

# 적정기술의 의미 및 활용방안

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적정기술재단 대표

홍성욱

## 적정기술이란?

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적정기술이란 환경파괴와 인간 소외를 초래하고 있는 현대산업문명을 이끄는 거대 생산기술에 대비되는 **대중에 의한 생산기술**입니다.

고액의 투자가 필요하지 않고, 에너지 사용이 적으며, 누구나 쉽게 배워서 쓸 수 있고, 희소재료를 낭비하지 않고, 현지에서 나는 원재료를 쓰고, 소규모의 사람들이 모여서 제품 생산이 가능한 기술입니다.

## 적정기술의 특징

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- 비용이 적게 든다.
- 가능하면 현지에서 나는 재료를 사용한다.
- 일자리를 창출하고, 현지의 기술과 노동력을 활용한다.
- 작은 규모의 농부들에 의해서도 사용가능할 정도로 소규모이다.
- 사람들의 협동 작업을 이끌어내며, 지역사회의 발전에 공헌한다.
- 분산된 재생 가능한 에너지 자원을 활용한다.
- 기술을 사용하는 사람들이 해당 기술을 이해할 수 있다.
- 변화하는 환경에 맞추어 적응할 수 있는 유연성이 있다.

“적정기술은 지역주민들에게 권리를 주는 것 뿐 아니라, 지역주민들의 실제 역량을 고려해 그 역량으로 누릴 수 있는 보다 많은 선택의 자유를 준다는데 의미가 있다. 적정기술은 곧 **적정역량(Appropriate Capacity)**을 의미한다. 개발의 측면에서 적정기술은 목표(goal)가 아니라 수단(tool)이며, 다음 단계의 개발로 이끄는 마중물의 역할을 할 수 있다.”

김정태, 적정기술 2권, 한밭대학교 적정기술연구소(2010)



