

Yields of biodynamic agriculture of Immanuel Voegele (1897-1959): Experimental Circle data of Pilgramshain

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ABSTRACT

A century ago the New Age philosopher Dr Rudolf Steiner (1861-1925) called for the development of a differentiated agriculture, one focussed on biology rather than chemistry. At his Agriculture Course at Koberwitz (now Kobierzyce), in the summer of 1924, Steiner founded the Experimental Circle of Anthroposophical Farmers and Gardeners. The Experimental Circle members each signed a non-disclosure agreement (NDA). Their task was to test Steiner's ideas, establish what worked, and to publish the results. That injunction was arguably satisfied by the publication of Ehrenfried Pfeiffer's book 'Bio-Dynamic Farming and Gardening' in 1938. The results reported in the present paper are Experimental Circle results that were subject to the secrecy provisions of the NDA at that time (1936), and are now finally revealed. Immanuel Voegele (1897-1959) recorded yields for five crops under Biodynamic (BD) management in the years 1931-1933, comparing these results to yields in the pre-BD years 1920-1926. He reported yield increases for potatoes to 55%, rye up to 48%, oats to 31%, wheat to 14%, and barley to 9%. Voegele was well credentialed and grounded to report on Biodynamics. He had studied agriculture at Stuttgart, he attended the Agricultural Course of Rudolf Steiner at Koberwitz, and he was an inaugural member of the Experimental Circle. Voegele had served as a farm manager at the Koberwitz estate of Count Carl Keyserlingk (1869-1928) (until 1925). He subsequently worked at the Biodynamic farm of Ernst Stegemann (1882-1943) at Marienstein. The present paper reports longitudinal yield results for five crops at Voegele's farm at Pilgramshain, Silesia, Germany, before and after the conversion to BD. These early BD yield data were shared amongst 'the faithful' at the time, and only now publicly. From the high point of his reported successes with BD, life and prospects for Voegele would rapidly deteriorate. The Nazi regime was hostile to Rudolf Steiner, Anthroposophy, and Anthroposophic ventures (of which Biodynamics was one). All books by Rudolf Steiner were banned by the Nazis in 1935 (including the Agriculture Course). Germany invaded Poland in 1939 and slaughtered millions of Polish civilians, before eventually in 1945 the Russian Army routed the Nazi army. The Russians marched on 'Fortress Breslau' and on to Berlin, sparking a mass westward exodus of Germans, including Immanuel Voegele. Territory, including Pilgramshain, was relinquished to Poland at the Potsdam Conference of 1945. Immanuel Voegele's legacy of reported successes with Biodynamics at a time when secrecy prevailed is now shared.

Keywords: Biodynamic farming, organic farming, Rudolf Steiner, Anthroposophy, Experimental Circle of Anthroposophical Farmers and Gardeners, Koberwitz, Kobierzyce, Żółkiewka, Poland

INTRODUCTION

In 1924, at a farming estate at Koberwitz, the New Age philosopher Dr Rudolf Steiner (1861-1925) called for an agriculture focussed on biology rather than chemistry, urging a farm be treated as 'an organism' rather than as a factory (R. Steiner, 1924a, 1924b, 1924c). Chemistry had recently come to the fore in farming, as 'the chemistry of war' was rapidly repurposed to 'the chemistry of agriculture', and away from making explosives and poison gas for World War 1 (WW1) to making agrochemicals (Freemantle, 2015; Haber, 1920; Smil, 2001).

At his Agriculture Course, Steiner urged his acolytes to test his ideas for a differentiated agriculture, and once proven to publish the results (R. Steiner, 1924a). The Experimental Circle of Anthroposophical Farmers and Gardeners was the vehicle founded by Steiner at Koberwitz to achieve this outcome. In the interim, secrecy was enjoined on members of his Experimental Circle of Anthroposophical Farmers and Gardeners (Paull, 2011b). Biodynamics went public in 1938 with the publication of the book 'Bio-Dynamic Farming and Gardening' by Ehrenfried Pfeiffer (Pfeiffer, 1938a).

