Fighting poverty and making money need not be mutually exclusive, according to famous business professor C.K. Prahalad in his book, ‘THE FORTUNE AT THE BOTTOM OF THE PYRAMID’ (2005). According to Prahalad, rather than regarding the four billion people currently living below the poverty line as victims, we should see them as potential consumers and entrepreneurs. Businesses can open up markets of unprecedented scope if they are sufficiently innovative in coming up with cheap products targeted at local needs.

As professor of the design engineering department at the Industrial Design faculty, Dr. PrabhU Kandachar has supervised dozens of graduation assignments with a bottom-of-the-pyramid focus. He calls Prahalad’s ideas ‘not revolutionary, but smart and well-timed.’ Kandachar: “Many businesses are on the lookout for new markets and are willing to run their business along socially responsible lines.”

Last year, after reading ‘THE FORTUNE AT THE BOTTOM OR THE PYRAMID’, industrial designer MSc. Roelie Bottema contacted Kandachar. “I don’t think the market offers the solution to every problem,” she says, “but charities will sometimes have this ‘let us improve your life for you’ attitude. A business is forced to look into what the people themselves want.” Kandachar proposed a graduation assignment for Bottema at the Danish company, Vestergaard Frandsen, which had developed a portable tube for purifying water. A week later Bottema travelled to five villages in Ghana to distribute the Lifestraw, as it is called, to a total of twenty-five test users. The testers were positive about the product. “Suddenly they weren’t ill any more.” The Lifestraw works by letting the user suck water through a number of filters and two ‘chambers’ that contain iodine granules and carbon, respectively. They thoroughly purify the water. Bottema: “Even the iodine taste of the purified water was not a problem to them, since it was proof that the water was now clean.”

However, children under the age of five did not manage to suck up the water, and it is this age group in which the drinking of polluted water causes the highest number of deaths. So, Bottema designed a child’s version, in which the tube was attached to a squeeze bottle. The company liked the idea very much. Bottema has since graduated and now works as a research and development project leader at Vestergaard Frandsen.

Saving
Once the Lifestraw receives the required safety certification, it will be marketed. “If charities decide to give away the product for free in large quantities, the users would not have to pay anything,” Bottema says. “Another scenario is where some people would have to pay only part of the selling price, and the charities would pay the remainder. I am not allowed to say whether the market price is one dollar or not, but we are trying our best to keep the price as low as possible.” One thing that Bottema noticed is that people are prepared to save up for the tube. “Nobody will pay as gladly for clean drinking water as the very poorest.” For the time being the Lifestraw will be produced in Asia. Bottema: “Africa simply does not have the know-how yet. And, Asia is cheaper because African countries often levy high taxes on each other’s imports.”
Seventy ice creams a day

In Accra, the capital of Ghana, three disabled street vendors ply their trade from a hand-driven bicycle. Four students at the Industrial Design faculty developed the bicycle in situ for the Movendi Foundation, an organisation dedicated to helping the disabled in developing countries. In Ghana the disabled are often reduced to begging because they are unable to get a job.

In a workshop the students together with local labourers built a prototype of the bicycle. Local production is not only important for economic reasons, according to industrial design student Sietse Cieraad. “Many of the wheelchairs sent from Europe to Ghana do not reach the right people, and when they do, there is nobody to repair them when they break down. Our bicycle can be repaired using local components, and it is rugged enough to be used on their bad roads.”

The production cost alone of the bicycle is 170 dollars, which is a major investment for the disabled. Fortunately, Danish dairy company Fanmilk ordered three bicycles to be fitted with coolers. These will enable three disabled people to make a living selling ice creams. Cieraad: “Thanks to the bicycle, one of them is now selling seventy ice-creams a day, as much as the able-bodied Fanmilk vendors.” The Danish dairy, which is also present in West Africa, is considering expanding its operation. “Cambodia is another place where the bicycle could be a success,” says industrial design student Imke Schepers.

Africa is not the easiest continent in which to turn a bottom-of-the-pyramid project into a success. Graduation assignments in design engineering often take place in Asia or South America. Supervisor Jan Carel Diehl MSc.: “In Africa you find multinationals and small companies. There is no intermediate layer to provide innovation. Africa does not have the entrepreneurial spirit you find in China and India, and at the universities there is a wide gap between science and practical applications. I know an African professor who gained a Ph.D. for his work on complex computer calculations, but knowledge like that is still far from relevant in Africa.”

Algae soup

Bioprocess technology lecturer Dr. Wouter van Winden (Applied Physics) and his friend from his
student days at Wageningen University, Bram van Beek, are working closely together with the Eduardo Mondlane University of Maputo, Mozambique. In the Zambezi delta they have set up an eye-catching test plant, consisting of a large pond in which an algae soup is being formed. Van Winden’s mission is to find out if and how these algae can be used to produce biodiesel fuel. The current source of biofuel usually consists of such crops as rape and oil palms, but these take up a lot of space which could otherwise be left to forests or agriculture.

When Van Winden established contact with people in Mozambique, the university welcomed the plan. “We were lucky, as they were just about to set up a subsidiary in the delta, which lies more than a thousand kilometres north of Maputo. Their support was important, since it elevated the project above the level of an idea imported by westerners.” Finding the right kind of algae is tricky. “Just like a garden will have its weeds, among the algae you will soon find types you don’t want. If you want to keep the process profitable, you will have to create a stable algae culture that produces lots of oil.” In the basins constructed so far — the largest of which measures a thousand square metres — the water is continuously kept in motion. “That is how you make the best algae soup.”

