

Wiwa

and the importance of biodynamic breeding

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Pictures courtesy of Die Getreidezüchtung Peter Kunz.

What is Wiwa?

Wiwa is a winter wheat which represents the pinnacle of my life's work learning how to biodynamically breed the best possible wheat both for farmers and for human consumption. Why is it special? It is simply an overall exceptional and well-liked wheat.

Wiwa is popular with farmer-bakers and commercial bakers. For example, I recently met a farmer-baker at the farmer's market. She told me that *"since we got Wiwa, our bread is always a success, beautiful, and very tasty."*

Large bakeries have also appreciated the flour from my breeding for many years, because it can be used for almost all baked goods. The very high and stable quality is appreciated. They like it also because more water can be added to the flour. This gives the bread more flavour and keeps it fresh, which is good for business. The millers are also fond of Wiwa. Wiwa's grains are full, hard and heavier than usual, thanks to the intensive ripening process that they undergo in the field. When milled, Wiwa's grains break down into small pieces of semolina that can be sifted and sold separately, while the rest still produces high-quality flour. Even without sieving, 100 kilos of grains can yield two to three kilos of extra flour.

Farmers like Wiwa, too. Farmers that grow Wiwa have an advantage. The Swiss Research Institute for Organic Agriculture has shown that Wiwa produces 95 Swiss francs per

hectare more per year thanks to the above average quality of its grain

So, in addition to its' consistently good yields and excellent nutritional quality, Wiwa brings additional monetary value to all partners in the value chain. In total, this amounts to around 500 Swiss francs per hectare and year.

Given the many thousand hectares under cultivation in Europe over the past 20 years, Wiwa production produces value in the hundreds of millions of francs. This reveals the leverage effect - or hidden gift - that biodynamic breeding and cultivation has contributed to the overall economy. The fact that neither industry representatives nor the farmers' associations themselves are aware of this is one reason why biodynamic breeding initiatives are not valued in Switzerland as highly as they should be. Despite their success, the breeders have to beg for support every year.

Where does Wiwa come from?

Over 100 years ago, Ernst Stegemann asked Rudolf Steiner to look for reasons for the increasing loss of quality in food. He pointed out that all cultivated plants become exhausted over time unless they are bred anew and gave him the task of studying and meditating on plants in depth. The efforts of Stegemann and his friends came to nothing in times of crisis and world war.

I have been interested in modern plant breeding since my school days. But I had questions of epistemology and methodology regarding how to do breeding in a way that fully brought out the potential of the crop plants. Modern varieties are often prevented from developing their vitality because their breeders arbitrarily set breeding goals. Varieties that come from these programmes are not optimal, and they cause problems, especially for organic farming.



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These questions led me in the 1980s to address these issues and to develop a style of biodynamic breeding together with the biologist Jochen Bockemühl at the Natural Science Section at the Goetheanum, in Switzerland. I found that when plants are allowed to develop and adapt, they not only become more productive, but their quality and resilience can be significantly improved.

We started the biodynamic breeding initiatives GZPK in Feldbach, Switzerland based on this insight. But it still would take years of work before our own varieties could become available. We created collections of varieties to provide suitable starting sources for our breeding. Several hundred crosses were made each year. But in 1992, a car accident turned over our tractor/planter and mixed all the offspring of our breeding programme together. All the pedigrees of over 500 crosses were intermingled. However, that did not stop us; all the seeds, over 100,000 grains in total, were resown. Among them were the seeds that would later become Wiwa.

After this, our breeding program had no references from the past to guide us. Only the breeder's free eye, careful observation and inner model



of strong, healthy plant development could be used to select the best plants. Once the individual ears were harvested, the grain was selected and observed. This is because the grain immediately shows how the plant has developed. Did the plant manage to cope with adverse environmental conditions? Has it been able to exploit the fertility potential of the site, develop a harmonious shape and concentrate its strength in fully developed, nutritious grains? Has there been a controlled ripening process or has it simply dried out? Experience shows that varieties that do not appear to be beautiful have a short life. This reminds us of a quote from Hilde Domin: *"We eat bread, but we live from beauty."*

The human/crop plant relationship:

Technical equipment by itself cannot answer the basic questions about how to work with plants to produce great varieties. The attitude, knowledge, and skills of the breeder are critical. Primarily what is needed is an attentive presence and a commitment to the choice. Basically, every selection is a promise, a renewal and deepening of the relationship with the being of the plant. That beingness of the plant is always effective and visible throughout development and never exhausted by the external appearance. Encounters in the nursery often feel like "love at first sight" and must be nurtured and protected, otherwise nothing will come of them.

Wild plants are embedded in ecological niches and supported by a dense network of relationships. But for cultivated plants, the relationship with humans is essential.

Especially at the beginning, new varieties live only with the minds of one or a few people. These people give them space and direction for development, externally in the protected nursery, internally by promising to guide them over all the hurdles that lie ahead. Seen in this way, breeding is leadership and personal responsibility for the crops grown. This is an investment that each generation must make to ensure that the crops continue to develop and maintain their vitality and nutritional value.

