PENTAHELIX SYNERGY IN AGRICULTURAL-BASED SCHOOL INNOVATION TOWARDS ACHIEVING FOOD SOVEREIGNTY

Kusnul Khotimah[1]
Universitas Negeri Surabaya, Indonesia
kusnulkhotimah@unesa.ac.id

Katon Galih Setyawan[2]
Universitas Negeri Surabaya, Indonesia
katonsetyawan@unesa.ac.id

Abstract

Food sovereignty is one of the main pillars in achieving national resilience, especially amidst various global challenges such as climate change, water crises, and population growth. Therefore, a holistic approach is required, which not only relies on traditional agriculture but also involves the education sector as a key driver in shaping a generation that is conscious of and capable of supporting food sovereignty. This study aims to explore how pentahelix synergy can support the success of agricultural-based school innovation. A qualitative approach was employed, with a case study research design. Data analysis was conducted using the Miles & Huberman technique. The pentahelix synergy established between academia, government, business practitioners, society, and the media has proven to play a key role in driving agricultural-based school innovation at SDN Banyoneng Dajah 2. Each element contributes in a complementary manner, ensuring that the innovations produced are sustainable and capable of achieving the ultimate goal of food sovereignty, both at the family and community levels. Through ongoing collaboration, food sovereignty can be comprehensively achieved, providing a broader positive impact on community welfare and creating a more sustainable future for the next generation.

Keywords: *Pentahelix Synergy, School Innovation, Food Sovereignty.*

Abstrak

Kemandirian pangan merupakan salah satu pilar utama dalam mewujudkan ketahanan nasional, terutama di tengah berbagai tantangan global seperti perubahan iklim, krisis air, dan peningkatan jumlah penduduk. Oleh karena itu, dibutuhkan pendekatan holistik yang tidak hanya mengandalkan sektor pertanian tradisional, tetapi juga melibatkan sektor pendidikan sebagai motor utama dalam membentuk generasi yang sadar dan mampu mendukung kemandirian pangan. penelitian ini bertujuan untuk mengeksplorasi sinergi pentahelix dapat mendukung keberhasilan inovasi sekolah tersebut. Pendekatan yang digunakan adalah kualitatif. Desain penelitian yang digunakan adalah studi kasus. Teknik analisi data menurut Miles & Huberman. Sinergitas pentahelix yang terjalin antara elemen-elemen akademisi, pemerintah, pelaku bisnis, masyarakat, dan media telah terbukti memainkan peran kunci dalam mendorong inovasi sekolah berbasis pertanian di SDN Banyoneng Dajah 2. Setiap elemen memiliki kontribusi yang saling melengkapi, memastikan bahwa inovasi yang dihasilkan dapat berkelanjutan dan mampu mencapai tujuan besar yakni ketahanan pangan yang mandiri, baik di tingkat keluarga maupun masyarakat luas. Melalui kolaborasi yang berkelanjutan, kemandirian pangan dapat tercapai secara menyeluruh,

memberikan dampak positif yang lebih luas bagi kesejahteraan masyarakat, serta menciptakan masa depan yang lebih berkelanjutan bagi generasi mendatang.

Kata Kunci: *Sinergitas Pentahelix, Inovasi Sekolah, Kemandirian Pangan.*

INTRODUCTION

Food sovereignty is one of the key pillars in achieving national resilience, particularly in the face of global challenges such as climate change, water crises, and population growth.[1] According to the FAO report (2020), climate change has led to a 21% decline in global agricultural productivity over the past few decades, while water availability has become a critical issue in various regions, including Indonesia. Therefore, a holistic approach is required, not only relying on the traditional agricultural sector but also involving the education sector as a primary driver in shaping a generation that is aware of and capable of supporting food sovereignty.[2] In this context, the education sector plays a strategic role in fostering awareness and competence among future generations to support food sovereignty.[3] One innovative approach that can be developed is the pentahelix synergy model in agricultural school innovation, as implemented at SDN Banyoneng Dajah 2 in Bangkalan Regency.

SDN Banyoneng Dajah 2 is located in an area that was initially infertile. According to the Bangkalan Regency Statistics Agency (BPS) (2023), this region has low soil fertility and uneven rainfall throughout the year. The challenging geographical conditions, such as limited access to water and low soil fertility, pose significant obstacles for the local community. However, through innovative water-efficient approaches, such as smart pots, tabulapot (potted plant cultivation), hydroponics, and optimized land use, the school has successfully developed a vegetable- and horticulture-based agricultural model. A previous study by Armevia[4] indicated that water-efficient methods like hydroponics can save up to 90% of water compared to conventional farming methods, making them highly suitable for regions with limited water resources.