As soon as the ideal algae composition is reached in the basin, the research becomes less complicated. “Once you have the right algae, all you have to do is collect them from the water, dry them, and then press them to extract the oil. Next to the basin we have constructed a container in which the extraction can take place on a laboratory scale. It is not a high-tech process, but who needs that in Mozambique?” Van Winden estimates that a car can run about fifty to one hundred kilometres on the daily production of the largest test basin. “The Zambezi delta covers thousands of square kilometres that could be used to construct larger basins.” When the researchers reach the end of their funding this December, the basins and equipment will be handed over to the university. The contact with TU Delft will be maintained, and TU Delft students will be sent out to serve internships in Mozambique. Van Winden: “We have to make sure the project doesn’t grind to a halt. Mozambique is one of the poorest countries in the world. If the plant were to become disused, people would start taking parts home with them, where the short-term benefits would be greater.”

Van Winden has not yet read Prahalad’s book. “When we started the project, we did know about the three Ps that form the basis of sustainable development: People, Planet, and Profit.”
You can keep pumping as much money into developing countries as you like, but the billions of foreign aid spent over the past decades have not managed to bridge the gulf between rich and poor. A better strategy is to enable people to establish their own business. Entrepreneur and mining engineer Martijn Nitzsche knows what he is talking about, since his Water Pyramid tested successfully in The Gambia and is now being introduced in Ghana, Indonesia, and Bangladesh. The Water Pyramids are solar-powered waterworks, and have proved capable of supporting local jobs. Nitzsche invented the Water Pyramid in response to a problem that threatens so many developing countries, the lack of clean drinking water. "During the wet season, the water pyramid can collect large quantities of water. During the dry season, it can also use solar distillation to extract pure water from brackish or salt water. Inside the pyramid salt water evaporates as it gets heated by the sun. The water condenses against the inside of a tent made from special materials, and then runs down the material into a trough that collects the distillate in a tank. In the tank the 100 percent pure water can either be remineralised for use as drinking water, or it can be used as distilled water for medical or industrial applications."

Nitzsche found out that it is not the technology itself, but the involvement of the local population that is crucial to making the water pyramid projects work. The one thousand people living in the Gambian village of Mandianri can become local entrepreneurs, selling the water in different guises as juices, bags of water, or cooled water. The employees of the water pyramid get their pay from the water sales. Nitzsche: "It is in the employees’ own interest to make sure the Water Pyramid is kept in good order. The local people understand why the water does not come free, since they can see that one of their own needs to be paid for standing out in the sun to bottle safe drinking water."

Nitzsche sees local entrepreneurship as the best way to prevent projects from failing after a while.

Solar waterworks

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This is where you can see the parallels with Prahalad’s idea: a project that does not generate a profit in the long term will never succeed and can therefore not be sustainable. As far as we are concerned, biodiesel fuel could just as well be produced by a western company in Mozambique, as long as it brings local jobs, tax revenues, and export currency to the Mozambique economy.

For Kandachar and his students, ‘THE FORTUNE AT THE BOTTOM OF THE PYRAMID’ has opened new doors, but this does not mean that he accepts the concept at face value. “I am a scientist. It takes proof to convince me, not ideas.”

As the editor of a publication dealing with the base-of-the-pyramid philosophy, to be published next year, Kandachar comes up with a number of awkward questions. Should companies be allowed to expose people with hardly any income at all to intensive marketing and advertising campaigns? Should traditional countries dispense with their old strategies for foreign aid altogether? “I don’t have the answers to all these questions,” Kandachar says, “but I don’t think the TU Delft should suspend such projects until every question has been answered. People need our help now. Academic discussions are the least of their interests.”

‘Nobody will pay as gladly for clean drinking water as the very poorest’

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Prabhu Kandachar: “Many companies are searching for new markets and want to conduct socially responsible business.”

Next year will be the 165th anniversary of TU Delft. The theme of the festivities is sustainable development, with a strong emphasis on Africa. “Over the next three or four decades something will have to be done to solve Africa’s problems with energy, food, environmental issues, public health, and drinking water. Solving these problems requires technological breakthroughs, which is our task as a university,” says Prof. Dr. Ben Droste, dean of the faculty of aerospace technology, and president of the anniversary committee. “Africa often gets mentioned in a negative context, but it offers enormous potential for the future.”

Africa

Surface area: approximately 30 million km² (approximately 20 percent of the earth’s total surface area)
Population: circa 887 million (14 percent of the global population)
Illiteracy rate: 40 percent
GDP per inhabitant: 1,968 U.S. dollars per year
Percentage of people who must live on less than $1 per day: 36 percent
Economic growth: 5 percent
Division of labour per sector: agriculture (60 percent), industry (15 percent) services (25 percent)
Most important minerals: oil, gold, copper, diamonds

Gambia
Surface area: 10,000 km²
Population: 1.5 million
Gross Domestic Product (GDP), adjusted for purchasing power: 3 billion (2005)
GDP per inhabitant: 1,900 U.S. dollars
Percentage of people who must live on less than $1 per day: 59 percent
Percentage of people who live under the national poverty line: 64 percent
Life expectancy: 54 years

Ghana
Surface area: 230,940 km²
Population: 22.4 million
Gross Domestic Product (GDP), adjusted for purchasing power: 54.9 billion
GDP per inhabitant: 2,500 U.S. dollars
Percentage of people who must live on less than $1 per day: 45 percent
Percentage of people who live under the national poverty line: 40 percent
Life expectancy: 59 years

Mozambique
Surface area: 784,090 km²
Population: 19.7 million
Gross Domestic Product (GDP), adjusted for purchasing power: 26.2 billion (2005)
GDP per inhabitant: 1,300 U.S. dollars
Percentage of people who must live on less than $1 per day: 38 percent
Percentage of people who live under the national poverty line: 70 percent
Life expectancy: 39 years