CASE STUDY: 1st view oct01

Appropriate Technologies for Enterprise Creation: ApproTEC - KENYA

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This case study was compiled by Caroline Pinder, EDIAIS Project Manager. It was derived from documents provided by ApproTEC, and one interview with John Kihia and Nick Moon (Managing Director) in July 2001, which included a field visit to three users of ApproTEC's irrigation pumps

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OVERVIEW:

ApproTEC aims to promote sustainable economic growth and employment creation in Kenya and other countries, by developing and promoting technologies which can be used by dynamic entrepreneurs to establish and run profitable small scale enterprises. This case study focuses on the methods used to assess the impact of its irrigation technologies on the livelihoods of small scale farmers in Kenya. Impact assessment is integral to ApproTECs development strategy, and is perceived as part of its customer service and market research programmes. It has established a system of ongoing monitoring of impact across all its stakeholders, supported by annual random surveys of customers, suppliers and manufacturers of its irrigation technologies.

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1 BACKGROUND

1.1 Aims and Objectives

ApproTEC was founded as a Kenyan NGO in 1991. Its Mission is:

"To promote sustainable economic growth and employment creation in Kenya and other countries, by developing and promoting technologies which can be used by dynamic entrepreneurs to establish and run profitable small scale enterprises."

ApproTEC's work is based on the following principles:

- that self-motivated entrepreneurs are the most effective agents of change in emerging economies

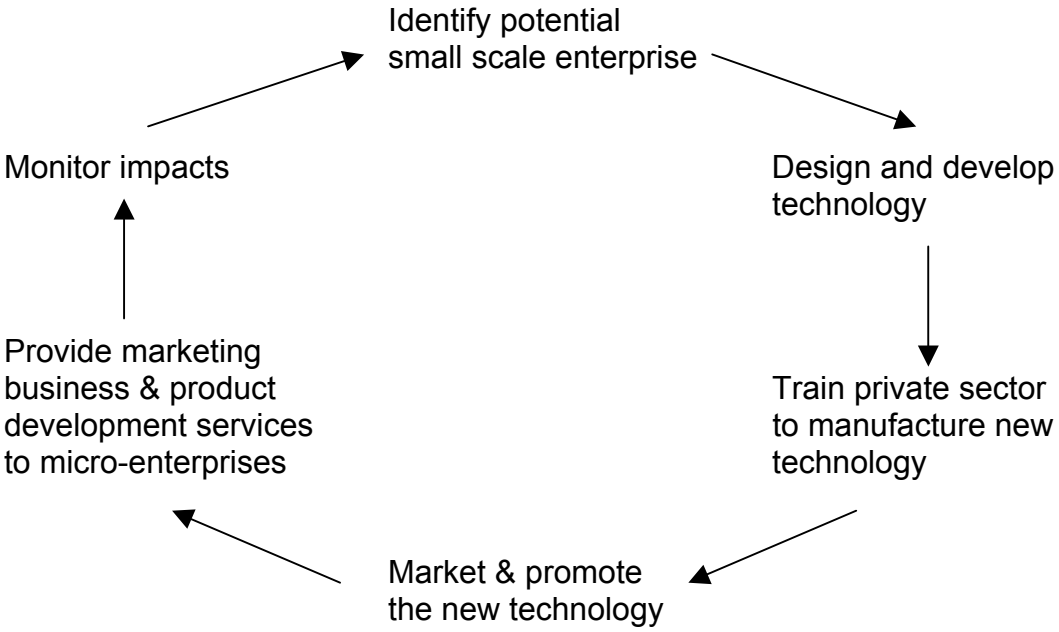
- that such entrepreneurs can raise small amounts of capital (US$100-1000) to start new enterprises
- that such entrepreneurs have the capacity and skills to manage the day to day affairs of a small business.

ApproTEC aims to resolve two major challenges faced by these entrepreneurs:

- Lack of business choice: Entrepreneurs cannot easily identify viable new enterprise opportunities. They need guidance about the options available.
- Access to technology: Nor can they easily access or develop the technologies they need for their new enterprises

Identification of these problems arose from the 1993 Gemini study of small businesses in Kenya which showed a poor rate of survival and growth amongst small enterprises, which ApproTEC attributed to lack of skills in market research, engineering design and marketing.

