Roving course on pump selection in Burkina Faso, Mali and Niger: Lessons learned

Leçons tirées des cours itinérants sur le choix des pompes au Burkina Faso, au Mali et au Niger

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Abstract

The utility of 4-days training courses for promoting the transfer of irrigation technology in Africa is discussed, using the case of three roving courses on pump selection that took place in Burkina Faso, Mali and Niger in January and June, 2001. Typically, a roving course aims to help unlock the potential for technology transfer and innovation adoption of a single technology, such as irrigation pumps, drip or sprinkler irrigation, and low-cost drilling, by offering a short-term training to 10-20 key persons in each country. This takes for granted that other constraints to technology transfer, if any, are of minor importance only. The extent to which this hypothesis holds true in the case of roving courses in Burkina Faso, Mali and Niger is examined. Ideally, roving courses should be embedded in a wider technology transfer process. Where this ideal situation cannot be created or found, stand-alone roving courses should attempt to take into account the conditions that prevail in individual countries in order to maximise their direct use in the transfer process. The need for a regional initiative to stimulate the technology transfer process from Asia to Africa is emphasised.

Résumé

L'utilité de formations de quatre jours pour promouvoir le transfert de technologie vers l'Afrique est présenté ici à partir du cas de trois cours itinérants sur le choix des pompes qui ont été donnés au Burkina Faso, au Mali et au Niger en janvier et juin 2001. Habituellement, un cours itinérant cherche à libérer le potentiel pour les transferts de technologies et l'adoption de technologies simples telles que les pompes pour l'irrigation, l'irrigation localisée ou par aspersion et les forages à faible coût, en organisant des courtes formations à 10-20 personnes dans chaque pays. Ceci présuppose que les autres contraintes aux transferts de technologies sont mineures, si même il y en a. A quel point cette assertion est vraie est examiné à travers le cas des cours itinérants au Burkina Faso, Mali et Niger. Idéalement, les formations itinérantes devraient être inclus dans un programme plus étendu de transfert de technologies. Quand cette situation idéale ne peut être trouvée ou créée, des cours seuls doivent essayer de prendre en compte les conditions qui prévalent dans chaque pays pour maximiser leur utilisation directe dans le processus de transfert. Enfin, on insiste sur le besoin d'une initiative régionale pour stimuler le processus de transfert de technologies de l'Asie vers l'Afrique.

1. Introduction

Three roving courses on pump selection took place in Burkina Faso and Niger, in January 2001, and in Mali in June 2001 (Van 't Hof 2001a, c and d). These courses were financed through a World Bank grant. Their aim was to train project staff, technicians, local consultants and equipment firms involved in small-scale irrigation design, to help farmers choose pumping equipment that is best adapted to local hydrologic and climatic conditions. The main subject of the course was how to use a pump selection tool in the form of a spreadsheet application called "PumpSelect" (Van 't Hof 2000b), which contains a database with the characteristics of about 100 pumps and 50 engines, many of Asian origin. The emphasis of PumpSelect is on mobile pump sets with relatively small diesel engines and mixed-flow pumps for discharges of 25 to 150 litres/second with static heads of 2 to 6 meters. A training manual (Van 't Hof 2000a) was used to explain how hydrological, economic and technical analyses can be combined to enable participants to advise farmers on selecting the most appropriate pumps and on improving system performance. Finally, practical results of the approach were illustrated, using a case from Timbuktu, Mali (Arby and Van 't Hof 2000).

The need for improving the availability of efficient and affordable low-lift pumps from countries, such as China, India and Turkey, has been emphasised by Zolty and Gadelle (2001). It featured prominently during the 1997 workshop on "Irrigation technology transfer in support of food security," Harare (FAO 1997), with contributions from Chinese and Indian pump industry representatives.

Nobody doubts that small-scale irrigation development in Asia, with millions of farmers buying dieselpowered pumping equipment, could ever have taken place if equipment prices had been 10 times higher.