small  
is  
beautiful



a  
study  
of  
economics  
as  
if



people  
mattered  
by  
ernst  
friedrich  
schumacher

# 작은 것이 아름답다

— 인간 중심의 경제를 위하여



E. F. 슈마허 지음  
이상호 옮김



작은 것은  
자유롭고  
창조적이고  
효과적이며,  
편하고  
즐겁고  
영원하다

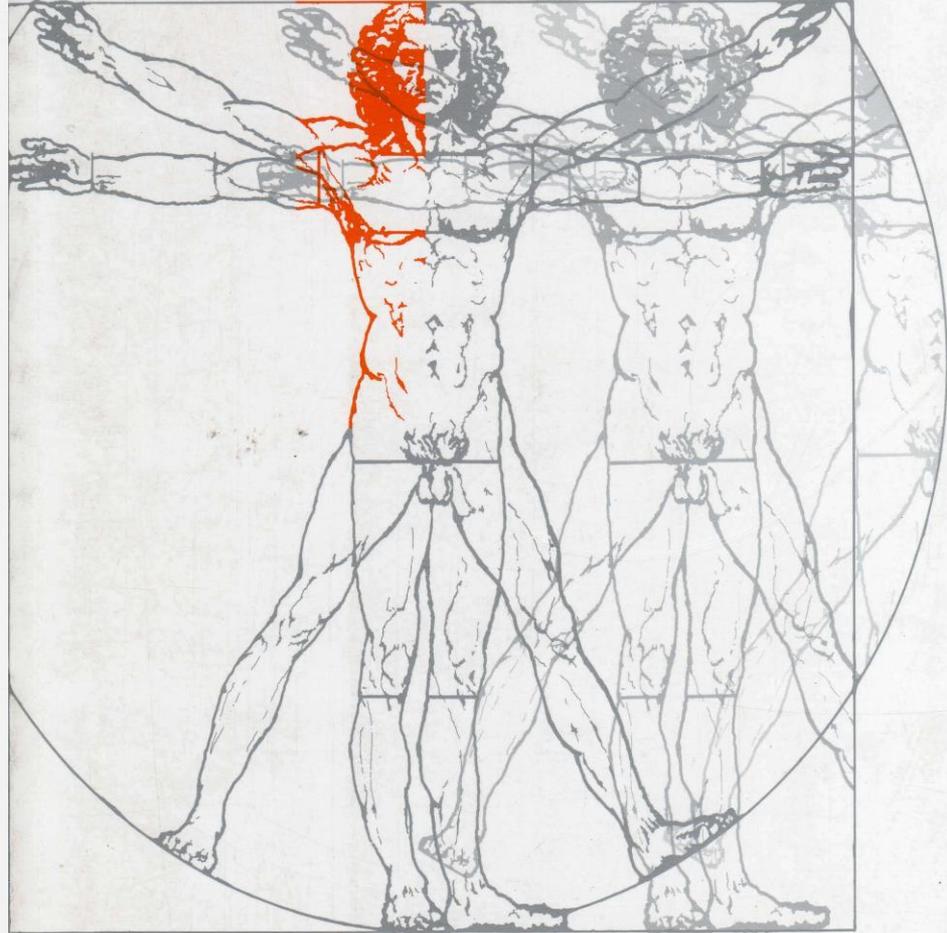


문예출판사

마진신서  
01

# 인간을 위한 디자인

빅터 파파넡 / 현용순 · 이은재 옮김



VICTOR PAPANEK

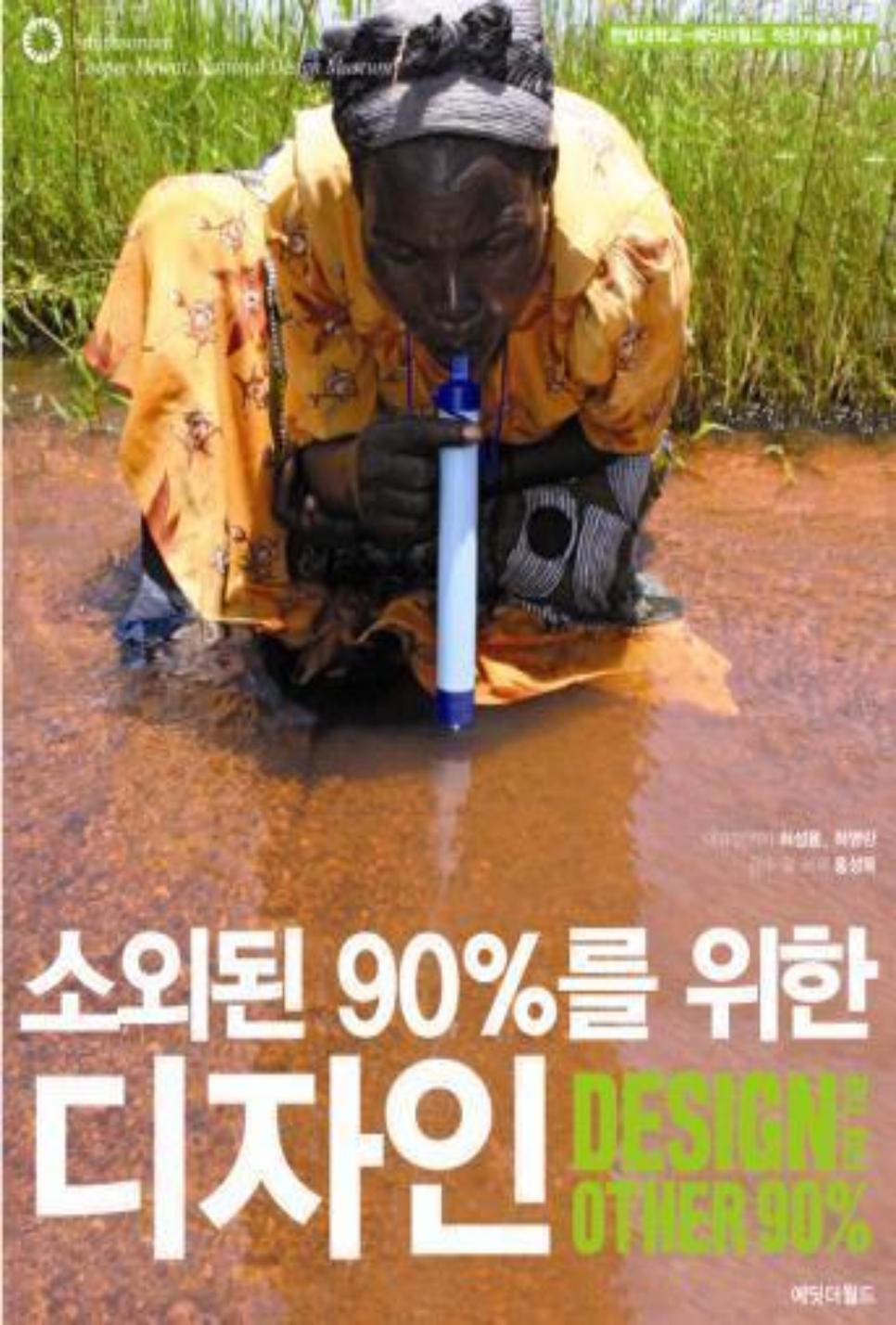
# DESIGN FOR THE REAL WORLD

...POLAK POLAK teaches us to think simple. Paul Polak bring forward ideas and solutions that bypass government agencies and other leaden institutions. Ideas that work!" —PAUL NEWMAN

PAUL POLAK

# OUT OF POVERTY

WHAT WORKS WHEN TRADITIONAL APPROACHES FAIL



소외된 90%를 위한  
디자인 DESIGN  
OTHER 90%

에딧더월드

## 10:90의 법칙

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“세계 디자이너의 95%는 오직 상위 10%의 부자 소비자들을 위한 상품과 서비스를 디자인하는데 온 힘을 기울인다. ‘디자인 혁명’이라 불릴 만한 일이 일어나지 않는다면 나머지 90%를 위한 디자인이란 것은 있을 수 없다.”