1.2 ApproTEC's Strategy



1.3 Technologies:

Since 1987 ApproTEC (or its predecessor the Appropriate Technology Unit of ActionAid - Kenya) has developed a range of technologies including equipment for small scale oil pressing, manufacture of soil blocks and tiles for low cost construction, and “domeslab”concrete latrine covers. It is currently researching viable means to produce avocado based cosmetics, developing a prototype of a manual hay baler, a “deep well” manual irrigation pump, and a micro-drip irrigation kit. Its principal current products, however, are the micro-irrigation pumps, of which there are two types, both treadle operated: the

CASE STUDY: 1st view oct01

Super Money Maker pressure pump and the newer, cheaper, pressure pump called the Money Maker PLUS!.

This case study focuses on the socio-economic impacts achieved to date by the Super Money Maker pressure pump, and how those impacts are assessed. However, it already looks like the Money Maker PLUS! will achieve even greater sales and impact on the incomes of its buyers than its 'parent' model, but since it was only launched early in 2001, it has not been possible to measure that impact yet.

PRODUCT PROFILE: THE SUPER MONEYMAKER PRESSURE PUMP

This was launched in October 1998 in response to a demand by small farmers for a pump that can 'push water uphill." Suitable for use on steeply sloping land where the water source may be at the bottom, it can be used to pump water from hand-dug wells, rivers, streams, lakes and ponds. It is ideal for sprinkler irrigation, filling overhead water tanks, or for use with nozzles and sprays attached to the end of the delivery hose.

The pump has a maximum suction head of 6 metres, and a maximum total delivery head (suction + pressure) of 13 metres. In normal use it delivers ¾ to 1 litre of water per second.

1.4 Funding:

ApproTEC has been supported by a range of funders over the years. Since 1996 DFID has been their main funder, however, making a five year commitment which required ApproTEC to establish a system of charging out to the various projects the centrally borne research and development costs. Although this will not enable ApproTEC to become fully sustainable it will make clear the R&D costs of each technology it develops, and ensure a significant part of those costs are recovered in pricing arrangements with manufacturers and retailers.

ApproTEC commissions manufacture of the “Super MoneyMaker” pressure pump at Ksh 3900, then sells it to dealers for Ksh. 5090, who retail it at Ksh 5990. In addition to the income it gains from wholesaling the pumps (and other technologies) to its network of dealers, ApproTEC generates income by undertaking some consultancy assignments, and running training courses.

In 1999/2000 ApproTEC generated 26% of its total income through quality inspection and marketing fees charged to manufacturers and retailers on the sale of its technologies and training and consultancy fees.

ApproTEC maintains that financial sustainability in the sense of full cost recovery from programme delivery is not a relevant issue for them, either as

an institution or for the services it provides. They argue that they are providing:

i. A technology R&D service that in developed economies is largely supported by public funds and carried out by specialized research institutes, universities and the military, but for which in Kenya very limited public funding is available.
ii. A "loss leading" product launch and promotion service, in order to raise awareness and to systematically build the market for a new technology up to a level at which the entire business chain, from production through to sale, can be carried on entirely in the private sector without further subsidy.

In so doing ApproTEC believes it is responding to market failure – i.e. by designing, developing and promoting technologies which would not otherwise be supplied by market mechanisms. The organization justifies the use of public (donor) funds for this purpose by pointing out that the economic benefits felt by the end-users of the technologies far outweighs the amount of subsidy (see Section 2.5) and that ultimately no subsidy is necessary, once the technology in question has become established in the market.

1.5 Partners in production and delivery of its products

ApproTEC aims to work with and through the private sector in the development and transfer of technologies. It therefore works in partnership with the private sector at each stage of the supply chain, from manufacture through to retail and sales support.

ApproTEC designs, develops, produces, distributes and promotes its technologies using only locally available resources, and only working with local companies. It has an engineering design team based in a light industrial area in Nairobi; here the technologies are designed and developed. Local engineering businesses are then commissioned to manufacture the range of ApproTEC equipment which is subsequently sold by ApproTEC through the network it has established of approximately one hundred and thirty dealers.

There are currently four engineering companies which manufacture the pressure pumps: each of these has been carefully selected for its actual and potential competences and capacity to deliver a consistently reliable product. ApproTEC trains and provides ongoing support to these companies to ensure they meet the required standard.

MANUFACTURER PROFILE: MAKIGA ENGINEERING WORKS

Makiga Engineering Works is a local metalwork firm that started in a very small way in Kariobangi in 1988, and began making ApproTEC designed equipment in 1989. Makiga has expanded over the years to become a well established manufacturer with an international reputation for high quality.

CASE STUDY: 1st view oct01

Dealers are similarly selected on the basis of their location and capacity to service the machines and provide high quality customer care; almost all dealers are one-person or one-family businesses. They are mostly agri-based such that most of the clients are farmers.

