



**NATAS**

Research Project

The Non-adaptation of Adequate  
Technologies in African Societies

**N.A.T.A.S.**

Research Project

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CEI-ISCTE-IUL

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### **Preliminary notes**

*This working document #2 of the research and capacity-building project does not yet constitute a complete and definite project proposal. It serves rather as a preliminary proposal for institutions and potential partners. Only with their input and in coordination with them will a definite project proposal be finalised, which will include the chapters about the scientific state of the art (including apparatus), and a definite but still flexible research plan, including the distribution of research tasks and a detailed time schedule.*



## RESEARCH PROPOSAL

### (WORKING DOCUMENT #2)

#### ***Project title***

### The Non-adaptation of Adequate Technologies in African Societies

#### The Big Question

The history of international development co-operation with sub-Saharan African countries can, at least in part, be read as a series of failed ventures to introduce technological and other innovations. The development aid industry tries to avoid analysing the failures of their interventions and focuses instead on the rare success cases of technology adoption which are widely publicised. Failures are not very often researched and not very well understood. Most frequently, analyses are centred on external actors' efforts and the failures attributed to some inherent incapacity of African societies to adopt technology.

However, this approach does not explain the complexity of dynamics of the interaction between technology and African societies. It is therefore necessary to take a different approach, that puts the African societies firmly in the centre of analysis and tries to understand why and how they do not adopt, why they reject and resist, and also the cases where they “adopt, adapt, appropriate, translate”.

Agrarian societies, for instance, appear in many theories and approaches as reluctant, or as obstacles to their own development, be it through passive resistance, or through lack of education or knowledge or resources. Their impressive resilience shows, however, that they, on the level of societal (“systemic”) intelligence, mostly know what they are doing. They adapt some modern technologies, even if these are not introduced through development interventions. However, while quietly innovating themselves in their own time-honoured ways, studies have clearly shown that agrarian societies may openly or quietly resist the innovations propagated by external or state actors.

So, why are some innovations adopted and adapted and others not by African societies? The project will study the question why some African societies do not adapt certain technologies that would, at least from the external point of view, seem adequate, while adopting others, even if the level of adoption is low. What are the internal dynamics and external conditions of the adaptation and non-adaptation of specific technologies?

This project will look at different technologies, modern and traditional, in a series of (comparative) case studies. The project will start by focusing on four technologies but does not preclude the integration of other approaches. Transversal technologies, e.g. modern communication technologies that affect the overall adaptation of technology will also be included and may result in specific studies.

The first four areas of study are bicycles, solar power, mobile payment systems and food security (post-harvest) technology. These have been selected for their current and future relevance in fields that are fundamental for the survival and quality of life for the societies involved.

The questions to be asked include the following:

Why do some African countries not use bicycles for the transport of people and merchandise, while others do? Why do their governments heavily invest in the extensive construction of infrastructure that could be concentrated, and therefore much more cost-effective, by increasing low-cost mobility?

Why do some countries not use what seems to be cheap and reliable off-grid solar power and invest in expensive, complex and maintenance-intensive electricity production and distribution systems, even if they have to import all the technology and the costly fuel for generators?

Why do many African societies not adapt mobile payment systems, still relying on expensive banking or money transfer systems, or cash payments, while others countries have already adapted mobile payment systems with great success?

Why do many African societies not use post-harvest treatment and storage technologies (traditional and modern), and suffer post-harvest losses of 30% to 50%, even if other societies use technologies that could substantially reduce these losses?

## Approach

The project will study the internal dynamics and external conditions of the adaptation and non-adaptation of specific technologies. Why do some African societies not adapt certain technologies that would, at first glance, seem more adequate in terms of sustainability, have less (negative) side effects, but more (positive) spin-off effects, and are generally more effective and efficient (value for money)?

The perception and definition of the adequacy of the technologies to be studied are derived from the successful adaptation by other societies which operate within the same or similar parameters.

The project will not start from the perspective that the non-adaptation is an obstacle to externally-introduced development or intervention efforts, but will rather put the focus on the internal societal dynamics and external contexts, and study the fields of operation onto which the forces of external actors are projected.

The project will take a multi-level approach that will consider the individual, the family, the group, the community, societies, countries and regions as well as international contexts<sup>1</sup>.