Following quickly on the heels of Pfeiffer's book was a book by another Biodynamic farmer, Lord Northbourne, who coined the term 'organic farming' and published his manifesto of



Figure 1. Immanuel Voegele (Source: Forschungsstelle Kulturimpuls).

organic agriculture 'Look to the Land' (Northbourne, 1940; Paull, 2014). It is this child of Biodynamics, organic farming, that has progressed to become the cornerstone of the movement for sustainable agriculture (Paull, 2010).

Immanuel Voegele (1897-1959) is described as: "one of the most important pioneers of the biodynamic movement" (Koepf, 2003) (Figure 1). Voegele was one of the farmers who urged Dr Rudolf Steiner (1861-1925) to present a course on agriculture. Voegele was present at Steiner's Agriculture Course at Koberwitz (now Kobierzyce, Poland) in 1924, and he was a member of Steiner's Experimental Circle (Koepf, 2003; Paull, 2020). At the Agricultural Course, Voegele stated his profession as farmer and his address as Breesen, Germany (Paull, 2020).

Voegele studied at the Agricultural College (Landwirtschaftlichen Hochschule) in Stuttgart-Hohenheim, Germany. He worked for a short time at Guldesmühle farm near Dischingen (c.100 km east of Stuttgart), a farm owned by Der Kommende Tag (Kommende Tag was a short-lived Anthroposophic business venture). Voegele then worked as a farm manager for Count Carl Keyserlingk (1869-1928) at Koberwitz (until 1925) (Koepf, 2003). Subsequently, Voegele worked for the BD pioneer Ernst Stegemann (1882-1943) at Marienstein (Paull, 2023), before taking over the management of a farming estate at Pilgramshain, Germany (now Żółkiewka, Poland). The Pilgramshain estate was owned by Joachim and Dorothea Elisabeth von Jeetze, who were, like Voegele, both Anthroposophists and Koberwitzers (Koepf, 2003; Paull, 2020).

The Pilgramshain estate was purchased jointly by Voegele and another Koberwitzer, Martin Schmidt (Koepf, 2003; Paull, 2020). Voegele converted his Pilgramshain farm to Biodynamics. His experience of the conversion is reported in

the present paper, including the yields of five crops (pre and post conversion to Biodynamics).

The task of the Experimental Circle was to test Steiner's ideas, establish what worked, and, in the fullness of time, to publish the results. Until such a time, the Experimental Circle members were bound to confidentiality by their signed non-disclosure agreements (NDAs). Additionally, there was Rudolf Steiner's personal injunction to keep confidential the contents of the Agriculture Course and the results of the Experimental Circle (R. Steiner, 1924b).

A project to examine historical data of Biodynamics' pioneers (e.g. Paull, 2023) revealed the data reported in the present paper. Rudolf Steiner had founded the Experimental Circle of Anthroposophical Farmers and Gardeners at the Agriculture Course at Koberwitz (R. Steiner, 1924a). By the end of 1938, there were more than 700 members of the Experimental Circle worldwide (Course Register, 1926+). The Experimental Circle was an ambitious and novel citizen-science geographically distributed research project, with members enlisted to test the 'hints' of the Agriculture Course.

It appears that the data of the Experimental Circle have generally not survived the passage of time. This absence is due to a confluence of events including: the secrecy imposed on the Experimental Circle; the distributed nature of the Experimental Circle across the world; the diversity of the Experimental Circle which comprised mostly enthusiasts rather than agronomists or scientists; the banning of Anthroposophy ventures (of which Biodynamics is one example) in Germany under the Nazi regime from 1935; the outbreak of World War 2 (WW2) in 1939; and the social, political, and economic upheaval pre, post and during WW2. As a consequence of this storm of factors, few data of the Experimental Circle have been scrutinised, few have been published, and the legacy and experience of many early pioneers of sustainable agriculture has been mostly absent from the public record. The present paper presents the surviving data of one Experimental Circle member.

METHODS

The data of Immanuel Voegele are preserved in the third issue (November 1936) of 'News Sheet of the Bio-Dynamic Method of Agriculture' (Voegele, 1936) and these are the data reported in the present paper. The 'News Sheet' is not indexed in the world's database of library holdings (worldcat.org), so it appears that there are no copies publicly held (worldcat.org at 22.09.2023). So, the data recovered for the present account are otherwise generally 'lost' or unavailable. Experimental Circle data were subject to a non-disclosure agreement.(NDA) at the time.