**Paul Polak, 소외된 90%를 위한 디자인**

# http://other90.cooperhewitt.org

Design For the Other 90% | Cooper-Hewitt, National Design Museum - Microsoft Internet Explorer

주소: http://other.cooperhewitt.org/

## DESIGN FOR THE OTHER 90%

VISIT COOPER-HEWITT SEARCH CREDITS

ABOUT THE EXHIBITION EVENTS BLOG RESOURCES

SHELTER HEALTH WATER EDUCATION ENERGY TRANSPORT

### EXPLORE THE MAP

Find objects used around the world by selecting a region on the map.



### A REVOLUTION IN DESIGN

"The majority of the world's designers focus all their efforts on developing products and services exclusively for the richest 10% of the world's customers. Nothing less than a revolution in design is needed to reach the other 90%."  
—Dr. Paul Polak, *International Development Enterprises*

Designers, engineers, students and professors, architects, and social entrepreneurs from all over the globe are devising cost-effective ways to increase access to [food](#), [water](#), [energy](#), [education](#), [healthcare](#), revenue-generating activities, and affordable [transportation](#) for those who most need them. And an increasing number of initiatives are providing solutions for underserved populations in developed countries such as the United States.



### JOIN THE DISCUSSION

**Schools Lead**  
CYNTHIA E. SMITH  
6 COMMENT(S)

A multitude of schools are at the forefront of devising low cost innovations around the world, these are only a few of the examples of initiatives and projects underway.

### GET INVOLVED

**Panel Discussion Video**

WATCH THE VIDEO – This panel highlights the growing trend in design to create affordable and socially responsible objects for the vast majority of the world's population (90%) not traditionally serviced.

완료 인터넷

# Q Drum

Designers: P. J. and J. P. S. Hendrikse

Manufacturer: Kaymac Rotomoulders and Pioneer Plastics South Africa, 1993

In use in: Kenya, Namibia, Ethiopia, Rwanda, Tanzania, Cote d'Ivoire, Nigeria, Ghana, etc.

Millions around the world, especially in rural Africa, live kilometers from a reliable source of clean water, leaving them vulnerable to cholera, dysentery, and other **water-borne diseases**. Water in adequate quantities is too heavy to carry. The Q Drum is **a durable container designed to roll easily, and can transport seventy-five liters of clean and potable water**. Rolling the water in a cylindrical container, rather than lifting and carrying it, eases the burden of bringing water to those who need it.



# LifeStraw

Designer: Torben Vestergaard Frandsen

Manufacturer: Vestergaard Frandsen S.A.

In use in: Ghana, Nigeria, Pakistan,  
Uganda

About half of the world's poor suffer from waterborne diseases, and more than 6,000 people, mainly children, die each day by consuming unsafe drinking water. LifeStraw, a personal mobile water-purification tool is designed to turn any surface water into drinking water. It has proven to be effective against waterborne diseases such as typhoid, cholera, dysentery, and diarrhea, and removes particles as small as fifteen microns.



# Pot-in-Pot cooler

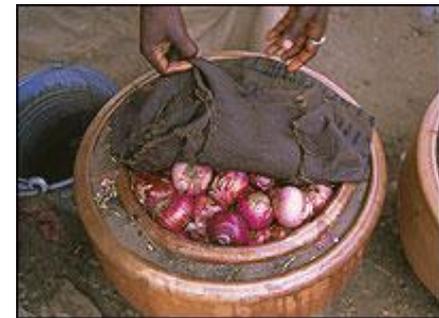
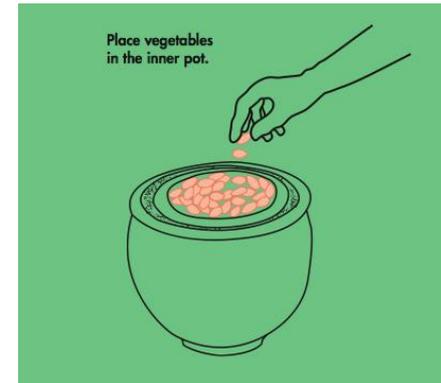
**Designer:** Mohammed Bah Abba

**Manufacturer:** local potters Nigeria, 1995

**In use in:** Cameroon, Tchad, Niger, Eritrea, Ethiopia, Burkina Faso

The Pot-in-Pot system consists of two pots, a smaller earthenware pot nestled within another pot, with the space in between filled with sand and water. When that water evaporates, it pulls heat from the interior of the smaller pot, in which vegetables and fruits can be kept. In rural Nigeria, many farmers lack transportation, water, and electricity, but one of their biggest problems is the inability to preserve their crops. With the Pot-in-Pot, tomatoes last for twenty-one days, rather than two or three days without this technology.