DEALER PROFILE: KILIMO KENYA LTD

Located in Thika town, Kilimo Kenya Ltd, combines as a retail/wholesale outlet for agro-chemical goods and other farm inputs. They were recruited to be one of ApproTEC's stockists of the Super Money Maker early in Dec 1999, and they have been selling 30-40 pumps monthly. The proprietor feels he is an agent of change by availing the irrigation pump to the farmers in the Thika area.

Typically, ApproTEC's end-users are small farmer households with 0.5-5.0 acres of land on which they grow subsistence and cash crops. The pumps can also be used to provide water for the household who not only benefit from the additional income generated by the improved crop irrigation but also the increased time available to them to spend on their families needs and crop cultivation. ApproTEC believes micro-irrigation can increase incomes, create employment and stimulate local economies in rural areas by enabling small-scale farmers to make the transition from subsistence agriculture to commercial farming by:

- increasing the land area under irrigation
- ensuring full irrigation resulting in improved crop quality
- increasing the number of growing cycles per year
- timing harvests to coincide with times of high prices
- employing more waged labour
- Growing of high value crops

CUSTOMER PROFILE:

Janet Ondiek is a small scale farmer in Kisumu. She was widowed in 1997, and depended on growing vegetables for sale, irrigating them with water drawn by bucket from a stream adjacent to her land. Even with up to three casual workers to help her this was tiring work, and one acre was as much as they could manage using the bucket system. Often vegetables were not watered enough, and some dried up. Using bucket irrigation she made a profit of just Ksh7,000 (US$115) per season.

In early 1999 Janet saw the Super MoneyMaker pump being demonstrated at her local market, and liked it so much she bought one on the spot. She now irrigates 2.5 acres, and has diversified her crops to include high value ones such as sweet peppers and tomatoes. Last season her profits topped Ksh60,000 (US$1000) and she now employs five workers.

After the death of her husband, Janet's six children almost dropped out of school due to lack of school fees, but now she makes enough money to send them to College. She is also putting up a small general shop at Gita market and plans to be a full time businesswoman. "Now," she says,"I'm making enough money to support my family without begging from relatives."

2 IMPACT ASSESSMENT APPROACHES AND METHODOLOGIES

2.1 Approach to Impact Assessment

IA is regarded by ApproTEC as a critical part of its customer service and market research. As was seen in the diagram at 1.2 IA is integral to ApproTEC's developmental strategy and every day work, and impact is assessed on the basis of only promoting technologies which:

- have affordable start-up costs (US$100-1000) and give quick returns on the investment (ie by the end of the first season in which the pump is used)
- targets local markets and uses locally available resources
- are easy to use and require little specialist training or skills
- are well engineered to ensure durability, easy maintenance and inter-changeable spare parts
- involve equipment and tools which are mass produced locally, thereby ensuring low prices and local availability

ApproTEC's stated **objective in impact monitoring** is to:

- Gather and provide information to:
  - ApproTEC management
  - Donors
  - Collaborators
  - Other stakeholders

The stated **purposes of their impact monitoring** are to:

- Overall programme impact assessment
- Enable the implementation of ongoing projects
- Provide feedback mechanisms of the effectiveness of ApproTEC's activities
- Highlight other possible areas of operation / new opportunities

2.2 IA Methodologies:

IA takes place at 3 levels:

i) Continuous / internal:

This is achieved through provision of a one-year guarantee on every pump they sell.

Every pump is given a serial number which is engraved on the machine by the manufacturer. Each pump has to pass a quality check by ApproTEC's technicians before it is given a guarantee card which accompanies the machine when it is delivered to the dealer and eventually to the customer. That guarantee promises customers speedy repair and replacement of parts, and is therefore regarded as a marketing tool for the retailer.

Spot checks are carried out by ApproTEC amongst dealers and customers to ensure the former comply with the terms of the guarantee for speedy repair and replacement of parts. Any faults reported (on a faulty pump form) are also followed up with the manufacturer, and action taken to ensure quality is maintained. In this way the reassurance of the guarantee and any necessary follow up action is viewed by the customer as part of the service due to them, rather than what often seems to be a requirement to participate in an impact assessment. Participation is therefore seen as a benefit rather than a chore.

ii) Baseline data:

A randomly selected sample is taken from customers who have had the pump for only two months or less. The purpose of this “Zero Age” survey is to establish the actual profile and status of the pump owners before they use and benefit from the pump. In other situations baseline surveys and/or control groups are a standard way of determining starting points and tracking change attributable to an intervention, but these cannot work in ApproTEC’s situation. This is because it is not known in advance who will buy the pump, and it is thought undesirable to establish a control group since this would mean denying some potential clients the chance of owning the pump. The “Zero Age” survey therefore aims at achieving what would otherwise be achieved through a baseline survey or control group. The results of the survey form the bases for determining changes that take place at the enterprise, household and individual levels that can be attributed to the pump.
The visit also provides an opportunity to give guidance on the correct use of the pump. A copy of the questionnaire used at this stage is attached

iii) Annual / internal:

Each year ApproTEC's Head of the Dept of Monitoring and Reporting spends a month randomly surveying customers who purchased a pump at least one year previously. Again, he approaches customers from the perspective of concern for quality and service, and interest in their views for purposes of market research that will contribute to improved and new technologies.