The framework and methodology will include many dimensions, such as history, culture, geographic and climate conditions, production systems, logistics and trade, infrastructure, local, regional, national and international policies, knowledge, experience, mindsets and perceptions, religious beliefs, communication processes and behavioural patterns.

The overall goal is to provide a more solid basis for the definition of public policies and intervention strategies on the national, regional and local levels.

## Technological topics

The analysis will start with four technologies, semi-modern, modern and traditional:

- Non-motorised transport (mainly bicycles. Semi-modern).

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<sup>1</sup> The approach will be inspired by the proposal advanced by McCracken, Kevin; Phillips, David R. (2012), *Global Health: An Introduction to Current and Future Trends*. Taylor and Francis, London, ISBN 9781136269981. Their proposed scheme will be inverted, however.  
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- Photovoltaic and other (off-grid) renewable energy technologies (modern).
- Mobile payment systems.
- Post-harvest treatment methods and technologies (traditional and modern).

Other technologies will be integrated into the study as needs and possibilities arise, allowing for generation of a general theory of factors required and criteria that need to be fulfilled for the adaptation of technologies, both modern and traditional, in (African) societies.

### Non-motorised transport (semi-modern)

The way in which a population uses available technologies for transport in a given territory is directly related not only to the way that society is organised, but also to the way in which it produces and exchanges its goods and services internally and externally. The conditions of spatial mobility help to shape and establish the very structures and dynamics of a society. The change in transport (type, infrastructure, technology, investment, and price) has been cause and consequence in the economic and social development of many societies since the late 19<sup>th</sup> century.

We will focus specifically on the characteristics of a particular type of mobility: non-motorized transport (NMT), with a special focus on bicycle vehicles and similarly human-powered transport, and try to understand the dynamics and characteristics that surround this type of transport.

In nearly all regions in the world, the (massive) introduction of the bicycle has proven beyond any doubt that it is an adequate and efficient solution to deal with mobility issues, not just in poor or developing countries, and there is still great potential for development.

The opportunities and potential that NMT offers in income generation, access to work, to education, health and other infrastructure, the distribution of goods and services, creating employment opportunities and income for populations in poor areas, are apparent in countries and territories where NMT exists on a meaningful scale.

Studies show that the use of this means of transport increases school attendance by more than a quarter. The bicycle quadruples the activity range of small traders and entrepreneurs. The capacity and autonomy to transport

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heavy items - such as firewood, charcoal, fruit or water – by bicycles are five times higher than the capacity of an adult on foot. The use of a bicycle saves between 50% and 75% of travel time.

But, contrary to what might be imagined, the high costs of the automotive transportation sector did not encourage the use of non-motorised vehicles (NMT) as a natural alternative in Africa. Although sub-Saharan Africa has the lowest incidence and greatest need for inexpensive forms of non-motorised transport, it has one of the most hostile political climates to use bicycles, and, proportionately, Africa has one of the lowest overall bicycle ownership rates.

Which social, economic, historical and cultural dynamics make this technology widely diffused in some areas, while in similar contexts it is ignored or nearly non-existent?

What are the environmental, cultural, economic, historical and social factors related to bicycle use in African contexts, and how do they encourage or discourage the adoption of NMT? Weather, topography, road insecurity?

What are the purpose and most widespread use of the bicycle in an African context?

### **Diagnosis of needs**

What other means of transport competes with the bicycle? What are the impediments to obtaining and maintaining the equipment?

### **Policy**

Which public policies stimulate or hinder NMT in Africa, and what mechanisms cause their impacts?

### **Costs**

Are affordable bicycles available for the African reality? How do prices correlate to incomes? What is the origin of the equipment used by the African population? What are the value chains that link production, trade, logistics and maintenance to the end user? Are there specific import policies for bicycles and spare parts?

Is there a template or design that best fits these usage requirements?

Are there adaptations and local technological solutions that favour the use of the bicycle, and that can overcome any obstacles?