In Asian countries with high intensities of pump-based irrigation (for example, India, Bangladesh, China, Vietnam and Cambodia), prices charged by agents and merchants to farmer customers, for pumps of Indian or Chinese manufacture, are typically around 10 percent of the prices charged by agents and merchants in West Africa, for pumps of similar capacity made in Europe. Low-lift pumping costs in Asia (inclusive of capital depreciation) are, therefore, in the order of 70 US\$/ha/season; whereas in West Africa, using the same basis of calculation, they are currently about 300 – 400 US\$/ha/season (Perlack 1988; Van 't Hof 1998). If efficient, affordable and reasonably reliable pumping equipment can be imported to West Africa from major manufacturing countries such as India and China, these costs can be brought down to an estimated 100 – 150 US\$/ha/season (Arby and Van 't Hof, 2000). This would greatly improve the competitiveness of irrigated agriculture in West Africa and would eliminate one of the main barriers to spontaneous irrigation development along Sahelian rivers, such as the Niger, the Senegal and the Logone.

In the background documents to the World Food Summit of 1995 (FAO 1996) specific mention is made of low-lift pump schemes as one of the successful approaches to water development even in Africa. However, most farmer-managed low-lift pump schemes in West Africa continue to rely on foreign imports when it comes to acquiring and replacing pumping equipment (Arby 1998 and 2001). Measures are urgently needed to improve the availability of affordable technologies for more spontaneous, sustainable small-scale irrigation development. Therefore, roving courses seem a practical way for increasing local awareness that less costly pumping equipment is a prerequisite for developing irrigation in Africa.

The question is how to organise roving courses for effectively enhancing the adoption of affordable irrigation technologies. In this note a preliminary assessment of the roving courses on pump selection is carried out, constraints to the practical application of the information supplied during the course are identified, and suggestions are made on improving roving courses for promoting the transfer of irrigation technology in Africa in general. Special attention is paid to the role of the private sector.

2. Course facts

- **Sponsors:** the World Bank (Trust Fund No TF039961) paid the trainer, local World Bank financed projects (APIPAC, ANPIP and APROFA¹) provided training spaces with computers (at least one computer for every two participants).
- Cost: fixed cost (course preparation) US\$3,216, variable cost (21 days mission, 3 wrap-up reports, reimbursement for travel, hotel, food, visa and report edition) US\$10,182, or a variable cost of US\$300 per selected participant (see below). Total cost US\$13,398.
- **Time and dates:** course 1: Amsterdam-Burkina Faso-Niamey 14-22 January 2001; course 2: Niamey-Amsterdam 22-29 January 2001; course 3: Amsterdam-Bamako-Amsterdam 10-18 June 2001.
- **Teaching aids**. By trainer: spreadsheet application "PumpSelect" with database, manual (60 p.), fully worked case study, 50 overhead sheets; by local project: overhead projector, computers (at least one for every two participants).
- Course teacher: present author.²

¹ Agence Nigérienne pour la Promotion de l'Irrigation Privée (ANPIP), Association des Professionnels de l'Irrigation Privée et des Activités Connexes (APIPAC), Agence pour la Promotion de Filières Agricoles (APROFA).

 $^{^{2}}$ The author has designed more than 10 rice schemes of 10 - 35 ha in the region of Timbuktu, Mali, and co-founded the HIPPO foundation (HIPPO = High-efficiency Irrigation Pumps, Procurement and Organisation, http://www.hipponet.nl).

- **Course organisation**: On average, 11 participants were selected by each local project. The attendants at the courses belonged to: projects 16, NGOs 5, government 3, consultancy firms 5, supplier 1, Chambers of Agriculture 3, volunteer organisation 1. Some of these were selected but never showed up; others were only available part of the time. The vast majority were available all the time and very interested in the course.
- **Course programme**: Monday was used for presentations and for preparing the course, including loading various files on each computer. Tuesday through Thursday were full training days with case studies; Friday was used for dealing with final questions and evaluation.