Fresher produce can be sold at the market, generating more income for the farmers.



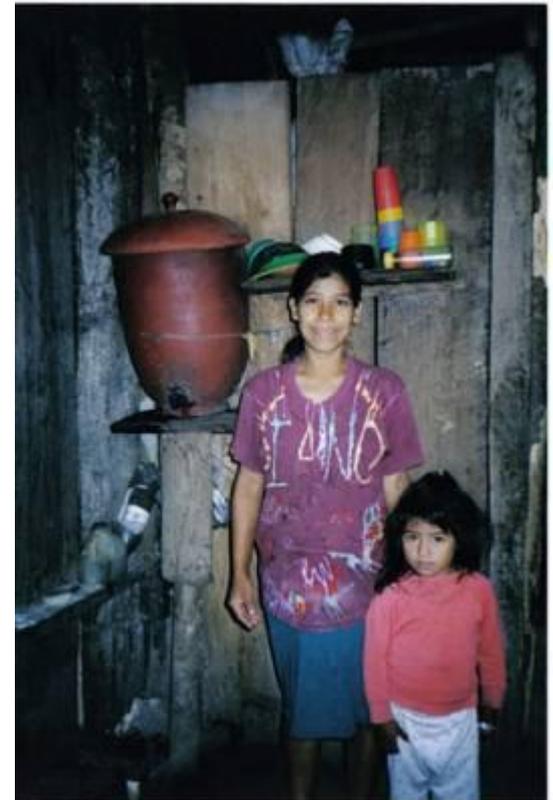
# Ceramic Water Filter, Cambodia

**Designers:** Dr. Fernando Mazariegos, Ron Rivera (Potters for Peace), and International Development Enterprises (IDE) Cambodia

**Manufacturer:** Local private factory set up by IDE Cambodia, 2006

**In use in:** Cambodia, Guatemala, Ecuador, Nicaragua, El Salvador, Honduras, Cuba, etc.

Originally designed by Dr. Fernando Mazareigos, a Guatemalan chemist, the Ceramic Water Filter combines **the filtration capability of ceramic material with the anti-bacteriological qualities of colloidal silver**. This filter has basic, yet impressive, impact on the lives of the rural poor, **dramatically decreasing diarrhea, days of school or work missed due to illness, and medical expenses**. A sociologist and potter, Ron Rivera of Potters for Peace redesigned the filter to standardize mass production in sixteen small production facilities in fourteen different countries. It is estimated that over **500,000 people have used the filter**.



# Ceramic Water Filter

세라믹 필터와 활성탄소, 또는 Colloidal 은을 이용해서 살균



# Super MoneyMaker Pump

**Designer:** Robert Hyde, Martin Fisher, Mark Butcher, and Adblikadir Musa

**Manufacturer:** KickStart International Kenya, Tanzania, and China, 1998

**In use in:** Kenya, Tanzania, Mali, Sudan, Uganda, Rwanda, Burundi, South Africa, Mozambique, and Philippines etc.

The Super MoneyMaker Pump is a manual treadle pump that will direct water to where it is needed, **pulling water from a depth of seven meters and lifting it up fourteen meters above the water source. No fuel or electricity is required to operate the pump.** The pump can irrigate a two-acre area over an eight-hour period. **Over 50,000 Super MoneyMaker Pumps have been shipped to customers all over the world,** and, based on KickStart's impact-monitoring studies, there are an estimated **35,000 households starting profitable small farm businesses using pumps to irrigate their fruits and vegetables during the dry season.** By greatly increasing the yield, growing higher-value crops, and growing year round, **these families have increased their net farm income from \$110 to \$1,100 per year—lifting themselves out of poverty.**