The types of crops cultivated at SDN Banyoneng Dajah 2 include tomatoes, chili peppers, eggplants, mustard greens, water spinach, cassava, and corn. The selection of these crops is based

[1] Azahari, D. H. (2008). Membangun Kemandirian pangan dalam rangka meningkatkan ketahanan Nasional. *Analisis Kebijakan Pertanian*, *6*(2), 174-195.

[2] Nugraha, R., Varlitya, C. R., Judijanto, L., Adiwijaya, S., Suryahani, I., Murwani, I. A., ... & Basbeth, F. (2024). *Green Economy: Teori, Konsep, Gagasan Penerapan Perekonomian Hijau Berbagai Bidang di Masa Depan*. PT. Sonpedia Publishing Indonesia.

[3] Syaifudin, M., Zuriah, N., & Taufik, M. (2016). Revolusi Mental melalui Model Pendidikan Karakter Bangsa untuk Penguatan Kemandirian Pangan dan Cinta Produk Indonesia. *SOSIOHUMANIKA*, *9*(2), 221-234.

[4] Armevia, N. G. B., Zakkiya, N. H., & Rahman, F. (2025). Socialization of Hydroponic Wick System in Mlorah Village: Exploring the Potential of Pakcoy Cultivation with AB Mix Nutrition. *PROFICIO*, *6*(1), 41-47.

on an analysis of local needs and the plants' adaptability to the area's soil conditions. Nugroho's[5] study revealed that horticultural crops such as tomatoes and chili peppers have significant potential for development in resource-limited areas due to their relatively short growing cycles and high economic value. This model not only enhances student learning through the integration of an environment-based curriculum but also educates both students and the community on adopting sustainable agricultural practices.

In its implementation, the synergy of the pentahelix model plays a crucial role in supporting the success of this innovation. The pentahelix approach involves five key elements: government, academia, business actors, communities, and media.[6] The government plays a role in providing regulations and funding programs, as demonstrated by various agricultural-based school programs in several regions of Indonesia. Academia, as highlighted in Pangestika's[7] study, contributes through research and the development of agricultural technologies suited to local needs. Business actors support innovation by providing essential facilities and infrastructure, such as hydroponic equipment and smart pots. The community, including parents and local residents, actively participates in the program's implementation and sustainability. Meanwhile, the media plays a vital role in publicizing the program's success, facilitating its replication in other schools.

This approach offers several advantages. First, multi-stakeholder involvement ensures the sustainability of innovation through mutually beneficial collaboration. Second, integrating this program into student learning enhances environmental awareness and practical skills from an early age. Third, the economic benefits derived from the harvest of horticultural crops have a direct impact on the well-being of the surrounding community. A study by Triyanti[8] found that a community-based approach to food sovereignty programs can increase household income by up to 15%.

Several previous studies serve as relevant references for this research. Tando[9] examined the impact of hydroponic technology on increasing agricultural yields in limited land areas. The study demonstrated that hydroponics is a water-efficient and environmentally friendly solution for

[5] Nugroho, T. T., Karima, T., & Hidayat, A. P. (2024). Pemodelan Pengaruh Pentahelix Terhadap Peningkatan Nilai pada UPT Pengembangan Agribisnis Tanaman Pangan dan Hortikultura Provinsi Jawa Timur. *Mimbar Agribisnis: Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis*, *10*(1), 148-163.

[6] Nafi'ah, D., Munawwaroh, S., & Pratiwi, R. (2024). Pengembangan Modal Sosial Berbasis Pentahelix untuk Penguatan Pengelolaan Sampah Berbasis Masyarakat. *Aliansi*, *19*(2), 79-86.

[7] Pangestika, M., Hohary, M., Agus, Y. H., Widyawati, N., Herawati, M. M., Sutrisno, A. J., ... & Nuswantara, B. (2020). *Smart Farming: Pertanian di Era Revolusi Industri 4.0*. Penerbit Andi.

[8] Triyanti, R., et.al (2023). Diversifikasi Usaha Mina Padi Mendukung Ketahanan Pangan dan Sumber Pertumbuhan Ekonomi Baru.

[9] Tando, E. (2019). Pemanfaatan teknologi greenhouse dan hidroponik sebagai solusi menghadapi perubahan iklim dalam budidaya tanaman hortikultura. *Buana Sains*, *19*(1), 91-102.

regions with limited water availability. The second study by Fauzi[10] explored the role of schools in environmental education through urban agriculture programs, emphasizing the importance of student involvement in hands-on activities to foster ecological awareness. Additionally, research by Cantya[11] highlighted the significance of collaboration between the government and communities in school-based food sovereignty programs. Purwantini[12] investigated the effectiveness of the tabulapot model in improving plant productivity in urban areas. Lastly, a study by Aprilliyanti[13] analyzed the role of media in promoting modern agricultural innovations in rural communities.