### Mobile payment systems (modern)

Mobile payment systems have, in a relatively short period, been introduced in Kenya and produced an overwhelming success. By now, more than a third of monetary transactions are handled by the M-Pesa system which was only introduced in 2007. With very limited costs this system allows to transfer very small sums and has conquered a remarkable share of this market, including economic agents on the lower scale that before had no access to classical banking services. Its impacts on the economy seem to be huge and growing. The linking up to worldwide transfer systems currently underway is expected to increase its importance for the live of Kenya's population. The availability of ever cheaper smart-phones for which Africa is the fastest growing market extends the technological bases and reduces the threshold for joining the system.

The overall success of the M-Pesa mobile payment in Kenya has, however, not been replicated in other African societies. On a smaller scale, the use of similar systems is observed in Ghana, Tanzania and Uganda, but with less market share if compared with Kenyan case.

The initial questions that will guide the analysis include the following:

#### **History and experiences**

What are the local experiences – good or bad – with banking and money transfer systems? What are the causes for the non-adaptation of modern mobile payment systems?

#### **Needs**

What are the needs at the individual or household level? What kind of financial services does the household use? At what costs and to what ends? Which conditions prepare these household (non-)decisions?

What kind of minimum coverage ratio is necessary for the system to get traction? What are the initial obstacles?

#### **Adequate technology in relation to needs**

Is adequate information available?

What is the level of confidence of the population in the use of the system in a context of fragile economies and pervasive by corruption?

Are there any cultural impediments to the introduction of mobile payment systems?

### **Supply**

Is it a matter of access to the underlying technology? Are smartphones available at affordable prices? Is there network coverage? Are there cultural impediments?

### **Public policies**

How do mobile payment systems figure in the overall financial policies? What are the microeconomic and macroeconomic impacts that use the type of system in the national economy?

What are the banking policies? How are they shaped? By whom, or under the influence of whom? Is there sufficient information?

Where are the specific policies located, at a central bank, ministry or other government institution? What kind of organisation is dedicated to the underlying technologies? Government controlled institutions or private enterprise? How is the sector regulated? What is the organisational landscape? Is there specific legislation concerning mobile payment systems?

How does the legal and regulatory situation evolve? What is the relationship between legislation and implementation of policies in this area?

### **International intervention**

Are there international and national agencies that try to introduce these systems? What are their strategies? How do they act on the policy, programme and project levels, and at the national, regional and local levels? Are there already successes or failures of their interventions? What kind of communication processes happen within the communities?

### **Media**

Are there public discussions in the media or on social media? Who does the agenda-setting? How do the media treat the money transfer and banking systems? Do mobile payment systems figure in the public discourse?

## Photovoltaic and other renewable energy technologies (modern)

Off-grid photovoltaic systems appear as an adequate technology for illumination, charging of electrical devices, and so on. The obvious benefits of this kind of modern technology are manifold, such as better illumination in rural dwellings at a reduced cost. The initial installation costs for a small photovoltaic system are fairly low. As they have very low operating costs beyond the replacement of the batteries every few years, their initial costs set off the yearly costs of illumination from other sources such as fires, candles or oil lamps. They reduce the cost for the use of batteries for radios, etc., and for the charging of phones. The reduction of smoke-related diseases is significant, as well as the increase of study time for students. Communication also improves, be it by phone or access to the internet.

The introduction of these systems in private households as well as, for example, for public illumination, or for the running of electrical installations in schools, health posts, and other infrastructures, in many regions of the world, indicates the potential adequacy of this technology.

In many areas due to their geographical conditions, such as in vast regions of the African continent, or on islands, where fuel has to be imported and transported, the production of electric energy by generators and its distribution are very expensive. Even in areas where hydroelectric power is produced, the installation and maintenance of distribution networks may be extremely expensive, especially so in thinly-populated rural areas, which are typical for many African countries.

Yet, even where climatic conditions are favourable, solar technologies which have proven their value beyond any doubt, often are not introduced and adopted.

The initial questions that will guide the analysis include the following:

### **History and experiences**

What are the local experiences – good or bad – with solar systems? What are the causes?

### **Needs**

What are the needs at the individual or household level? What kind of energy does the household use? At what costs and to what ends? Which conditions prepare these household (non-)decisions?

### **Adequate technology in relation to needs**

Is adequate information available?

Are there any cultural impediments to the introduction of solar systems? Is it a matter of initial investment, a lack of funding? What are the current market prices for solar systems in relation to disposable income? What are the opportunity costs? Are adequate systems available at affordable prices?