The early issues of the 'News Sheet of the Bio-Dynamic Method of Agriculture' appeared without declaring a publisher, an editor, nor any office bearers. The Editorial of the third issue is unattributed (as are others).

The 'News Sheet' was published by a breakaway group from the Anthroposophical Agricultural Foundation (AAF), after the Great Anthroposophy Purge of 1935. The Purge was executed by Anthroposophy headquarters at Dornach, Switzerland

(Paull & Harvey, 2023). The Anthroposophy Society in Great Britain was expelled from the General Anthroposophical Society (GAS). Leading Anthroposophists of the day were also expelled, including Dr Ita Wegman and Elisabeth Vreede, who were close associates of Dr Rudolf Steiner, and were personally appointed by him to head, respectively, the Medical Section, and the Mathematical and Astronomical Section, of the School of Spiritual Science (at the Goetheanum, Dornach, Switzerland) (M. Steiner, 1944). Issue 5 of the News Sheet (November 1937) stated that: “an Association is about to be formed” (Anon, 1937). By Issue 7 of the News Sheet (November 1938) the byline appears: “Organ of the Bio-Dynamic Association (B.D.A) for Soil and Crop Improvement” along with a report stating that the first General Meeting was 11 June 1938, London (Poppelbaum, 1938). At the time of the founding of the BDA, the AAF was already a decade old, having been founded in 1928 (Paull & Harvey, 2023).

The first name of the subject of the present paper appears variously as ‘Immanuel’, ‘Emanuel’, and ‘J’ (Immanuel), and the family name as ‘Voegelé’ and ‘Vögele’ (i.e. variant spellings) in various accounts. Following Koepf, ‘Immanuel Voegelé’ is adopted in the present account (Koepf, 2003). The terms ‘Biodynamics’, ‘Biodynamic farming’, ‘Biodynamic agriculture’, and ‘BD’ are used interchangeably in the present paper.

RESULTS

Immanuel Voegelé’s farm at Pilgramshain was “1214 Morgen (approx 750 acres)” (304 hectares) (Voegelé, 1936, p.13). Pilgramshain is about 60 km west of Breslau (then Germany, since 1945, Pilgramshain is Żółkiewka, Poland, and Breslau is Wrocław, Poland). Voegelé’s farm was located in the foothills of the Silesian mountains. Voegelé’s Pilgramshain farm was a mixed farm of arable land (66%), timber (21%), meadows (7%), infrastructure (4%), pasture (2%) (Voegelé, 1936) (Figure 2).

Prior to his move to Pilgramshain, Immanuel Voegelé worked as a farm manager for Count Carl Keyserlingk (the host of the Agriculture Course) at Koberwitz, until 1925. Voegelé then worked briefly for BD pioneer Ernst Stegemann on his farm at Marienstein, before taking over the Pilgramshain farm (Koepf, 2003; Paull, 2023).

A start was made with Biodynamics at Pilgramshain:

“It was in 1926-1927 that a beginning was made with the bio-dynamic agricultural methods. At the time there was not available a sufficient mass of experience of these methods ... Pilgramshain is, however, one of those estates on which the bio-dynamic method was tried out in practice in its early stages” (Voegelé, 1936, p. 14).

There was a compelling economic reason for Pilgramshain converting to Biodynamic:

“before the change ... the financial burden on the estate was so heavy that the owner had been advised to sell the whole property ... However, the owner did not sell but decided to convert the entire working of the place

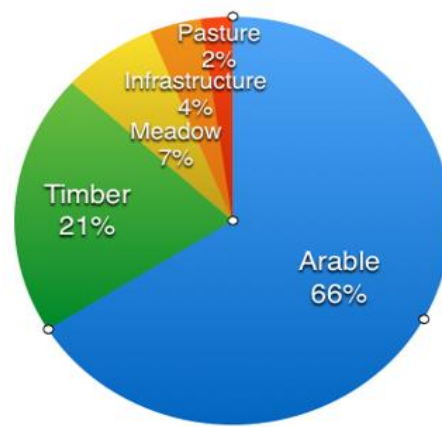


Figure 2. Land use at Pilgramshain farm (Voegelé, 1936)

to bio-dynamic methods. From 1927 onwards, no more artificial manure was put on the fields” (Voegelé, 1936, p. 14).

