

## HOW TO KEEP TRACTORS RUNNING IN AFRICA?

### Lessons for knowledge and skills development from Zambia

Successful agricultural mechanization requires building knowledge and skills of machinery owners, operators and technicians on how to manage, run, maintain and repair machinery. Building such knowledge and skills still remains a major bottleneck in most African countries (see PARI Policy Brief No. 5 and No. 7). A study in Ghana has found that 80% of the tractor-owners regularly face long breakdowns due to a lack of knowledge and skills. But what kinds of knowledge and skills are needed? And what are the most appropriate ways to build them? This policy brief presents some answers based on a comprehensive study on the knowledge and skill requirements for machinery owners and operators in Zambia.

#### Methodology

The policy brief is based on data gathered through: (1) interviews with experts from across the world and a review of existing training programs, and (2) an in-depth case study in Zambia, where 2% of the farmers use tractors. The study was done in collaboration with the Zambian–German Agricultural Knowledge & Training Centre, including 454 feedback forms from training attendants, visits to 39 tractor-owners and several workshops of technicians, interviews with 28 mechanization stakeholder and screening 300 discussions of the vibrant Zambian Facebook group “Small-scale farmers, farming as a business”.

#### What to train?

**Knowledge and skills on how to maintain machinery is essential to avoid costly breakdowns.** On the ground, maintenance is often neglected: tractors lacked grease and had leaking gaskets and clogged oil filters. The Zambian Bemba language has no word for maintenance; the closest word, *lungisha*, means repair. Learning about maintenance is one of the low-hanging fruits of mechanization knowledge and skills development. It is also an example where theoretical training may fail. To grasp the need for maintenance, a basic

understanding of the engine-, fuel-, lubrication-, hydraulic and electric system is required. Models of cut-open engines, for example, may help to show the effects of inadequate maintenance and to illustrate the importance of a clean working environment during maintenance. Importantly, it is both operators and owners who need to learn about machinery. A well-trained operator is unlikely to convince an untrained tractor-owner to buy inputs for maintenance.

**Training on the economics of machinery ownership, maintenance and service provision is needed in addition to technical training.** Such training could be used to illustrate the benefits of maintenance and to show how to increase tractor utilization by providing services.

**Another important skill is how to set implements.** This can be practiced, but theory is also needed. For example, knowing basic aspects of agronomy is key to understanding the importance of adjusting ploughing depths. Such trainings could also be used to highlight the need for conserving soil fertility, for instance by practicing conservation agriculture. Diagnostic skills related to audio and visual problems can also help avoid high repair costs, but may be more difficult to learn.

#### How to train?

Fulfilling the above-mentioned training needs would require months or years of training. However, with the short duration of many development projects and the governance challenges faced by some public institutions, this might not always be feasible. It may therefore be most effective to **combine long-term training using institutions for vocational training with short-term training organised by development actors or the extension system.** Short-term courses can serve to sharpen skills and present new technologies, but should not end up as “machinery shows” where equipment and skills are demonstrated that cannot be applied or afforded by trainees.

**Training should be as practical as possible.** The success of the German vocational training systems has



shown the advantages of hands-on training. However, large group sizes, limited time and lack of equipment often lead to only rudimentary hands-on training focusing on demonstrations, component identification and sharing of experiences. Training centres often aim at reaching large numbers of beneficiaries which compromises their ability to offer longer training with small-sized classes and sufficient time for practical elements.

Other aspects are essential, too, for example using local trainers, providing visual communication and adjusting training to farming schedules. To reach farmers more effectively, mobile training centres can travel with trainers, tractors and tools through the countryside. Experiences from the Mobile Agri-Skills Development and Training Centre in South Africa and the Mobile Training Unit in Ghana suggest that this can be a promising pathway.

**Training programmes should not end when participants leave the training centre.** To create sustainable impact, multiple field demonstrations, frequent refresher courses and follow-up trainings are essential and handouts should be provided.

**Information and communication technologies can effectively support training activities.** Mobile tools exist to send maintenance alerts and manage customers. However, only 20% of the Zambian tractor-owners were using smartphones, mainly for communication. Rather than developing apps, taking advantage of social media channels such as Facebook and WhatsApp may be more useful. For example, farmers can be encouraged to discuss via Facebook or ask questions to extension officers via WhatsApp. Facebook groups such as “Small-scale farmers, farming as a business” have around 400,000 followers and can be used to disseminate knowledge using photos and videos. **However, ICTs cannot replace hands-on machinery training.**

#### Policy Recommendations:

- **Combine short- and long-term training approaches.** Strengthening the national agricultural education system to offer long-term training might be one of the most sustainable investment options for donors and governments. However, short-term training can help to reap some of the low-hanging fruits of knowledge and skills development.
- **Provide context-specific and hands-on training.** Training should reflect the conditions of the trainees. Training should be as hands-on as possible. Theoretical concepts should be taught when needed. Modules on economics of machinery ownership, maintenance and service provision are needed.
- **Become mobile.** When farmers cannot come to the training centre, the centre has to come to the farmers.
- **Use innovative training approaches.** ICT tools can be used to supplement training, facilitate follow-ups and enable farmer-to-farmer extension. However, many aspects of mechanization training need to be hands-on which cannot be addressed by ICTs.

This Policy Brief is based on the study: Thoelen, Jan (2018). New approaches to training and education in sustainable agricultural mechanization for emerging farmers in Zambia. Master thesis. University Hohenheim. Available upon request from [pari@uni-bonn.de](mailto:pari@uni-bonn.de).

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