### **Supply**

Is it a matter of trade? Do traders have adequate knowledge about the products? Are there importers and wholesalers who import the systems? What are the prices? Where do the products originate? Are there agents of the producers or international companies in the country? Do their outlets reach into the potential (rural) markets, or are they concentrated in the cities?

In general, what are the trade barriers?

### **Public policies**

How do renewable energies figure in the overall energy policies? Are there import and sales taxes that increase the end user prices? What are the energy policies? How are they shaped? By whom, or under the influence of whom? Is there specific legislation concerning renewable energy production and distribution? Is there sufficient information about solar systems?

### **International intervention**

Are there international and national agencies that try to introduce these systems? What are their strategies? How do they act on the policy, programme and project levels, and at the national, regional and local levels? Are there already successes or failures of their interventions? What kind of communication processes happen within the communities?

### **Media**

Are there public discussions in the media or on social media? Who does the agenda-setting? How do the media treat the energy question? Do solar systems and other renewables figure in the public discourse? Is there an environment-related ministry or office in the country? Do international organisations have dedicated agencies in the country? What is the organisational landscape?

## Food security: Post-harvest treatment technologies (traditional and modern)

Food insecurity is one of Africa's most pressing problems that is unlikely to go away soon. Hunger crises are getting more frequent. So far, external interventions, as well as national policies, have mostly focused on increasing food production – with mixed results.

Given that pre- and post-harvest losses amount to 30% to 50% for many staples, even reaching 80% in some cases, only relatively weak efforts have been undertaken to reduce them. Some of them were directed at improving storage on a village, regional or state level. As food treatment and storage in sub-Saharan African agrarian societies happens nearly exclusively on the compound level, these ill-conceived approaches were not very successful. Many of these interventions have left no traces at all.

The relatively few initiatives by international organisations to improve treatment and storage on the compound level were, mostly, equally failures. National rural extension services, where they exist, seem mostly to be neither aware of the problem nor equipped to improve the situation.

So, on the whole, the agrarian societies have often been left to their own devices. The societal organisation of these groups is ethnic with a wide variety, and their methods of post-harvest treatment and storage vary equally widely. Steeped in their traditions, many of these societies have developed, over time, rather ingenious methods to treat, store and transform their seeds and staple crops. These are not particularly effective, however, against the most damaging factors, which include fungus, insects, birds, rodents, fire and theft in different measures.

A particularly important problem is the treatment and storage of seeds, because while losses of staples affect the nutritional status of the families and their capacity to sell parts of their produce, the loss of seeds can put the next productive cycle in jeopardy. Therefore, many societies have developed specific mechanisms to guarantee the availability of seeds for all producers before the beginning of the planting season. These go well beyond the mechanisms of solidarity that are in place for the sharing and re-distribution of foodstuffs. Many societies have traditional “seed banks” that provide adequate seeds for staple products, according to the specific needs of producers that depend on many factors, such as climatic and soil conditions, etc.

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We will also look into the dynamics of post-harvest treatment, storage, food transformation and food consumption and their impact on nutrition and food security at the individual, household, community and society levels.

It is obvious that some treatment and storage methods are much more adequate against some of the most damaging factors than others. The non-adoption of measures proposed by external interventions can be attributed mostly to inadequate approaches, and to a lack of understanding of the intricacies of the societal factors involved in compound treatment and storage by external agencies.

It is significant, however, that relatively good storage practices from some societies do not seem to diffuse and be adopted by others which have access to them and could easily introduce and adapt them to their own needs, as they operate under nearly identical conditions.

To understand these phenomena, thorough research that analyses the social structures, the specific traditions, the cultural matrices and the practices governing treatment and storage is required. It will also be necessary to study the internal dynamics and the specific floating equilibria within the productive and reproductive units on different aggregate levels (family, extended family, neighbourhood, village, lineage, etc.). As these dynamics are directly linked to the intricacies of agricultural and horticultural production systems, these will have to be taken into account.

Initial questions:

### **History and experiences**

What are the practices used historically and actually? What are the underlying patterns?

### **Needs and problems**

What are best practices? What are the losses, by product, by storage type, by transformation technology? On what level?