There were challenges converting to Biodynamic:

“It was at that time impossible to obtain enough stable manure, since the amount of stock was insufficient in relation to the area of arable land ... Lack of money made the purchase of additional stock out of the question ... and in any case, economic circumstances did not permit the incurring of any further expenditure on artificial manure” (Voegelé, 1936, p. 14).

Voegelé recognised that his work was pioneering:

“The change-over was at the same time a piece of pioneer work, and so demanded an enhanced pioneering spirit ... it was a case of, ‘Take your courage in both hands and go ahead’” (Voegelé, 1936, p. 14).

The conversion to BD was progressive:

“Such fields as could be manured with dung were treated with the whole range of [BD] preparations; all other fields only with the [BD] Sprays 500 & 501. The former group produced straightaway yields as high as those obtained with the help of artificial manure during the period 1920-1926. In the case of the fields that had to be skimmed one had, to begin with, as had been foreseen, to admit a slight drop in the yield. It was four years before every field had had at least one dressing of prepared manure ... since 1932 we have had as many head of cattle as we hold to be necessary for our requirements” (Voegelé, 1936, p. 15-16).

Voegelé reported successes:

“The success of all the steps we have taken that have been derived from bio-dynamic methods of agriculture shows itself in the striking improvement in our soil. It no longer forms a crust or closes up to the extent it did formerly, and it retains moisture better. It is looser in structure and easier to work ... Yields increase, and crops become more uniform” (Voegelé, 1936).

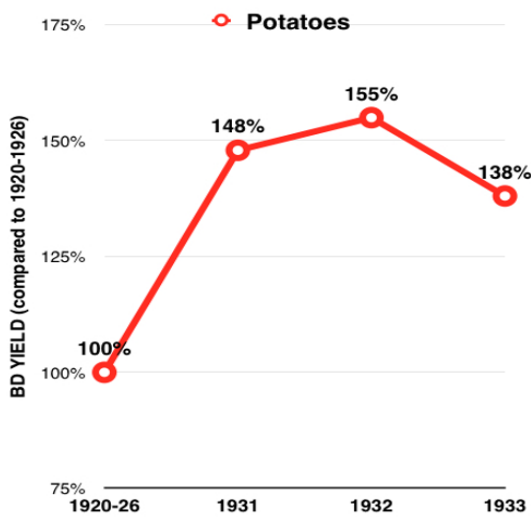


Figure 3. Potatoes: BD yield at Pilgramshain farm (compared to 1920-1926) (Voegelé, 1936)

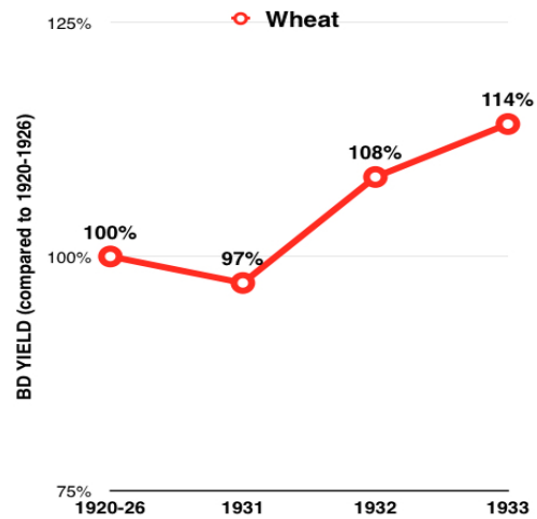


Figure 6. Wheat: BD yield at Pilgramshain farm (compared to 1920-1926) (Voegelé, 1936)

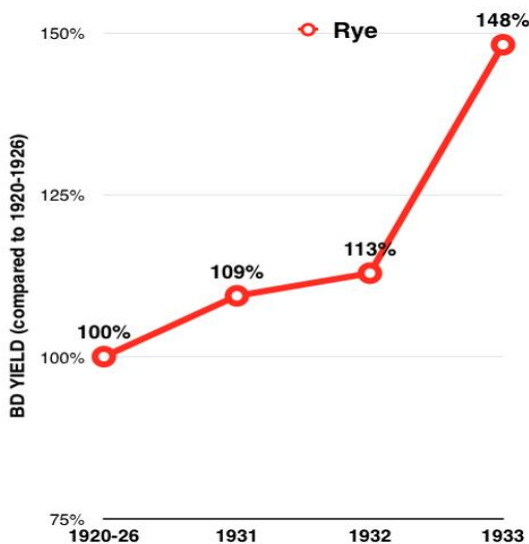


Figure 4. Rye: BD yield at Pilgramshain farm (compared to 1920-1926) (Voegelé, 1936)