These studies provide a theoretical and empirical basis for the development of innovation at SDN Banyoneng Dajah 2. However, this research offers a more comprehensive approach through the application of pentahelix synergy. This research presents several new things compared to previous research, namely by presenting a holistic approach through pentahelix synergy. Not only focusing on one element, this research explores cross-sector collaboration to support agricultural-based school innovation. Basically, this research aims to explore the pentahelix synergy that can support the success of school innovation.

The pentahelix approach involves five main elements: government, academics, business people, community and media. In the context of agricultural-based school innovation at SDN Banyoneng Dajah 2, this synergy is realized through collaboration between: 1) The government, which provides policy support, funding and program facilitation. 2) Academics, who provide the knowledge and research base to develop agricultural technology that is appropriate to local conditions. 3) Business actors, who support the provision of facilities and infrastructure such as hydroponic equipment and smart pots. 4) The community, including students' parents and the surrounding community, plays an active role in implementing this innovation. 5) Media, which publicizes the success of the program so that it can be replicated by other schools. Synergy between these elements is the key to overcoming existing challenges, as well as accelerating the adoption of sustainable agricultural technology.

[10] Fauzi, A. R., Ichniarsyah, A. N., & Agustin, H. (2016). Pertanian perkotaan: urgensi, peranan, dan praktik terbaik. *Jurnal agroteknologi*, *10*(01), 49-62.

[11] Cantya, N., & Rahmawati, A. (2024). Implementasi Kebijakan dalam Pengelolaan Sampah Melalui Metode Biopori di Kota Yogyakarta. *PAMARENDA: Public Administration and Government Journal*, *4*(2), 383-394.

[12] Purwantini, T. B. (2012). Potensi dan prospek pemanfaatan lahan pekarangan untuk mendukung ketahanan pangan. In *Forum penelitian agro ekonomi* (Vol. 30, No. 1, pp. 13-30).

[13] Aprilliyanti, A., & Riyanto, S. (2020). Analisis Peran Media Sosial Dalam Pemasaran Sayur Di Tingkat Petani Desa Dalisodo Kecamatan Wagir Kabupaten Malang. *Jurnal Indonesia Sosial Sains*, *1*(03), 173-179.

METHOD

The approach used in this research is qualitative. This approach was chosen because this research aims to understand in depth the synergy process between stakeholders (government, academics, business actors, communities and media) in developing agricultural-based school innovations to support food sovereignty. Qualitative research provides flexibility in exploring relationship dynamics, strategies, and obstacles in implementing the pentahelix concept. The research design used is a case study. Case studies allow researchers to explore specific phenomena in one or several agriculture-based schools that have implemented the pentahelix approach. The focus is on the context and interactions between the parties involved. The data collection technique uses in-depth interviews with the five elements involved in this innovation. Data analysis techniques are the process of collecting data systematically to make it easier for researchers to reach conclusions. Qualitative data analysis is inductive, namely analysis based on the data obtained. Data analysis techniques according to Miles & Huberman consist of three streams of activities that occur simultaneously, namely: data reduction, data presentation, drawing conclusions/verification.[14] To validate the data in this research, triangulation of data sources is used, where this triangulation directs the research so that in collecting data, it must use a variety of existing data.

RESULTS AND DISCUSSION

1. Government Element: Bangkalan District Education Office

Government elements have a strategic role in encouraging the success of agricultural-based school innovation at SDN Banyoneng Dajah 2, Geger District, Bangkalan Regency. In this context, the Bangkalan District Education Office, represented by the Geger District Elementary School Supervisor, Moh. Suidi, S.Pd., M.Pd., has shown real support for the program. This support can be seen from the agreement to use Regular BOS and Performance BOS funds to finance various school innovation activities. This step confirms the government's commitment to providing the necessary financial facilities to ensure the smooth implementation of agricultural-based innovation programs at the elementary school level.

One form of significant support is the active presence of Moh. Suidi as school supervisor. He regularly attends SDN Banyoneng Dajah 2 to provide assistance in implementing innovation programs. This assistance includes supervision of the technical implementation of the program, providing strategic input for development, and ensuring the achievement of program objectives in accordance with educational standards. The presence of supervisors in the field reflects a

[14] Miles, M. B. (1994). Qualitative data analysis: An expanded sourcebook. *Thousand Oaks*.

participatory supervision approach, which is not only oriented towards evaluation but also towards empowering the school.