A copy of the questionnaire completed by the Dept Head at this stage is attached

iv) Occasional / External

The DFID funding allows for periodic extensive impact assessments to be carried out of all ApproTEC's work, using external consultants, as part of their review process. A “Final Evaluation of DFID Core Funding of ApproTEC” was presented in June 2001 by DFID consultants. Mid term reviews of both the Long Term Micro Irrigation Promotion Project (Kenya) and the Micro Irrigation Promotion Project (Tanzania) are due over the next few months.

2.3 Indicators:

In recognition of their different interests, the Dept Head has developed the following range of indicators by stakeholder:

i) **Internal Project Managers** want to know:

- number of pumps manufactured, sold by who and when
- trend of pump sales over time
- pumps sold by each retailer and where the pump will be used
- the effectiveness of various marketing methods
- dealers' performance (ie what is the concentration of the no of pumps sold in which areas?)
- operational problems of pumps (and which manufacturer's made these)

ii) **Senior Management** (Directors and the Board) want to know:

- number of pumps manufactured and sold by who
- % of pumps in use
- new net income/profits to pump owners
- jobs created and new wages per pump
- cost effectiveness of the programme (cost/benefit ratio)
- problem areas
- new opportunities for future work and research

iii) **Donors** want to know:

- number of enterprises assisted / started
- who are the entrepreneurs, what is their income and social status, how many men/women
- number of manufacturers and their sizes / employment levels
- number of retailers, their sizes / employment levels and locations
- who controls the additional income generated as a result of improved micro-irrigation

- how many jobs are created by every pump, at what wages, and who holds those jobs (eg men/women)
- direct and indirect impacts of the pumps on the environment/health/gender equity and other social aspects
- income / cost recovery ration / sustainability of the ApproTEC programme

iv) **Manufacturers and retailers** want to know:

- number of pumps they can sell
- profits per pump sold

v) **Buyers**:

ApproTEC's computer database contains information about all pump buyers, retailers and manufacturers. The data collected about buyers includes:

- who manages the pump
- who operates the pump
- sources of capital used to buy the pump
- what use the pump has been put to
- when the pump is used and frequency
- new jobs and new wages which have been created[1]
- new net income / profits
- social and economic benefits
- problems and other needs

As can be seen from the attached questionnaires much of this information is stored in quantifiable form, but there are also several open ended questions. Some interviews go into even more depth than required for the form and become case studies, in particular regarding indirect social benefits resulting from the income generated by the improved irrigation such as extra school fees paid, health services accessed etc.

2.4 Challenges of IA:

The Dept Head recognises there are some problems and challenges in their present methods of assessing impact, including:

- the more indicators there are, the harder it is to measure impact
- assessing direct attribution of the pumps' impact on income / profit
- defining a 'job'; how long those jobs last; how to assess job displacement
- comparison between different types of development interventions, ie ApproTEC's approach compared with other BDS projects

[1] ApproTEC defines a job as minimum 150 days work a year, for 5 hours a day

CASE STUDY: 1st view oct01

In connection with the last of these ApproTEC has argued for the introduction of a quantifiable cost effectiveness indicator, or "bang-for-buck" measurement of impact, which they define as:

$$\text{Bang for buck} = \frac{\text{New profits generated by entrepreneurs} + \text{New wages paid to their employees}}{\text{Donor's Intervention Costs}}$$

2.5 Summary of outputs and findings (re Super MoneyMaker pump) of recent impact assessments:

Outputs:-

Following introduction of the Super MoneyMaker pump in September 1998, sales have been as follows:-

		Sales	= per month
• Year 1	Sep 98 – Aug 99	**2383**	199
• Year 2	Sep 99 – Aug 00	**4816**	401
• Year 3	Sep 00 – May 01	**3898**	433
Total Sales		**11097**	

Findings

- New wages paid to new employees and new profits generated by microenterprises using these pumps:-

  Kenya Shillings 2.46 billion
  = US$ 31.5 million
  = **UK£ 21.5 million**
  (at August 2001 exchange rates)