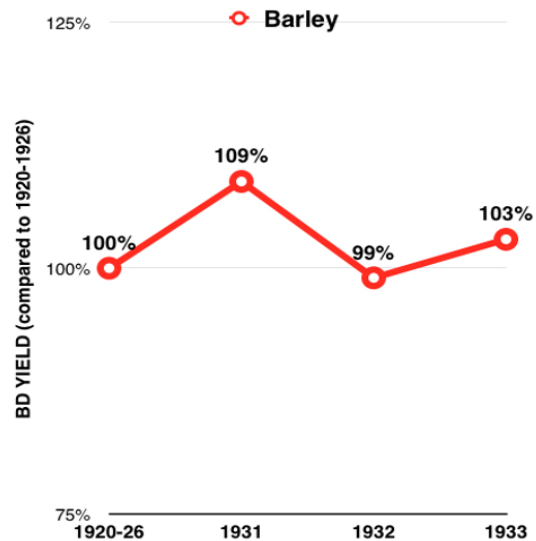


Figure 7. Barley: BD yield at Pilgramshain farm (compared to 1920-1926) (Voegelé, 1936)

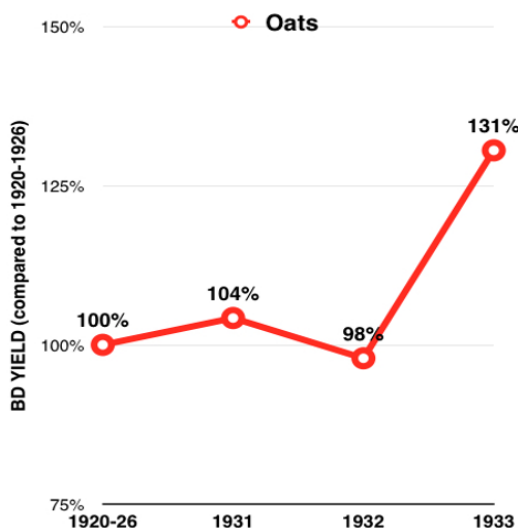


Figure 5. Oats: BD yield at Pilgramshain farm (compared to 1920-1926) (Voegelé, 1936)

Compared to yields pre-BD (1920-1926), Voegelé reported yields post-BD (1931-1933) for five crops, reporting: increases in yield for potatoes up to 55% (Figure 3); for rye to 48% (Figure 4); oats to 31% (Figure 5); wheat to 14% (Figure 6); and barley to 9% (Figure 7). Voegelé reported yields in 'Zentners' and areas in 'Morgens'.

Voegelé commented on the storage qualities of BD produce:

"A special word must be given to the length of time that our potatoes and also our swedes keep in store ... If autumn potatoes like these were produced all over Germany, the growing and importation of new potatoes would, before long, become to a great extent superfluous" (Voegelé, 1936, p. 20).

Farm autarky was a claimed benefit of the transition to BD:

"bio-dynamic methods at Pilgramshain have had the effect of rendering the farm increasingly self-sufficient,

and of giving it more and more the character of a unified, balanced organism” (Voegelé, 1936, p. 20).

While input costs were down, labour costs were up:

“insistent respect for the biological and dynamic points of view has been accompanied by an increase in the amount of human labour pressed into service. The wages bill could be reduced were the whole working of the farm more extensively mechanized ... But ... to give employment to a larger number of one’s fellow-countrymen is sociologically no false step” (Voegelé, 1936, p. 21).

Voegelé regarded employing workers as a social good; this was at a time before a life on social welfare could be a lifestyle choice for some.

Voegelé reported that Biodynamics stimulated:

“a new consciousness of Nature ... the production of healthy foodstuffs for human beings ... strengthened ... determination to take first place among the guarantors of the nation” (Voegelé, 1936, p. 20).

