Irrigation design from below

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Although often ignored or belittled by irrigation engineers and development planners, vernacular and counter designs in irrigation should be considered as valuable and complementary to the mainstream approaches of engineers and planners.

Irrigation in sub-Saharan Africa is dominantly seen as highly underdeveloped. However, statistics exclude large areas of irrigated agriculture, likely amounting to several millions of hectares, which are predominantly related to irrigation developed by smallholder farmers. Although self-developed irrigation is at the core of farmers' agricultural intensification and commercialization strategies, many irrigation engineers and development planners look down on it, some mockingly calling it 'playing with mud' rather than irrigation. But whose reality counts? Whose views are considered as relevant and worthwhile for development investments and design interventions? The views of marginalized people, whether on the basis of gender, class, race or else, are often of little influence in the mainstream, though the way people design and re-design from these marginalized positions is valuable, yet often ignored by those in more powerful positions.

My professional development started just before the turn of the millennium, when I started studying at university aiming to become a development worker, specialising in irrigation and water management. I was highly optimistic about technological progress and the positive contribution that our engineering knowledge could make to the prosperity of people in developing countries. While our fresh batch of students was full of like-minded idealistic young adults, most university staff had undergone a radical change to see development work as highly political and contentious. Furthermore, many had come to realize that expert knowledge was partial and not generally applicable. Some had in fact become fervent supporters of the idea that 'local knowledge' trumps 'expert knowledge'.

For me, Robert Chambers' book *Whose Reality Counts? Putting the First Last*[1] has been one of the anchor points for understanding that technological transformation processes are indeed deeply political. Technologies are not value-free material objects that can be applied universally, independent of context. Technological change, such as irrigation development, is about creating new worlds of social and material relations including the shaping of norms for what is a desired and successful outcome[2]. Technological change and societal change go hand-in-hand and even co-constitute each other.

Robert Chambers' question, "Whose reality counts?", presupposes that there are different realities. For some this can be an inspiring philosophical question, but for many water scientists and irrigation engineers this is rather alienating and difficult to grasp. Perhaps this is because they consider their natural science-based views to be the undisputable reality. From a minority position, it is much easier to observe how power and culture co-determine what is seen as acceptable and factual. We have recently witnessed this around the Covid-19 crises with even the understanding of what constitutes the core of the problem being thoroughly different for different people, (sub)cultures and societies. Different realities around COVID-19 and how to deal with it created and deepened divisions in personal relations and in society alike. A similar frustrating feeling applies to water engineers and farmers who often live worlds apart.

While technological design is often seen as the domain of engineers, farmers also develop material solutions themselves, often outside the view of engineers. Such pro-active, locally rooted and situated processes are referred to as vernacular designs. A striking example in our field is that of African smallholder farmers developing their own irrigation systems over very large areas with no or limited support from governments or development organisations, a process referred to as 'farmer-led irrigation development'. Frequently these designs prove the assumptions of irrigation engineers wrong, for instance through the locations in which farmers do this (on steeper slopes and areas with higher flood risk), their forms of organisation (often individual and almost always informal) and the irrigation technologies that they use (in basins and furrows above sprinklers and drip)[3].

Formal design processes often aim to be hegemonic in their transformation of socio-technical relations, reproducing dominant political and engineering discourse around centralised control, formalised institutions, efficiency-thinking and technological fixes. Whether these socio–technical transformations are shaped through top-down or co-production processes, farmers do not passively undergo these as obedient recipients. In their day-to-day lives, men and women farmers creatively keep using water resources and modify technologies in ways other than those prescribed by formal plans. Irritated engineers typically refer to such modifications as damage, vandalism, misuse or ignorance. I prefer to call these creative counter designs. For example, in drip irrigation projects targeting smallholders, numerous examples show how farmers actively experiment with, and adapt, the irrigation systems and procedures despite opposition by the engineers, technology providers and policymakers that installed or promoted them in the first place[4].

Both pro-active vernacular design processes (as in farmer-led irrigation development) and re-active counter-design processes (as in smallholder drip irrigation) are ridiculed by those in powerful positions living in different realities. This marginalization and ridiculing could be seen as a sign that elites feel threatened that these ideas are even considered as realistic alternatives[5]. As privileged academics, we should heed Robert Chambers' call to "put the first last", at least by being reflective on our own realities and power positions, reporting on them when engaging in technological transformation processes. This may give room to the realities of marginalized people and

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their design processes, thereby exposing the weaknesses of widely-held convictions and providing great opportunities for more relevant innovation.

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Competing interests

The author declares no competing interests.