# MoneyMaker Block Press

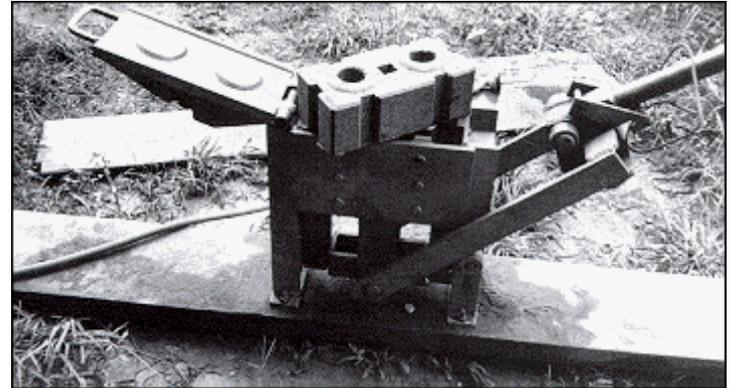
**Designer:** Martin Fisher

**Manufacturer:** KickStart International

Kenya, 1986

**In use in:** Kenya, Rwanda, Uganda, Tanzania, Malawi, Zambia, Somalia, Congo, etc.

Over 2,200 KickStart MoneyMaker Block Presses have been sold to East African block-making and construction businesses to build cost-effective homes, schools, and commercial buildings. **The press makes strong and durable building blocks from soil mixed with a small percentage of cement, compressed at high pressure and cured for ten days.** The press accommodates operators of different sizes and strength, allows for high-compaction blocks, and includes a built-in variable volume batch box to allow for different types of soils, with the resultant block always having maximum density and standard dimensions. **Five to eight workers can produce 400 to 800 blocks a day using the press.**



# Big Boda load-carrying bicycle

**Designer:** WorldBike, Adam French (first phase), Ed Lucero with contributions from Paul Freedman, Matt Snyder, Ross Evans, Moses Odhiamb (second phase)

**Manufacturer:** WorldBike and Moses Odhiambo's workshop Kenya, 2002–05

**In use in:** Kenya, Uganda

The Big Boda **is able to carry hundreds of pounds of cargo or two additional passengers easily**, at a substantially **lower cost** than other forms of human-powered utility vehicles. It was designed to transport goods to and from market for entrepreneurs and consumers in developing countries. WorldBike originally designed a low-cost frame extension called the Longtail to be compatible with the low-cost Chinese-made single-speeds ubiquitous in East Africa. In 2005, it was redesigned to be more suitable with the Western Kenyan Boda Boda bicycle-taxi operators and for easier manufacturing in small workshops.



The Big Boda is able to carry hundreds of pounds of cargo or two additional passengers easily



# Sugarcane charcoal

## Designer/Manufacturer:

D-lab, Haiti, 2004–05

In use in: Haiti, Ghana; Brazil, India (field demonstrations)

In Haiti, the production of wood charcoal, the primary source of cooking fuel, contributes to severe deforestation and environmental degradation. More than 90% of Haiti is now deforested. Many children die of respiratory infections from breathing indoor cooking fumes. Sugarcane charcoal was developed as an alternative to wood charcoal. Dried bagasse, the waste product from sugarcane processing, is burned in a simple kiln, carbonized, mixed with a binder, and compacted using a press to produce sugarcane charcoal briquettes, which burn as well as wood charcoal. Other agricultural waste materials such as corn cobs are being explored as other “food for fuel” alternatives. Corn cobs do not need further processing after burning, eliminating the need for binders and briquetting equipment and significantly reducing the cost of charcoal production.



At this site, please explore the links at left or email Amy Smith at [abs@mit.edu](mailto:abs@mit.edu).



# Kenya Ceramic Jiko

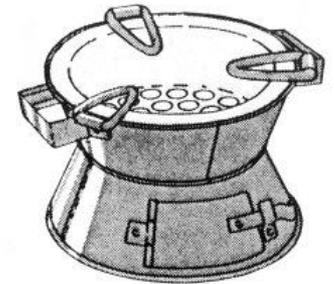
## Designer:

International aid and governmental agencies, local women's organizations, and craftspeople

Manufacturer: Rural Technology Enterprises  
Kenya, 1982–83

In use in: Kenya, Uganda, Rwanda, Ethiopia, Malawi, Niger, Senegal, Sudan, Burundi, Tanzania, Democratic Republic of Congo

The Kenya Ceramic Jiko is a portable charcoal stove which, with proper use and maintenance, can reduce fuel consumption by 30-50%, saving the consumer money, reducing toxic gas and particulate matter, and resulting in better overall health for the user. The stove is now used in over 50% of all urban homes and 16% of rural homes in Kenya and is spreading to neighboring African countries.



Kenya Ceramic Jiko





**Lakech**

**MIRT**



# PermaNet

**Designer:** Vestergaard Frandsen

**Manufacturer:** Vestergaard Frandsen S.A.  
Switzerland and Vietnam, 2000

**In use in:** Bolivia, Ecuador, Nicaragua,  
Venezuela,  
Haiti, Guatemala, Suriname, French Guyana, etc.

PermaNet is a **long-lasting, insecticide-treated mosquito net** commonly used in Africa by people who live among malarial mosquitoes. **The net kills or repels mosquitoes for up to four years—up to five times longer than other normal treated nets—without losing effectiveness, even after twenty washes.** Low re-treatment rates represent the biggest challenge in the fight against malaria, the infectious disease that kills more children than any other illness in Africa. **Malaria's kills millions each year**, helping to make economic growth in countries with high malaria transmission historically lower than in countries without malaria.