Under the stewardship of Immanuel Voegelé, Pilgramshain became a haven of Anthroposophic enterprise for young Anthropop innovators. Hilde Pfeiffer (1914-2007) managed the garden and preparations for the Curative Education Institute in Pilgramshain, Silesia (Heilpädagogischen Instituts im Schlesischen Pilgramshain). Dr Karl König (1902-1966) established the Pilgramshain Castle Health and Rehabilitation Institute (Heil und Enziehungsinstitut Schloss Pilgramshain) (1929-1936) for disabled children (Inhetveen, Schmitt, & Spieker, 2021).

DISCUSSION

The happy picture shared by Immanuel Voegelé, in the mid 1930s, would soon face serious headwinds. The rise of the Nazis in Germany saw Anthroposophic ventures closed, all books by Rudolf Steiner were banned in 1935, including the ‘Agriculture Course’, and things would ‘get worse before they got worse’.

Germany invaded Poland on September 1939. The brutal extermination of millions of Polish civilians was a previously unimagined horror, as Hitler’s forces pushed eastward for ‘Lebensraum’ (living space) for Germans, unencumbered by Poles (Hargreaves, 2010; Matthäus, Böhler, & Mallmann, 2014). In 1945 Russian troops pushed back, past ‘Fortress Breslau’ (and nearby Koberwitz), past Voegelé’s Pilgramshain estate in Silesia, and onto Berlin (Hargreaves, 2013; Thum, 2011) (Figure 8).

There was a mass exodus of Germans from the territory. When ‘the dust settled’ by way of the Potsdam Conference of 1945, the Polish border was shifted c.180 km to the west. In a post-war Poland, ‘Breslau’ was now ‘Wrocław’ (Figure 9), ‘Pilgramshain’ was now ‘Żółkiewka’.

The abandonment of Voegelé’s BD idyll at Pilgramshain was one of the many personal forfeitures of WWII.

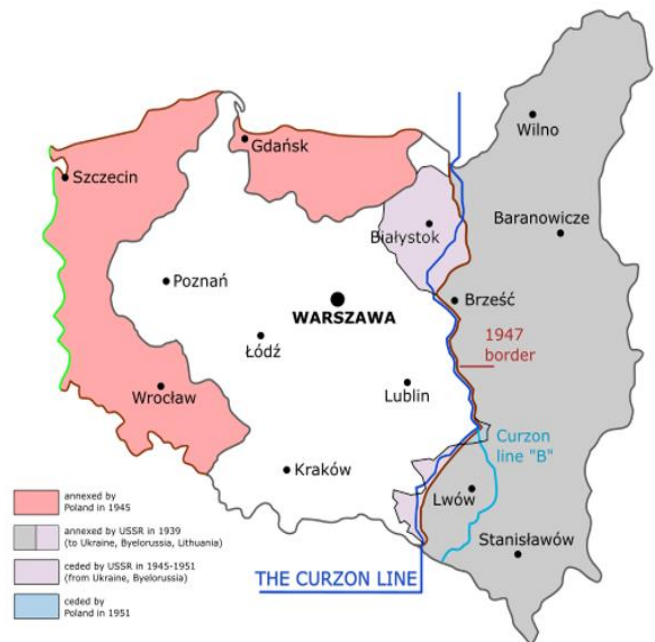


Figure 8. Pilgramshain is 60 km west of Wrocław-Breslau - with territory (in pink) ceded by Germany to Poland in 1945 (Source: S. Radek)

Nevertheless, Immanuel Voegelé had provided, what he described as:

“practical proof of the efficacy of the [BD] method” (Voegelé, 1936, p. 21).

The confidentiality agreement for Experimental Circle members, prevailing at the time of Voegelé’s 1936 report, was arguably extinguished by the publication of Ehrenfried Pfeiffer’s book ‘Bio-Dynamic Farming & Gardening’ (Pfeiffer, 1938a, 1938b). It was a time when the world was on the threshold of the catastrophe of a new world war (Paull, 2011a). Much of the work on Biodynamics slowed or ceased during World War II. Anthroposophy was banned in Nazi Germany, and the war brought pressing issues of austerity, scarcity, hardship, and survival.