A high level of expertise is required for a breeder to develop and sell seed from a wheat variety. Such varieties must meet regulatory and market requirements. This requires agronomic knowledge, and appropriate technical equipment and communication, because today's world only understands the language of externalized science.

As an outcome of our breeding process, Wiwa overcame all these hurdles more than 20 years ago. Had we not fulfilled any single criterion Wiwa would not have had its chance to survive in the economic system.

And this holds true also for the future. Only if I – or another breeder – recognize Wiwa as a suitable parent for making new crosses, or as a genetic resource, will it be used in the future, become the basis for a subsequent generation of varieties, and start a new cycle of further development of the wheat crop.

The importance of on-farm selection and breeding.

Agriculture always starts with the land. Soil is a living organism, even when we walk on it, not just a sponge for nutrients and water. It is a place on the earth with a life of its own



and a unique relationship with the sun, moon and stars that determines many of the conditions for growth. The course of light and heat determines the year. Depending on the availability of water, plant growth develops three very different yields in land: at the root level the plants feed the soil organisms directly, above ground they provide food for farm animals and only the third yield feeds humans. Without this plant-based yields and the nutrient cycle, there would be no living soil, and animals and humans could not live on Earth.

That the farm is or should be a kind of organism is the basic concept of biodynamics that was introduced by Rudolf Steiner a hundred years ago. This farm organism is an active relationship between many different living organisms. After all, organisms are always more than the sum of their parts. Ideally, the farm should build on its own resources, be almost self-contained and designed so that the organs support and nurture each other. No organ should be a parasite, or if it becomes one, its needs must be compensated for by another.

In practice, however, this concept has been known for thousands of years: wherever agriculture has formed the basis of advanced civilizations, it has been used. A balanced relationship between soil, crop production, animal husbandry and human needs produces primary production, surpluses and added value, on which the prosperity and health of non-agricultural society worldwide is based.

Wherever this basic organic concept has been abandoned or neglected, for example when forests have been cut down for shipbuilding or when modernity has moved towards industrial input-output agriculture, then agriculture becomes an economic, health and environmental problem. It then costs more than it produces and damages its own resources.

Breeding in the biodynamic sense means developing crops and varieties that support the farm organism and maximize its potential in terms of yield and quality. How well do the variety and the site work together to produce stable yields and high quality over the years? Do they really promote soil life and provide sufficient and good feed for the animals? In breeding practice, the main focus is on how candidate

varieties cope with sub-optimal conditions. Can they cope with temporary shortages and extreme weather conditions?

Deepening our approach with the microbiome and nitrogen as mediators

We have known for several years that each variety has its own microbiome, not only in the root area, but also on and in the green plant and even in the fruit. Genome analyses show that the spectrum of this whole world of microorganisms is much larger and more important than previously thought. The microbiome is part of both the plant organism and the environment. Without definable boundaries, the microbiome bridges and embodies important relationships. In conjunction with the elements of the farm organism, it provides plant stability and health, with a direct impact on food quality and safety. Even plant diseases are part of the microbiome; only now they are being given their own functions as ecological components, putting the traditional concept of pathogen into perspective.

If we want to develop varieties with a healthy microbiome, we need to rethink breeding and include the farm organism. This type of breeding, as practiced in biodynamics for over 40 years, is a start. It follows the principle of carrying out all breeding steps outdoors. In this way, plants are never cut off from the microbiome and epigenetic adaptations can take place. Walter Goldstein's work is also providing the impetus for the further development of on-farm selection methodology in the USA that observes the microbiome in the body of the living plant. I will be initiating this kind of approach in Switzerland in the summer of 2024 together with Amadeus Zschunke. For 20 years, Mr. Goldstein has been developing corn varieties with high protein and methionine content that allow poultry to be fed without the addition of synthetic methionine. He has observed how certain maize lines promote and harbour bacteria that can fix vital nitrogen from the air and make it available to plants, a process known only from legumes. This leads to darker leaf colour, higher chlorophyll concentrations and improved assimilation of nitrogen and minerals. It is important that no



mineral nitrogen fertilizer is added from outside as this will interfere with the process. In addition, the plants must provide a carbohydrate-rich food substrate for the bacteria, because nitrogen fixation requires a lot of energy: to fix one gram of nitrogen, the bacteria need 12 grams of sugar.

Goldstein's maize varieties appear to obtain substantial quantities of N per hectare from their microbial partners and pass their microbiome and this ability on to the next generation through the seed. Conventional varieties do not have this ability, apparently because no breeder or researcher had thought of it before. But this is also due to breeding on biodynamic farms for many years. This enables a co-evolution of the plants with their microbiome and the farm organism. Nitrogen plays a central mediating role. Rudolf Steiner pointed this out in the Agricultural Course in 1924: It should be part of the art of biodynamic farmers to understand the nature of nitrogen and direct it to where it is needed for the health and performance of the agricultural organism.

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