3. Constraints to the practical application of course information

Possible constraints to the practical application of course information in a particular country include the lack of:

- 1. information on characteristics and parameters of locally available equipment;
- 2. equipment alternatives;
- 3. certainty about the performance of new equipment;
- 4. after-sales service of new equipment;
- 5. repair and maintenance know-how;
- 6. awareness of the availability among potential buyers;
- 7. willingness to consider buying in spite of better performance;
- 8. local training capability to train others.

Constraint 1 occurred in Burkina Faso, where there was no or limited information on the parameters and characteristics of locally available pump sets (Honda, Robin, Yanmar, and Kirloskar).

Constraint 2 is typical of the situation in Niger for Asian diesel-powered pump sets. The availability of Chinese equipment leaves much to be desired in Burkina Faso and Niger. The situation is Mali is much better, but no efforts to optimise equipment for low-lift conditions along the Niger River were observed.

Uncertainty about the performance of new equipment (constraint 3) is a general problem. Very few efforts, if any, are made to collect information on equipment performance (head, discharge, fuel consumption, repair cost, and life-span) of any equipment, exotic or common. In the case of the small, petrol pumps of Honda, Yamaha and Robin, the manufacturers do not seem to have this type of information.

Lack of after-sale service of new equipment (constraint 4) is common. An example is the 300 or 500 Kirloskar TV-1 pump sets that came to Burkina Faso in 1996. Not a single seller of spare parts could be identified in January 2001, with the exception of one, who had no spares in stock, but claimed to know where they were. He was ready to provide some prices. When asked if he had a list of spare parts from the manufacturer, the answer was negative.

Lack of repair and maintenance know-how (no. 5) is a common constraint, too. Even simple diesel engines from India and China require some know-how. There is little reason to believe that this know-how is widespread, especially since there are no maintenance manuals.

Constraint 6 – lack of awareness of the availability among potential buyers – is likely to prevail in most countries. There seem to be no generally accessible lists of equipment, their suppliers and contact details. Early October 2001, an unknown buyer in Mali apparently did not know any Malian importers of Chinese equipment (i.e., an S195 diesel engine), and contacted a Belgian company, who in turn contacted the HIPPO Foundation in the Netherlands. The latter provided the Belgian company with the names and addresses of three Malian importers of Chinese S195 diesel engines, although the company stated that buying locally was not an option!

The unwillingness to consider buying new equipment in spite of better (economic) performance (constraint 7) can be seen at work in several countries. The interaction between the three privatesector groups that deal with pumps (users, suppliers, and advisers) can yield arbitrary outcomes. For example, a consultant, when asked to advise a development organisation for choosing an equipment, may be hesitant to advise cheaper exotic equipment because there is insufficient experience with it in that particular country. The same consultant may well be less hesitant in a country where this equipment is much more common. The organisation considers that its small-scale development project is already sufficiently complex and will be inclined to reduce the risk of breakdown and maintenance problems. The farmers, because they don't have to pay for the equipment, will incite the development organisation to buy the most expensive (and reliable) equipment available on the market.

As a result of this type of short-term thinking, the introduction of affordable, exotic equipment is blocked. Lack of competition will increase prices and erode after-sales services. There will be little incentive to importers to improve the equipment selection process. Exotic equipment will lose its competitive edge and farmers will not be able to carry out spontaneous, small-scale irrigation development. This is the aid trap of the equipment market in large parts of sub-Saharan Africa.

Finally, it was not assessed whether the roving course enhanced the local capability to train other groups (constraint 8). The roving course on pump selection was not intended as a Training of Trainers course. On the other hand, it cannot be ruled out that a number of trainees are now capable of carrying out similar training activities. The main teaching aids were a manual, a spreadsheet application, and a report. Electronic versions were provided to all trainees having a diskette, i.e., almost all of them. Transparencies can be produced on a US\$ 60 printer by enlarging the 50-odd images in the manual.

4. Course assessment and potential for improved course design and organisation

The aim of the roving course was to train project staff, technicians, local consultants and equipment firms involved in small-scale irrigation design to help farmers choose equipment that is best adapted to local hydrologic and climatic conditions.