# Internet Village Motoman Network

## Network

American Assistance for Cambodia, Operation Village Health, Sihanouk Hospital Center of Hope, Massachusetts General Hospital/Harvard Medical School  
Mobile access point and antenna, Solar panel, IPSTAR, broadband satellite system, Helmet, Motorcycle

The Internet Village Motoman was launched for fifteen solar-powered village **schools, telemedicine clinics, and the governor's office** in Ratanakiri, a remote province of Cambodia, using five Honda motorcycles equipped with mobile access points and a satellite uplink. Each of the schools can send and receive email and browse the Internet using a non-real-time search engine. The network was implemented for American Assistance for Cambodia, which operates over 200 rural schools.

**Telemedicine clinics**, held in remote areas of Cambodia by Operation Village Health, give patients access to physicians in Boston, Massachusetts. A visiting nurse from Phnom Penh makes the six-hour trip by truck to each village to interview, examine, and digitally photograph patients, then transmits the information by satellite to physicians in Boston using a solar-powered computer. Within hours, the physicians respond with medical opinions and treatment recommendations.

School



Clinics



# Solar Aid/태양전지 충전기

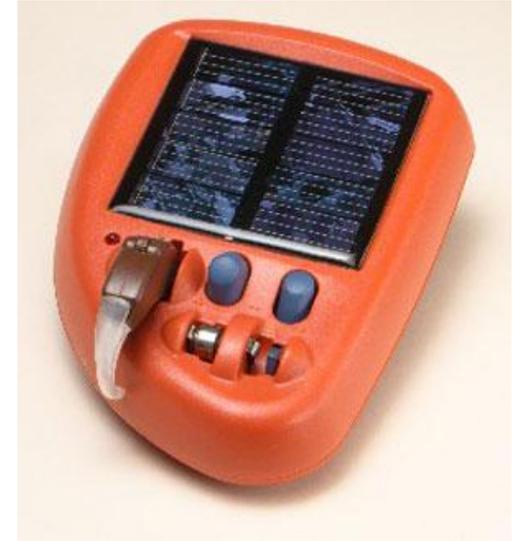
## Designer/Manufacturer: Godisa Technologies

Botswana, 2003 UV-resistant ABS plastic, 680-ohm resistor, 10-kilo-ohm resistor, 100-ohm resistor, transistor, diode, LED, batteries, solar panel, rubber, screws

In use in: Angola, Bolivia, Botswana, Brazil, Cambodia, Cameroon, Canada, Columbia, Zimbabwe etc.

Approximately 10% of the world population has a disabling hearing impairment, and 80% of them live in developing countries. The most expensive part of a hearing aid is the battery, which needs to be continually replaced.

The Solar Aid solar-powered hearing-aid **battery recharger**, developed in Botswana, helps those with hearing disabilities afford to continue in school and participate in economy activity. More than 7,000 units are in use in South America, Central America, Africa, and Asia. And because batteries are generally expensive everywhere, Godisa intends to make this affordable technology widely available not just in the developing countries but also in the United States and Europe.





# 적정기술의 활용방안

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- 적정기술과 공학교육
- 적정기술과 사회적 기업
- 적정기술과 국제개발협력
- 적정기술과 기후변화
- 적정기술과 선교
- 기타



Biodiversity, August 1, 2002

The UN says at current rates of plant and animal extinction, Earth loses one potential major drug every two years.

-State of the World 2003, Worldwatch Inst



MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
*D-Lab: Introduction to Development*

D-Lab I: Development

D-Lab II: Design

D-Lab III: Dissemination

D-Lab IV: Continuing Projects

Resources/Case Studies



D-Lab Project Portfolio



Last Updated September 27, 2007

# MIT의 D-Lab Courses

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- 기계공학과 Lecturer인 **Amy Smith**에 의해 2002년 가을에 처음 개설된 과목임
- 방학을 이용해서 **field trip**을 실시한 후 현지에 적합한 **Capstone Design** 실시
- 현재 MIT에서 가장 인기 있는 강좌 중 하나임
- 대표적인 제품으로 2003년 Haiti project 결과인 **Sugarcane Charcoal**이 있음

<http://web.mit.edu/d-lab/>

In the US, an infant incubator costs twenty thousand dollars. A farm irrigation system costs a hundred thousand. An electric grid costs millions. But what if you could rethink the problem and provide the world's poor with incubators, water pumps, and electric lighting, each for under \$30? Now that would be Extreme Affordability.



