. public, which makes up over 50% of the organization’s global public supporters. Based in Washington, D.C., APOPO U.S. also seeks to build partnerships with other U.S.-based global actors and public health implementers so that APOPO’s detection rat technology can impact more communities across the globe.

In 2017, APOPO U.S. played a leadership role in launching monthly, self-funded initiatives with several organizational partners, giving individuals giving more than $7,000 to sponsor their very own HeroRATs. The office also supports the APOPO Colombia mine-action program due to the proximity of the animal rescue and commitment and interest from U.S. organizations, and continues to support the mine action program in South Sudan. APOPO U.S. also formed partnerships with U.S.-based, and in 2018, live, simulated mine-detection demonstrations are expected to be a feature of at least one major zoo in the U.S.

APOPO SWISS FOUNDATION

APOPO SWISS FOUNDATION

THE APOPO FOUNDATION, WHICH OPENED IN SWITZERLAND IN 2015, AIMS TO SUPPORT THE ORGANIZATION’S OVERALL GLOBAL ACTIVITIES BY STRENGTHENING ITS NETWORK AND FINANCIAL RESOURCES. THE OFFICE FACILITATES DIRECT TAX-DEDUCTIBLE DONATIONS FOR SWISS DONORS AND AIDS IN FURTHER ENGAGING ITS LOCAL AUDIENCES IN SUPPORT OF APOPO’S LIFE-SAVING ACTIVITIES WORLDWIDE. BASED IN GENEVA, AT THE FOREFRONT OF INTERNATIONAL MINE ACTION EFFORTS AND INTERNATIONAL HEALTH, WE PURSUE A ROLE OF LIAISON WITH BOTH EXISTING AND POTENTIAL PARTNERS AND DONORS IN SWITZERLAND, IDENTIFYING OPPORTUNITIES FOR JOINT COMMUNICATION AND EVENTS TO FOSTER LONG-LASTING PARTNERSHIPS, AS WELL AS INCREASING ENGAGEMENT WITH INTERNATIONAL PLAYERS SUCH AS THE GLOBAL FUND, WHO, GICHD, AND UNDP.

In 2017, APOPO U.S. continued to support the global fundraising effort of APOPO in Switzerland and further afield, bringing its total funds raised to over CHF 500,000. The office was notably instrumental in securing funding to ensure continuation of mine action operations in both Angola and Cambodia. The Foundation also intensified its promotion of rat detection technology by taking part in a number of conferences and panels at the invitation of International Schools, the United Nations, and the Swiss Confederation, among others. Dedicated to support the groundbreaking movement of the Sustainable Development Goals (SDG), the Foundation was thrilled to see the mine detection rats featured in the demining section of the “SDG Stories.” This is an interactive platform created by the Perception Change Project (PCP) of the United Nations in Geneva (UNOG) that reinterprets traditional stories through the prism of the SDGs and is dedicated to informing the public around those issues.

In October, the Foundation had the honor to host a 20th-anniversary celebration event centered on our detection rate innovation, its evolution, and our life-saving missions around the world. It was a wonderful opportunity to warmly thank again all our donors, partners, and friends. Your support allows us to make a true difference.

YVES HERVEY-CAUSSE, CHAIRPERSON, SWISS BOARD

“WE were very grateful to see so many people joining us for our 20th-anniversary celebration event centered on our detection rate innovation, its evolution, and our life-saving missions around the world. It was a wonderful opportunity to warmly thank again all our donors, partners, and friends. Your support allows us to make a true difference.”