Financial support through Regular BOS and Performance BOS shows the flexibility of government policy in supporting local innovation. According to previous research, as stated by Karno[15], the use of BOS funds directed at innovation programs based on local wisdom can increase community participation and the relevance of education. In this case, the use of BOS funds to support agriculture-based programs at SDN Banyoneng Dajah 2 not only strengthens contextual learning aspects but also strengthens the school's contribution to the local community's food sovereignty.

The mentoring approach taken by Moh. Suidi is also relevant to Rahmah's[16] findings which emphasize the importance of educational supervision in encouraging educational innovation. Rahmah found that supervisors who were actively involved in developing school programs were able to create learning environments that were innovative and adaptive to local needs. In the context of SDN Banyoneng Dajah 2, consistent assistance allows for effective communication between the school and the government, so that the program can run according to plan.

Further analysis shows that supervisor involvement in this program provides additional motivation for teachers and students to actively engage in agriculture-based activities. For example, supervisors often give appreciation to students' work, such as harvests from the school garden, which are then exhibited in school activities. This approach is in line with work motivation theory which states that recognition and appreciation from authorities can improve individual and group performance.

However, support from this government element also faces challenges, such as the supervisor's limited time allocation to reach all schools in his work area. Therefore, it is necessary to strengthen coordination between supervisors, school principals and teachers to ensure program sustainability. According to a study by Prasetyanti[17], good synergy between government, schools and society is very important to maintain the sustainability of locally based innovation.

Overall, these findings show that the role of government elements, especially through school supervisors, is very crucial in supporting agricultural-based school innovation.

[15] Karno, E. (2019). *Mutu Pendidikan dan Inovasi Pembelajaran*. Uho Edupress.
[16] Rahmah, N. A., Antiah, S. L., & Subandi, S. (2024). Peran Supervisi Manajerial dalam Meningkatkan Kualitas Pembelajaran di Sekolah. *Indonesian Journal of Social and Humanities*, *2*(1), 32-40.
[17] Prasetyanti, R., & Kusuma, B. M. A. (2020). Quintuple Helix dan Model Desa Inovatif (Studi Kasus Inovasi Desa di Desa Panggungharjo, Yogyakarta). *Jurnal Borneo Administrator*, *16*(3), 337-360.

A participatory approach, provision of financial facilities, and educational supervision are the keys to the success of this program. These findings emphasize the relevance of the pentahelix synergy concept in supporting contextual and sustainable educational innovation.

2. Academic Element: Faculty of Social and Political Sciences, Surabaya State University

This research shows that pentahelix synergy in agricultural-based school innovation to support food sovereignty is greatly influenced by the role of academics, especially lecturers from the Faculty of Social and Political Sciences, Surabaya State University who act as facilitators. In the context of SDN Banyoneng Dajah 2, this lecturer plays an important role in facilitating the development of school innovation which aims to integrate agricultural principles into learning and school culture. This is in line with the view that developing educational innovation requires cross-sector collaboration, where the role of academics is not only limited to teaching, but also to developing relevant curriculum and educational programs.[18]

At the beginning of the development of this innovation, academics were present at the school to provide direct assistance in designing agricultural-based programs that could be applied in teaching and learning activities. This assistance also includes adjusting the curriculum and preparing material related to agriculture so that students can understand the importance of agriculture in the context of food sovereignty. The existence of academics who direct and accompany this process strengthens the idea that educational innovation based on local wisdom and community needs can create significant changes at the school level.[19]

Furthermore, the innovation implemented at SDN Banyoneng Dajah 2 is expected not only to have a positive impact in the educational context, but also to create a sustainable lifestyle for students. Academics direct that student not only be taught about agriculture theoretically, but also trained to implement these concepts in everyday life, so that they can apply them in their homes and communities. This supports the theory of sustainable education put forward by Nurfatimah[20], which emphasizes the importance of education that not only teaches knowledge, but also skills that can be used to improve the quality of life and environmental sustainability.

In the program development phase, academics are not only present in person, but also provide online assistance. This online assistance enables continuous monitoring and evaluation of the implementation of agricultural-based school innovations. This online assistance also

[18] Yusgiantara, A., Asma'I, G., Basiroh, S., & Khuriyah, K. (2024). Inovasi Pendidikan Karakter Berbasis Kurikulum: Pendekatan Holistik untuk SD, SMP, dan SMA di Era Digital. *Journal of Education Research*, *5*(4), 6023-6030.