# Stanford 대학

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- Design School에는 “**Entrepreneurial Design for Extreme Affordability**” 라는 대학원 과목이 개설되어 있음
- 2005년에 Jim Patell (경영학) 교수와 David Kelley (기계공학) 교수에 의해서 처음 개설됨
- 매년 100여명의 공대, 경영대, 인문학 분야의 대학원생이 수강 신청을 하고 있으며 40명만 수강 가능
- MIT의 D-lab과 마찬가지로 방학 동안 미얀마 등을 방문하고 현지 적용 가능한 제품을 설계함



BUILDING 324

451

2009.02.25 03:22



## D-School 내부

## Prototyping room





# International Development Design Summit



<http://www.iddsummit.org>

# IDDS

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- MIT + Olin College + Cooper Perkins
- **A month-long collaboration** that brings together people from around the globe to build technologies for communities in the developing world.
- The brainchild of MIT Senior Lecturer and D-Lab founder Amy Smith
- 2007년부터 여름 방학 기간에 실시
- 2009년에는 7~8월에 가나의 **KNUST**에서 개최됨
- 2010년에는 7월에 콜로라도 주립대에서 개최됨
- 2011년에는 7.6~8.8에 가나의 **KNUST**에서 개최됨



# Practical Action

<http://practicalaction.org>

## “빈곤에 도전하는 기술”

미개발국의 빈곤을 개선하기 위해 지속 가능한 기술을 개발하고 적용하는 기관. 1966년 슈마허에 의해 ITDG로 창립.

에너지, 주택, 물, 교통, 재난방재, 음식과농업 문제들을 중심으로 방대한 자료와 경험을 축적하고 있음



### Transport expertise

- Cycle trailers
- Animal-drawn carts
- Road building
- Gravity ropeways
- Tuin river crossings

- People stories
- Road building
- Aerial ropeway
- Animal-drawn carts
- Bicycle ambulances
- Gravity ropeways

### Water and sanitation

- Farming
- Rainwater harvesting
- Irrigation
- Access to sanitation

- People stories

- Strategy and research findings

### Water and sanitation projects

- Darfur rural livelihoods
- Eastern Sudan
- Disaster mitigation
- Nyamarimbira
- Community energy
- Vilcanota valley
- Animal health
- Maasai housing
- Arsenic mitigation

### Shelter expertise

- Earthquake resistant houses
- Maasai houses
- Stabilised soil blocks
- Brickmaking cooperatives
- Enabling housing standards
- Women in construction

- People stories

- Strategy

- Research
- Knowledge and information systems
- Regulatory guidelines for urban upgrading (RGUU)
- RGUU workshop
- RGUU discussion
- Integrated urban housing development
- World Urban Forum

- Shelter projects

### Energy expertise

- Improved stoves
- Indoor air pollution
- Micro-hydro
- Solar power
- Biogas
- Small-scale wind power

- People stories

- Biogas
- Smoke hoods
- Microhydro
- Improved fuel efficiency
- Wind power

- Research and strategy
- Energy publications
- Small-scale hydro power
- Smoke, health and household energy

- Energy projects
- Smoke and health
- Street foods
- Urban waste management
- Sparknet

# International Development Enterprises

<http://www.ide-international.org/>



시장(market)에 기반을 둔 접근법을 통해 미 개발국이 가난으로부터 벗어나도록 돕는 비영리 국제기관. Paul Polak에 의해 창립

## The PRISM Approach

- 빈곤한 농부에게 필요한 농기구와 자재를 공급하는 영세기업의 네트워크를 만들어 준다.
- 생산성을 높이기 위해 소농과 함께 일한다.
- 영세 농가의 농산품을 시장에 연결시켜 준다.

## CASE STUDIES

- 홈페이지에 다양한 성공사례들을 예시하고 있음
- 기술 활용 사례들의 비중은 적음

## TECHNOLOGY LIBRARY

네팔 기술 카탈로그

[Ferro-cement lined tanks](#)

[Modified Thai Jars](#)

[Simple drip systems](#)

[Sprinkle irrigation systems](#)



## Services 분야

### Technology Development

Innovation and testing of pro-poor technologies  
Farmer-led technology development  
South-South technology transfers  
Assessing small-scale irrigation potential

### Business Development Services

Feasibility studies , Sub-sector analysis  
Assessment of local private-sector capacity  
Supply Chain development, Micro-enterprise development  
Technology transfer to the private sector  
Technology production systems, Customer service training  
Training in technology operation and maintenance  
Quality control systems

### Rural Marketing

Market assessment, Marketing and promotional strategies  
Demonstrations and field trials  
Production of videos, films, and village theatre  
Social marketing to change public attitudes and behavior