- New jobs created at the microenterprises:-

  18,754 jobs

These estimates were based on the results of sample surveys of MSEs/users carried out by ApproTEC staff, which were later corroborated by the findings of external evaluators commissioned by ApproTEC's donors to assess the economic benefits resulting from their programme. (Final Evaluation Report)

Previously the 2000 annual random sample conducted by the Dept Head across 44 entrepreneurs who had bought the Super Money Maker pump, gave the following results:

- 91% of pumps sold are in active use; of which 98% are used for irrigation
- 30% of users had previously been irrigating with bucket and rope

- 73% of pumps are managed by women
- each pump is operated by 2.89 people (of which a third are waged and two-thirds are family)
- the average area under irrigation with the pump is 0.23 hectare (0.5 acre);
- the area under irrigation increased by up to 700% following acquisition of the pump
- each pump generated an average of Ksh40,088 (US$670) new / additional net income/profit per season
- each pump creates 1.69 jobs, waged at Ksh2101 (US$35) per season
- each pump is used by an average of 1.55 households (ie 35% of pumps are lent or hired out to other farmers)

(Note: Kshs/US$ conversion computed at contemporary exchange rate)

The last of these was an unexpected outcome, as it had been assumed households only used the pump for their own needs.

3 CONCLUSION

Incorporating impact assessment as part of its total strategy, in the context of customer service and market research, has contributed to ApproTEC's success by enabling the organization to understand customers'/beneficiaries' needs which are fed directly into the process of developing new technologies. In the case of the Super Money Maker an outcome of that learning process was the development of the lightweight (and therefore more portable and cheaper) Money Maker PLUS! They have also taken impact into account at each stage of the supply chain between themselves as designers and promoters of the pump, and the end user, by establishing systems, which capture socio-economic data amongst their manufacturers, dealers and end-users. Further indication of the importance they attach to ongoing impact assessment is in the establishment of a department with three staff employed just for this purpose.

4 ATTACHMENTS

4.1 **INTERVIEW QUESTIONNAIRE FOR SMM PUMP OWNERS 1999.doc**: *(Conducted each year to collect data on jobs and business operations of pump owners)*

4.2 **INTERVIEW QUESTIONNAIRE FOR 14 months old smm owners.doc**: *(Conducted to asses business growth, increased turnover, profitability, further investments & employment)*

4.3 **INTERVIEW QUESTIONNAIRE FOR final MicroPED project.doc**: Interview Questionnaire for Microped Project Final Evaluation for Super-MoneyMaker & Oil press Entrepreneurs *(Conducted at the end of the project period Irrigation pump and Oil Press entrepreneurs*)

4.4 **INTERVIEW QUESTIONNARE IN THE PERI URBAN ZONE OF NAIROBI.doc**: Interview Questionnare of Super Money Maker Owners in The Peri Urban Zone of Nairobi *(Conducted in July 2000)*

4.5 **super money maker data analysis 1999(1).xls**

4.6 **super money maker 1999 impact report[1].doc**: " Super-MoneyMaker Pressure Pedal Pump Impact Assessment in Utilisation, Job Creation and Income Generation"

4.7 **INTERVIEW QUESTIONNAIRE FOR ZERO AGE PRESSURE PUMP OWNERS.doc**: *Conducted to get the client profile for the pressure pump owners in income, jobs and expenditure;* Conducted in January – February 2000

4.8 **zero age follow-up questionnaire 18 months old.doc**: (Conducted to asses business growth, increased turnover, further investments & employment. The results will be compared with zero age survey conducted in January 2000) Conducted in July – August 2001

4.9 **zero age survey report[1].doc**: "Zero Age Survey for Super-Moneymaker - Client Profile and Status Assessment: Monitoring Survey Conducted in Central,Eastern, Rift Valley, Western and Nyanza Provinces of Kenya"

4.10 **zero age analysis(1).xls**

5 OTHER DOCUMENTS MADE AVAILABLE FOR THIS CASE STUDY:

5.1 Havers, M (1998), "ApproTEC, Kenya: Developing Technology-Based Business Opportunities", Case Study for Workshop on BDS for Small Enterprises, Harare 29 Sept - 1 Oct 1998

5.2 DFID - East Africa office (May 1999), Project Memorandum: ApproTEC, Kenya - Long term Micro Irrigation Project

5.3 ApproTEC (Sept 2000), Annual Report 1999/2000

5.4 Kihia, J, (2000), Notes prepared for presentation to Workshop at Springfield Centre for Business Development

5.5 DFID - East Africa office (May 2001): 20th (final) quarterly narrative report on Five-Year Support Programme to ApproTEC, for period 1 January - 31 March 2001.