APOPO U.S. OFFICE

APOPO U.S. OFFICE

“IN APOPO’S 20 YEARS OF IMPACT, WE HAVE SEEN TECHNOLOGY, PARTNERSHIPS, AND COMMUNITY ENGAGEMENT MOVE OUR ORGANIZATION INTO NEW AREAS. WE LOOK FORWARD TO SEEING OUR IMPACT AND GLOBAL REACH GROW AS THE ORGANIZATION GAINS TRACTION WITHIN THE MINE ACTION COMMUNITY AND INNOVATES INTO NEW AREAS.”
In 2017, the long-standing relationship and efforts between APOPO and Sokoine University of Agriculture (SUA) led to a milestone we will all remain proud of: We were chosen by the World Bank as an Africa Centre of Excellence for Innovative Rodent Pest Management and Biosensor Technology Development. This center provides a great opportunity for us to refine biosensor technology and explore possibilities for its application beyond landmine and tuberculosis detection. Most importantly, it provides an opportunity to expand the capacity in terms of a trained human resource across the region and beyond, and consequently to ignite the drive to cascade our technologies to the public domain.

It is one of the four World Bank Centers of Excellence in Tanzania selected through a rigorous and highly competitive exercise that saw 116 project proposals submitted but only 24 chosen to form the African Centers of Excellence II (ACE II) across the East and Southern Africa (ESA) region. ACE I is a similar set of African Centers of Excellence in West Africa. Each of the 24 ACEs will be funded up to U.S. $6 million over the five years of the project.

The objective of the ACE II project is to strengthen selected higher education institutions in Eastern and Southern Africa to deliver quality postgraduate education and build collaborative research capacity in the regional priority areas. These experts will go on to develop and apply science and technology and meet the demand for skills required to solve Africa’s most pressing challenges.

The launch of the Tanzanian African Centers of Excellence took place on August 23, 2017, at the Nelson Mandela Institute of Science and Technology in Arusha.

I trust that we will maximally exploit this rare opportunity to achieve even more incredible milestones for the betterment of our needy and marginalized communities. Thanks to the World Bank for its confidence and trust in us. Rest assured of my support as the Director of Pest Management Centre towards the realization of this endeavor.

“As a humanitarian NGO embracing social transformation and innovation, we are proud to be part of APOPO’s plan to play a proactive role in safeguarding our climate and planet through offsetting its carbon footprint.”

Janet Maro, Founder SAT

In April 2016, APOPO partnered with Sustainable Agriculture Tanzania (SAT) to embark on a tree planting project that will help offset APOPO’s CO2 emissions caused primarily by transport and travel. The project aims to plant 50,000 trees over a five-year period, aimed at promoting sustainable agricultural practices that prevent soil productivity and protect the nearby ecosystem against deforestation. Once they have reached maturity each tree can sequester 50,000 tons of carbon dioxide per year.

In 2017, 3,282 trees were planted successfully amongst 2017 tree species that were previously selected and trained by SAT. These trained farmers will help restore degraded landscapes and decrease deforestation, which is driven by basic human needs such as subsistence farming and the need for firewood for fuel. As watersheds, the forests of the Uluguru Mountains are of critical importance to indigenous village communities, the cities of Morogoro and Dar es Salaam, and the survival of plants and animals unique to the region.
Since the start of the APOPO Cambodia Mine Action program in 2015, the public has shown a strong interest in the use of rats to detect landmines. APOPO capitalized on this by opening a Visitor Centre to highlight our work and raise public awareness about the global issue of landmines.

The Center provides background to APOPO’s work to give our visitors a better understanding of mine action and how landmines affect local communities, and also to introduce and demonstrate the work of the mine detection rats. The MDR provide our supportive national partner The Cambodian Mine Action Center (CMAC) with a unique solution to speeding up demining efforts in the country, helping to detect landmines faster than by using conventional methods such as metal detectors.

APOPO has also been careful to make sure the center is environmentally friendly by supporting the community through employing locally and working with ethical and local suppliers. By the end of the year, the center had already hosted more than 1,000 visitors from all around the world.

Meet our HeroRATs

Shuri is a staff favourite with a cheeky personality who brings a smile to the face of everyone she meets. With a flash of her whiskers, Shuri will help sniff out landmines in Angola, one of the most mine-affected places in the world.