### **Cost and investments**

What are the overall and specific costs? What kind of investment is required? Are the necessary inputs available?

### **Knowledge and awareness**

Is there knowledge about losses, about other methods and technologies? About the potential of different approaches?

### **Supply and marketing**

Are the products for protection available on the market? Are the products intended for self-consumption or sale? What are the quality requirements for marketable products? Are there trade barriers?

### **Public policies**

Are there specific food security policies, programmes and projects? Do they include post-harvest treatment and transformation? How are they shaped? Are there specific interest groups influencing these policies and programmes? What kind of actors are involved?

### **Media and communication**

Are the relevant topics aired in national and local media? In what ways? Are there any specific agencies that promote the relevant topics? What is the organisational landscape dealing with food security and post-harvest-related matters? What are the internal perceptions and communication processes about the relevant topics? Is there an awareness of the post-harvest process potential for food security?

## **Geographical limits**

For a start, the project will study a limited number of sub-Saharan African countries. In a second phase, it can be extended to other regions.

## **Expected outcomes**

- Produce an encompassing theoretical framework about non-adaptation of technologies in sub-Saharan Africa.
- Develop a methodological framework that will allow the general and specific study of non-adaptation.
- Develop and test a set of toolboxes of methods and techniques for the study of non-adaptation of technologies.

- Case studies in a comparative perspective, i.e. successful adaptation vs. non-adaptation.
- Train researchers at the graduate, post-graduate, master, PhD and post-doctorate levels.
- Increase the research and training capacity of institutions, by deepening the already existing co-operation with some partners that reaches back for more than a quarter of a century and by integrating new partners into the common effort.
- Disseminate the results through a multi-channel approach, integrating partners of the project into international networks that are active in similar areas of research.

## Deliverables

- Comparative case studies for each research topic.
- Research toolkits for different research topics and settings, including research design models, detailed and easily adaptable field research plans and corresponding data processing and analysis models.
- Modular manuals for the study of (non-)adaptation of technology.
- Dissertations and theses at all levels of academic training.
- Scientific papers, books and manuals.
- Communication tools for the general interested public (newspaper articles, blogs, podcasts, videos, etc.).

## Methodology

As the outcomes and deliverables include a methodological framework as well as adequate toolboxes for the study of non-adaptation of technologies, great emphasis will be given to the selection, application and validation of research methods for the different research topics.

The project will, therefore, draw from a wide range of research methods, participatory and non-participatory, short-term and long-term, from different research disciplines, (social anthropology, sociology, economics, agriculture, environment, etc.) and apply adequate methods on the different sectors and levels (local, regional, national, international) for each topic. For each topic, detailed research plans will be based on triangulation, i.e. the combination of different methods. In a constant effort, all research methods and all

triangulation approaches will be constantly tested and validated. This meta-methodological approach will be necessary to produce the methodological framework as well as the specific toolboxes. Therefore, methods will be validated not only for reliability but also for cost and time constraints and for simplicity of design and application, taking into account available research capacities, such as institutional setups, the level of training and experience of researchers and interviewers, as well as data processing and analysis capabilities in each case. The aim is to develop a wide array of tools that allow, for one, the adaptation of research methods to different research goals for in-depth studies, but also for quick appraisals and more focused and limited research. This wide approach will provide appropriate/better methodology for academic research, for policy formulation, as well as for project studies.

### Timeline

The initial project duration will be three years. A follow-up is proposed for the implementation of design and of adequate policies and strategies in collaboration with government and international agencies, as well as with national and civil society organisations and companies.

### Research Institution Portugal

CEI-IUL - Centro de Estudos Internacionais (Center for International Studies)  
ISCTE-IUL, Lisbon

### Institutional co-operation and research partnerships

The project will be implemented in co-operation between Portuguese and African universities and research institutions. This partnership will be open for other actors such as Civil Society Organisations and companies.

### Researchers

The research project will provide opportunities for students on the graduate, post-graduate, master, PhD and post-doctorate levels to integrate into multi-disciplinary research teams while doing their research for their theses.

It will also allow for individuals with adequate qualifications and experience to join as independent researchers. The project's main focus is sub-Saharan Africa, but researchers from other geographical areas with relevant and interesting research may also join.

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## Project leaders Portugal

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## Research team (provisional)

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