Not all of the Biodynamics pioneers survived the war. The Biodynamics pioneer Stanisław Karłowski in Poland was summarily executed in the town square of Gostyń by invading Nazis (Paull & Bietkowski, 2022). Karłowski was a ‘neighbour’ of Voegelé; Karłowski’s Szelejewo farm was about 160 km north east of Voegelé’s Pilgramshain farm.

Not all biodynamic enterprises survived the war. Immanuel Voegelé’s BD farm at Pilgramshain was one such loss; in the wake of Germany’s WWII surrender, the territory was ceded to Poland at the Potsdam Conference of 1945. Owners of estates in the new territory of post-war Poland had the option of taking up Polish citizenship or selling (Paull & Bietkowski, 2022).

CONCLUDING REMARKS

The data reported in the present paper are recovered from behind the cloak of secrecy that prevailed for Biodynamics

from the 1924 Koberwitz course to the 1938 book of Ehrenfried Pfeiffer (and to an extent beyond). Steiner had prescribed that the data of the Experimental Circle was to inform the projected publication of the results. Just how much data was ever generated by the Experimental Circle is unclear. In any event, it seems that very little has survived. So, the results reported in the present paper (from the 1930s) serve to fill a gap in the history of Biodynamics and organic agriculture, and are some of the earliest data reported in the quest for sustainable agriculture.

Rudolf Steiner was mortally ill by the time of his 1924 Agriculture Course. The Course was never repeated. Three months after Koberwitz, Steiner retired from public life entirely and permanently. After a further six months he died (Wachsmuth, 1989). So, if his agriculture ideas were to be progressed, they would be progressed by others. This was the role of the Experimental Circle of Anthroposophical Farmers and Gardeners.

Operating under the terms of an NDA, Voegelé converted the Pilgramshain estate to BD and tested the efficacy of Biodynamics. At the start there was an economic imperative and there was the learning-curve with Biodynamic methods; later these two issues faded in prominence as the Nazi regime made life progressively more and more uncomfortable for Anthroposophists in Germany in the decade 1935 to 1945. This 'Era of Nazi Persecution' for Anthroposophy (1935-1945) was bookended by the 1935 Nazi book bans (including all books by Rudolf Steiner) and the 1945 capitulation of Germany.

After the war, Voegelé made a new life with further BD adventures which are beyond the scope of the present paper. He was born 11 December 1897 at Schorndorf, Württemberg, and died 16 November 1959 at Hamborn near Paderborn, Westphalia.

Germany now leads the world in Biodynamics, accounting for 34% of global BD hectares, 84,426 hectares. Poland rates twelfth place in global BD hectares, with 4,261 hectares (Paull & Hennig, 2020).