Magawa is one of the friendliest HeroRATs ever, but once he gets to work, he’s as determined as they come. Based in Siem Reap, Cambodia, Magawa sniffs out deadly explosives 96 times faster than conventional solutions can find them.

Chewa is one of the biggest HeroRATs of all time. Weighing in at a monstrous 1.36 kg, Chewa’s weight meant he was always destined to sniff out tuberculosis rather than landmines. Chewa means “brave” in Swahili, but his handlers call him Mchapa-kazi, which means “the hard worker.”

The best animal adoption in the world

APOPO’s HeroRAT adoption gives you the chance to join one of three HeroRATs on a life-saving adventure. Every adoption comes complete with a 10-page welcome pack, adoption certificate, and monthly impact updates with the latest news, pictures, and statistics from the field. For as little as U.S. $7 a month, you can adopt or gift a HeroRAT and help save lives. And now you can make your adoption extra-special by including a printed welcome pack, soft toy, or T-shirt as part of the package as well. Visit our website to find out more!

Visitors have been impressed by APOPO’s work, and most are not aware that Cambodia remains one of the most mine-affected countries in the world. On popular online ratings sites, the Visitor Center has achieved a perfect five-star score. We will now work to make the center more accessible to non-English-speaking people, host local events such as photography exhibitions, and develop a section about the APOPO TB-detection rats.

I visited Apopo when it first opened and was blown away! It was so amazing to learn about the incredible work that they have already done and are continuing to do in Cambodia and around the world. It was also very special to see the rats in action. They are so well treated and really are heroes.

5-star review, Trip Advisor

Short’s is a staff favourite with a cheeky personality, who brings a smile to the face of everyone she meets. Just a graduate, she has recently graduated from APOPO mine detection training with flying colors. With a flash of her whiskers, Shuri will help sniff out landmines in Angola, one of the most mine-affected places in the world.

Magawa is one of the friendliest HeroRATs ever, but once he gets to work, he’s as determined as they come. Based in Siem Reap, Cambodia, Magawa sniffs out deadly explosives 96 times faster than conventional solutions can find them.

Chewa is one of the biggest HeroRATs of all time. Weighing in at a monstrous 1.36 kg, Chewa’s weight meant he was always destined to sniff out tuberculosis rather than landmines. Chewa (pronounced Cheh-wah) means “brave” in Swahili, but his handlers call him Mchapa-kazi, which means “the hard worker.”
Thank you to our partners and donors

ONCE AGAIN, WITH GREAT APPRECIATION, THANK YOU FOR YOUR SUPPORT. APOPO IS DEBUTED TO ALL THE JOURNALISTS, MEDIA SPECIALISTS AND LEGAL SUPPORTERS WHO CONTRIBUTE TO SPREAD THE WORD AND SUPPORT OUR WORK.

For almost 20 years, people like you have directly helped us strengthen foundations that upgrade not just the ability of our HeroRATs to detect landmines and tuberculosis but also APOPO’s overall capacity to address these grave global issues. With your continued support in 2017, we built on those foundations by setting foot in two new landmine-contaminated countries, constructing a new TB facility in Ethiopia, and commencing investigations on exciting new areas that address wildlife conservation and carbon offsetting. As well as this, you directly boosted our organizational capability by helping us acquire key staff and operational equipment that have huge potential for helping us to work more efficiently and capitalize on opportunities. Our enhanced marketing activities have already raised the profile of the issues of landmines and global tuberculosis, as well as putting us in a good position to increase our public funding income.

I would personally like to thank each of you for caring about what is happening in the world. So it is with very special thanks that I hope you have read through this report and found out about how you have helped us impact the communities who need it most.