The participants successfully carried out most of the exercises, showing that they were capable of using PumpSelect for the technical analysis of pumping systems and for simple economic calculations. Some participants grasped the course content in just a few hours. Nevertheless, the level of the participants was highly variable, some missed basic notions in physics, while others had difficulty in interpolating pump characteristic curves or lacked experience in using spreadsheets. The advanced economic calculations based on the method of Perlack (1988) could be explained to only very few people.

A number of additional suggestions were made by one or more participants during the course, including:

(1) the database of PumpSelect should be enlarged to include locally available pumps;

- (2) more information is needed on equipment use and maintenance;
- (3) a field demonstration should be included;
- (4) addresses of manufacturers and their local representatives should be provided.

The overall sentiment was that the course was very interesting, but perhaps lacked direct applicability, except for those directly involved in pump selection on a regular basis.

The first suggestion was first made in Burkina Faso, with respect to the small petrol pumps (Honda, Robin, and Yamaha). A week later it became clear that all the necessary information had already been collected by the ANPIP (2000) project in Niger, where 12 small pumps had been measured on a test bench. This enabled the inclusion of these small pump sets in the PumpSelect database, although there were difficulties in distinguishing between pump and engine efficiency (not measured separately on the test bench). In Mali, one of the exercises consisted in entering data of 12 Indian pump sets in the data base of PumpSelect. Another exercise consisted in comparing the pumping costs of three different local pumping systems.

A one-day field demonstration would be very useful to show the reliability of simulations with PumpSelect in practice. This should involve practical exercises where participants would measure various speeds, heads, discharges and fuel consumption. A good place for this would be an agricultural mechanisation training facility, especially if it could become part of the curriculum. An inexpensive 5 hp, low-lift diesel pump from China or India would seem quite suitable.

If it were admitted that pump selection is an effective method to ensure that farmers buy the most economic equipment available, an effort should be made in each country to complete the national database. Entering a set of data in PumpSelect takes about 10 minutes per pump, so the main problem is to obtain characteristics and other parameters and to make sure they are correct. Of course, this will also require the establishment of a list with addresses of manufacturers and their local representatives. Regional networking to obtain characteristics and parameters is advisable.

5. Conclusions and recommendations

Training courses can only be effective in the context of a wider technology transfer process. Such a process involves aspects, such as the identification of marketable (e.g., affordable) technologies, promotion and capacity building of supply chains. Often, the private sector efficiently takes care of all these aspects, but this does not seem to be the case of irrigation technology transfer in sub-Saharan Africa, to the detriment of private irrigation development.

At present, importers of Asian (Chinese, Indian, and Turkish) equipment in West Africa are not capable of selecting the most appropriate equipment with a fair degree of certainty. For the same reason, they are incapable to convince development organisations, the main buyers of irrigation equipment, of the appropriateness of what they offer, perhaps also because of weak after-sales services. On the other hand, development organisations do not display rational behaviour in terms of demand. They are not aware of potentially useful technologies; they seem to be generally tangled up in organisation-specific procurement processes, and follow short-term logic where a long-term vision is required.

To end this deadlock, an intervention at a regional scale could be considered along the following lines:

- identification³ and test of a range of Asian pumping equipment based on present engine availability⁴ on the West African market;
- (2) strengthening importers' after-sales services (repair and maintenance manuals, spare part lists);
- (3) promoting the equipment with demonstrations, advertising and especially by showing that the equipment has the lowest possible pumping costs.

The pump selection course can be used to improve the decision-making capacity of sales persons, local consultants, development organisations, and farmers. It is much more likely that the private sector will respond to providing affordable irrigation equipment, once importers know what they have to import and farmers and development agencies know what to ask for.

³ Van't Hof (2000c) proposed more than 10 low-lift pumping systems from Asia.

⁴ All common Indian and Chinese engines have reached the West African market, sometimes in large numbers.

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