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REFERENCES

- Anon. (1937). Editorial. *News Sheet of the Bio-Dynamic Method of Agriculture*, 5(November), 1-2.
- Course Register. (1926+). *Verzeichnis der Besitzer des landwirtschaftlichen Kursus der von Dornach ausgegeben wurde* [List of owners of the agricultural course issued by Dornach]. Archive of the Goetheanum.
- Freemantle, M. (2015). *The chemists' war 1914-1918*. Royal Society of Chemistry. <https://doi.org/10.1039/9781839168284>
- Haber, F. (1920). The synthesis of ammonia from its elements. In Nobel lectures, chemistry 1901-1921 (1966, pp. 326-340). Elsevier Publishing.
- Hargreaves, R. (2010). *Blitzkrieg unleashed: The German invasion of Poland, 1939*. Stackpole Books.
- Hargreaves, R. (2013). *Hitler's final fortress, Breslau 1945*. Pen & Sword Military.
- Inhetteen, H., Schmitt, M., & Spieker, I. (2021). *Passion und profession: Pionierinnen des ökologischen Landbaus* [Pioneers of organic farming]. Oekom Verlag. <https://doi.org/10.14512/9783962388300>
- Koepf, H. H. (2003). Voegelé, Immanuel. In B. v. Plato (Ed.), *Anthroposophie im 20. Jahrhundert. Ein Kulturimpuls in biografischen Porträts* [Anthroposophy in the 20th century. A cultural impulse in biographical portraits]. Biographien Dokumentation der Forschungsstelle Kulturimpuls, Goetheanum [Biographies Documentation from the Cultural Impulse Research Center, Goetheanum].
- Matthäus, J., Böhler, J., & Mallmann, K.-M. (2014). *War, pacification, and mass murder, 1939: The Einsatzgruppen in Poland*. Rowman & Littlefield.
- Northbourne, L. (1940). *Look to the land*. Dent.
- Paull, J. (2010). From France to the world: The International Federation of Organic Agriculture Movements (IFOAM). *Journal of Social Research & Policy*, 1(2), 93-102.
- Paull, J. (2011a). Biodynamic agriculture: The journey from Koberwitz to the world, 1924-1938. *Journal of Organic Systems*, 6(1), 27-41.
- Paull, J. (2011b). The secrets of Koberwitz: The diffusion of Rudolf Steiner's agriculture course and the founding of biodynamic agriculture. *Journal of Social Research & Policy*, 2(1), 19-29.
- Paull, J. (2014). Lord Northbourne, the man who invented organic farming, a biography. *Journal of Organic Systems*, 9(1), 31-53.
- Paull, J. (2020). The Koberwitzers: Those who attended Rudolf Steiner's agriculture course at Koberwitz in 1924, world's foundational organic agriculture course. *International Journal of Environmental Planning and Management*, 6(2), 47-54.
- Paull, J. (2023). Yields of biodynamic agriculture of Ernst Stegemann (1882-1943): Experimental Circle data of the first biodynamic farmer. *European Journal of Agriculture and Food Sciences*, 5(5), 1-4. <https://doi.org/10.24018/ejfood.2023.5.5.699>
- Paull, J., & Bietkowski, P. (2022). Stanisław Karłowski (1879-1939): Pioneer of biodynamic farming and organic agriculture in Poland. *Advances in Social Sciences Research Journal*, 9(7), 358-387. <https://doi.org/10.14738/assrj.97.12692>
- Paull, J., & Harvey, J. (2023). Marna Pease (1866-1947): Founder of biodynamics for the English-speaking world. *Advances in Social Sciences Research Journal*, 10(5), 272-301. <https://doi.org/10.14738/assrj.105.14747>
- Paull, J., & Hennig, B. (2020). A world map of biodynamic agriculture. *Agricultural and Biological Sciences Journal*, 6(2), 114-119.

- Pfeiffer, E. (1938a). *Bio-dynamic farming and gardening: Soil fertility renewal and preservation*. Anthroposophic Press.
- Pfeiffer, E. (1938b). *Die Fruchtbarkeit der Erde Ihre Erhaltung and Erneuerung: Das Biologisch-Dynamische Prinzip in der Natur* [The fertility of the earth, its preservation and renewal: The biodynamic principle in nature]. Verlag Zbinden & Hugin.
- Poppelbaum, H. (1938). The Bio-Dynamic Association (B.D.A.) for crop and soil improvement: A report of the first general meeting. *News Sheet of the Bio-Dynamic Method of Agriculture*, 7(November), 3-5.
- Smil, V. E. (2001). *Enriching the earth: Fritz Haber, Carl Bosch, and the transformation of world food production*. The MIT Press. <https://doi.org/10.7551/mitpress/2767.001.0001>
- Steiner, M. (1944). *Proceedings of the Founding Conference of the General Anthroposophical Society*. Roneoed Publication.
- Steiner, R. (1924a). *Agriculture course*. Goetheanum.
- Steiner, R. (1924b). *Landwirtschaftlicher Kursus gehalten zu Koberwitz 7. bis 16. Juni 1924* [Agricultural course held in Koberwitz June 7th to 16th, 1924]. Naturwissenschaftlichen Sektion am Goetheanum [Natural Science Section at the Goetheanum].
- Steiner, R. (1924c). To all members: The meetings at Koberwitz and Breslau. *Anthroposophical Movement*, 1, 9-11.
- Thum, G. (2011). *Uprooted: How Breslau became Wrocław during the century of expulsions*. Princeton University Press. <https://doi.org/10.1515/9781400839964>
- Voegele, J. (1936). Some expeiences of the bio-dynamic methods in agriculture: A report from Pilgramshain. *News Sheet of the Bio-Dynamic Method of Agriculture*, 3(November), 13-21.
- Wachsmuth, G. (1989). *The life and work of Rudolf Steiner*. Spiritual Science Library.