CHRISTOPHE COX
APOPO CEO

Media appearances
501
Facebook followers
72,697
Twitter followers
6,069
Instagram followers
14,303
Website users
866,282
Newsletter subscribers
23,396

APOPO is indebted to all the journalists, media specialists and legal supporters who continue to spread the word and support our work.
## Donations & Subsidies 2017

- **Public fundraising**: €606,626
- **Government grants**: €532,157
- **Foundations grants**: €2,691,157
- **Research grants**: €239,022
- **Miscellaneous operating income**: €42,695

### Expenses and Investments 2017

#### IN EURO*

<table>
<thead>
<tr>
<th>Activity</th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Action Mozambique</td>
<td>111,900</td>
<td></td>
</tr>
<tr>
<td>Mine Action Angola</td>
<td>468,721</td>
<td></td>
</tr>
<tr>
<td>Mine Action Cambodia</td>
<td>537,519</td>
<td></td>
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<tr>
<td>Mine Action Zimbabwe</td>
<td>182,234</td>
<td></td>
</tr>
<tr>
<td>Mine Action Colombia</td>
<td>99,671</td>
<td></td>
</tr>
<tr>
<td>Visitor Center Cambodia</td>
<td>85,858</td>
<td></td>
</tr>
<tr>
<td>Training Technical Survey Dogs</td>
<td>425,500</td>
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<tr>
<td>TB program Tanzania-Morogoro</td>
<td>350,441</td>
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<td>TB program Tanzania-Dar</td>
<td>193,734</td>
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<td>TB program Mozambique</td>
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<tr>
<td>TB program Ethiopia</td>
<td>342,699</td>
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<tr>
<td>Research and Development</td>
<td>236,068</td>
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<tr>
<td>Training Mine Detection Rats</td>
<td>175,648</td>
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<td>U.S. Office</td>
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<td>Swiss Foundation</td>
<td>136,779</td>
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<tr>
<td>Administration</td>
<td>478,660</td>
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<td>Marketing</td>
<td>322,760</td>
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<tr>
<td>Carbon Offset</td>
<td>5,000</td>
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<tr>
<td>Exchange fluctuations</td>
<td>157,396</td>
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</tr>
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</table>

* Cash-based

### Profit & Loss Statement (Euro)

<table>
<thead>
<tr>
<th>Description</th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td>4,093,293</td>
<td>4,060,232</td>
</tr>
<tr>
<td>Total operating expenses</td>
<td>3,548,293</td>
<td>2,900,346</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1,095,293</td>
<td>1,050,346</td>
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<tr>
<td>Operating result</td>
<td>648,000</td>
<td>110,690</td>
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<tr>
<td>Extraordinary result</td>
<td>8,921</td>
<td>514</td>
</tr>
<tr>
<td>Net income</td>
<td>(699,745)</td>
<td>330,447</td>
</tr>
</tbody>
</table>

### Balance Sheet in Euro

<table>
<thead>
<tr>
<th>Description</th>
<th>2017</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current assets</td>
<td>3,146,237</td>
<td>4,220,830</td>
</tr>
<tr>
<td>Current receivables</td>
<td>302,808</td>
<td>408,408</td>
</tr>
<tr>
<td>Other assets</td>
<td>507,000</td>
<td>579,131</td>
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<tr>
<td>Cash and equivalents</td>
<td>2,336,465</td>
<td>3,233,291</td>
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<tr>
<td>TOTAL ASSETS</td>
<td>4,084,028</td>
<td>4,220,830</td>
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</table>

### Expenses and Investments Per Activity

- Mine Action Mozambique
- Mine Action Angola
- Mine Action Cambodia
- Mine Action Zimbabwe
- Mine Action Colombia
- Visitor Center Cambodia
- Training Technical Survey Dogs
- TB program Tanzania-Morogoro
- TB program Tanzania-Dar
- TB program Mozambique
- TB program Ethiopia
- Research and Development
- Training Mine Detection Rats
- U.S. Office
- Swiss Foundation
- Administration
- Marketing
- Carbon Offset
- Exchange fluctuations

* Cash-based