

## The Genetics of Innovation

By Ueli Scheuermeier, AGRIDEA<sup>1</sup>

In Bolivia, a group of Quechua-speaking farmers was seriously discussing ideas for a new water distribution regime. The engineer from the company that had sold them the pump and the pipes was listening eagerly and making notes on the various arguments. Outside, a blue pipe with sprinklers attached meandered across a field, serving as both experiment and demonstration. It emerges that these farmers have been irrigating their field for centuries from water channels built during Inca times, collecting water from the mountains and distributing it over the gentle slopes that lead down to the saline plain. So why the pumps? And why the pipes? The discussion continued in both Quechua and Spanish, since the engineer only understood but did not speak Quechua. Over a lunch of guinea pig and beans, the debate moved constantly from technical engineering questions through harvesting and marketing to organisational issues related to water distribution, then back again to technical ideas for dispersed water storage and so on. But aren't the farmers supposed to be getting water from the dam that has been built? Oh yes, but they know nothing about that project, except that it must have failed badly, since they are not getting the water they were promised; on top, they are only told about a week in advance when to expect the water to come. You can't plan a crop that way! But this pump here and the pipes laid out along the old channels, this really promises to make money for them, so they pay the engineer for his time and his equipment...

Why did the dam built by the large technocratic project fail, while this small engineering company is making

money with its pumps and pipes? The success of innovations seems to depend heavily on the interaction between the "ethical" knowledge held by the people who make their living in certain circumstances, and the "topical" knowledge that can be brought to bear on the same situation. "Ethical" knowledge is everything that a person needs to know in order to be able to live decently in the place that he or she calls home, or to work successfully in the workplace that (s)he knows. "Ethical" knowledge is highly specific to locality, culture and time. "Topical" knowledge, on the other hand, is knowledge that can be applied almost anywhere on the planet and at any time: natural sciences, economics and so on are examples of this type of knowledge.

The water-engineering company in Bolivia has a remarkable approach: They have their equipment, they have their systems and of course they are being innovative with that equipment. But they also realise that their success depends on more than just finding the right equipment to match the right natural conditions. They know that they need to involve their client-farmers. So, instead of demonstrating finished products and instructing farmers how to use them, they go to the farmers and enter into a mutual learning arrangement with them. The engineers told the farmers that they were not sure how to operate the system, and asked them for help in working out how best to operate the equipment so they could understand how to design their irrigation systems in a way that made sense to farmers. The result was this group of farmers, quite knowledgeable and well-acquainted with the equipment, but doing their own experiments with it and coming up with their own extremely interesting ways of modifying their social system to take advantage of the equipment. While the engineers helped with the new equipment, the farmers were carrying out their

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own experiments in harvesting. Now, the sprinklers and driplines were the innovation that they were interested in working out together, and this is what triggered the question about decentralised water-storage. Most surprising of all: The idea of switching from channel irrigation to pressurised irrigation came from the farmers themselves. They had seen and experienced the drinking water schemes the company had been building and, as a result, approached the company to see whether that technology could also be applied to irrigation. A perfect example of recombination!

Interestingly, there are parallels between biological genetics and the generation of successful innovations: the meeting and intense interaction between the complementary but diverse “ethical” and “topical” knowledges; the induced mutations when a new idea suddenly emerges; the recombination of different elements into new and viable innovations which are then the offspring of the interaction of diverse types of knowledge.

So, if our programmes are to be useful in complex environments such as those in Bolivia, we need to ensure we interact closely with local “ethical” knowledge. We desperately need more field-based Research and Development (R&D) efforts where the intended beneficiaries are included as co-explorers in working out the complexities of an innovation. No matter how well development programmes may be formulated at a high generic level, and how complex its funding through various multilateral and sectoral agencies, basket funds and so on, ultimately it always boils down to this central question: What innovations will this effort produce in the field, and how will these innovations add sustained value to the livelihood of the intended beneficiaries.

I believe there is a strong case to be made for modern and intelligent small programmes that specifically aim at tapping the creative potential that comes from combining “ethical” and “topical” knowledge, whether this is out in the field, in villages and towns, or on the inside of organisations. Usually this type of R&D also turns into economic R&D, or even business R&D,

so as to identify the variables for building business plans that a credit scheme can fund. Sometimes there may even be a commercial stake in conducting R&D with farmers and micro and small entrepreneurs; such programmes could, therefore, even be run on a commercial basis.

This has happened with the group of farmers in Bolivia. Having realised how much water they were saving with pressurised irrigation, someone suddenly came up with the idea of changing the distribution regime from their centuries-old system based on “hours of water” to the “amount of water” used. The wealthier farmers at the top of the irrigation channel began to realise that their hours of water use actually resulted in less water, because they had less pressure in their pipes than the poorer farmers further down the long slope. What was more, with pressure in the pipe a farmer would get water immediately, without having to wait half-an-hour for the first drop to reach his field. So the farmers obtained a loan to install expensive water-meters and they connected more farmers into the system, thus spreading the costs further. Meanwhile, the engineering company is doing good business. Win-win-win in all directions: An amazing achievement. These Quechua-speaking farmers have succeeded in applying their centuries of experience in negotiating water rights to tap the potential of a new technology. And a smart engineering company is including input from its clients in its R&D. “Ethical” knowledge marries “topical” knowledge and produces a whole range of diverse offspring innovations.