### Program Planning

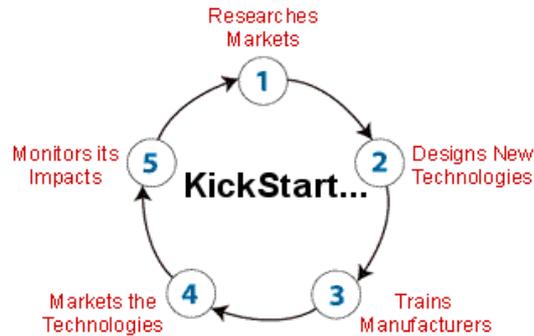
Market-based approaches to meet development goals  
Smallholder-oriented development, Project evaluation



# KickStart

<http://www.kickstart.org/>

아프리카에 필요한 새 기술을 개발하고 상품화 하는 비영리 기관. 저 비용 기술을 이용하여 소규모 사업을 일으켜 빈곤으로 부터 탈출 하게 하는 프로그램 운영.



## The Technologies

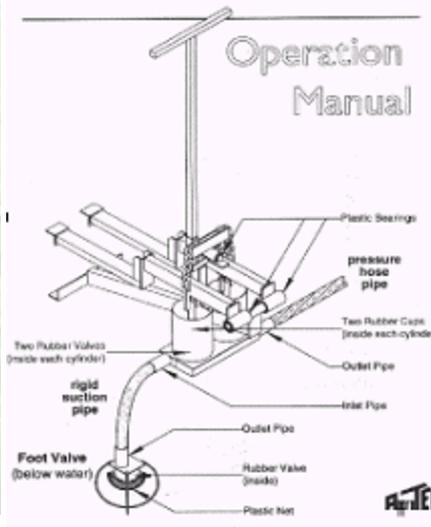
Micro-Irrigation Technologies:

Cooking Oil Technologies:

Building Technologies:



## Super - MoneyMaker pressure irrigation pump





# The Light Up The World Foundation (LUTW)

고효율 반영구적인 백색발광다이오드를 기술을 세계의 가난하며, 환경적으로 민감하며, 소외된 지역에 보급, 적용하는 국제기관. 현재까지 42개국에 14,000가정의 조명을 밝혔음.

## Our projects



### Africa:

- > Ghana
- > South Africa

### Asia:

- > Papua New Guinea
- > Tibet
- > India
- > Pakistan
- > Nepal
- > Philippines
- > Sri Lanka

### Middle East:

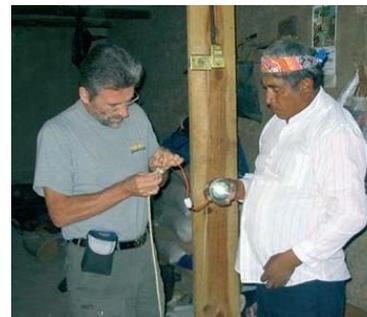
- > Afghanistan

### Latin America:

- > Costa Rica
- > Dominican Republic
- > Ecuador
- > Mexico
- > Peru



[인도, 캘거리]



# SIFAT

SHARING GOD'S LOVE IN PRACTICAL WAYS

HOME  
YOUTH  
DONATE  
MISSION  
TRAINING

[www.sifat.org/tech.html](http://www.sifat.org/tech.html)

하나님의 사랑을 실제적인 방식으로 실천하기 위해 1976년 Ken and Sarah Corson에 의해 볼리비아 정글 속에서 처음으로 이 사업에 대한 확신을 얻어 시작됨.

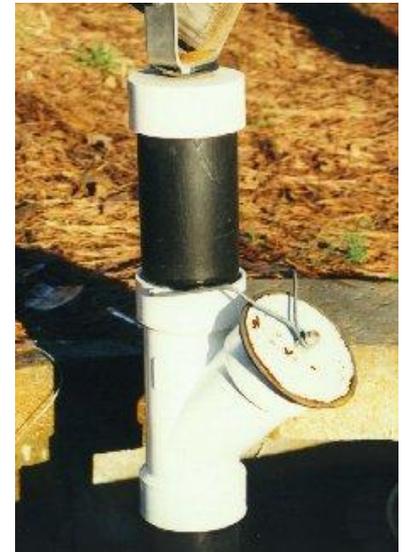
## Appropriate technology(적정 기술)

가난한 사람들의 삶의 질을 높이기 위한 기술을 개발하고 훈련시키는 활동을 벌이며, 대체에너지원(동물, 풍력, 수력, 태양에너지, 수동력 등)에 대한 설계를 함. 소개된 사례는 아래와 같음

**CSD Floor Spinner**  
**Barrel Stove**  
**Inertia Pump**  
**Rope and Washer Pump**  
**Drill Press**  
**Standing Tool Grinder**  
**Grain Drill**  
**Solar Cooker**



[태양열 조리기]



[관성펌프]



[스토브]

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