[19] Diatmika, I. P. G., & Rahayu, S. (2022). *Model Pemberdayaan Ekonomi Masyarakat Lokal dan Peran Pemerintah*. Ahlimedia Book.

[20] Nurfatimah, S. A., Hasna, S., & Rostika, D. (2022). Membangun kualitas pendidikan di Indonesia dalam mewujudkan program Sustainable Development Goals (SDGs). *Jurnal Basicedu*, *6*(4), 6145-6154.

allows academics to continue to provide direction and solutions to problems that arise during program implementation. This success in using technology to support educational innovation is in line with previous findings by Huda[21], which stated that technology can increase the effectiveness of teaching and learning, as well as strengthen relationships between academics and schools.

In the context of sustainability, the presence of academics as facilitators is not only limited to the initial process, but also ensures that this innovation continues to develop and becomes part of the school culture. It is hoped that this agricultural-focused innovation can become a model for other schools in creating a learning environment that supports food sovereignty. This is in line with the principles of sustainable development promoted by UNESCO (2019), which hopes that education can encourage changes in behavior oriented towards sustainability in various sectors of life.

In further analysis, the success of this pentahelix synergy is also related to the involvement of various parties in supporting innovation. Although in these findings academics play a major role, support from other elements in the pentahelix such as society and the private sector also has a significant contribution in supporting the continuity and expansion of agricultural-based innovation programs in schools. This is consistent with the pentahelix theory explained by Chairuddin[22], which emphasizes the importance of collaboration between various sectors to create sustainable innovation.

3. Elements of Business Actors: Involvement of Entrepreneurs in Buying and Selling Used Goods

This research shows that the role of business actors in the pentahelix synergy to support agricultural-based school innovation at SDN Banyoneng Dajah 2 has a great influence on the success of program implementation. The business person in question is H. Mad Ali, a local resident who has a business buying and selling used goods. As an alumnus of SDN Banyoneng Dajah 2, H. Mad Ali feels he has a responsibility to support the school's innovation program, especially in terms of providing facilities that support agricultural-based learning activities. These findings show that the involvement of business actors can make a major contribution to the development of school innovation programs without having to involve large funds from other sectors.

[21] Huda, I. A. (2020). Perkembangan teknologi informasi dan komunikasi (TIK) terhadap kualitas pembelajaran di sekolah dasar. *Jurnal Pendidikan Dan Konseling (JPDK)*, *2*(1), 121-125.

[22] Chairudin, M., & Widodo, L. (2024). Transformasi Dan Inovasi Perguruan Tinggi Islam Menjadi Universitas Kelas Dunia. *DAARUS TSAQOFAH, Jurnal Pendidikan Pascasarjana Universitas Qomaruddin*, *1*(2), 146-155.

H. Mad Ali provides facilities in the form of used goods needed by the school free of charge. These used items, such as plant pots, simple agricultural tools, and other materials that can be used in school agricultural activities, are provided at no cost. This approach reflects the active involvement of business actors in advancing social and educational programs that have a direct impact on society. This also illustrates how business actors can play a role not only in economic activities, but also in supporting social activities aimed at improving the quality of education and community welfare, as discussed by Mudiarta[23], who emphasizes the importance of business contributions in social development.

H. Mad Ali's involvement in this program also shows the high social value in business development. As a profit-oriented businessman, H. Mad Ali actually chose to give used goods for free to schools. This decision shows a commitment to the welfare of local communities and better education, even without any direct financial reward. This is relevant to the Corporate Social Responsibility (CSR) theory explained by Carroll[24], which states that companies or business people should not only focus on profits, but also make positive contributions to society through social activities that are beneficial to the surrounding environment.

It is hoped that the agricultural-based school innovation developed at SDN Banyoneng Dajah 2 can become a model that can be imitated by the local community. H. Mad Ali, as a business actor who is directly involved, hopes that this program can inspire other residents to support and implement similar activities in their environment. This hope is based on the belief that if this program is successful in schools, then the concepts and values taught, such as the importance of agriculture and sustainability, can be applied in their own homes by local residents. This shows that pentahelix synergy is not only limited to schools and academics, but also involves the wider community in creating greater social change.[25]

In the implementation process, business actors also provide all the requirements needed to support the smooth running of this innovation program. Apart from used goods, H. Mad Ali also provides guidance regarding the use of used goods in agricultural activities, so that students can learn creative and sustainable ways to use the resources around them. The use of used goods in agricultural education is very relevant to the theory of sustainable education which

[23] Mudiarta, K. G. (2011). Perspektif dan peran sosiologi ekonomi dalam pembangunan ekonomi masyarakat. In *Forum Penelitian Agro Ekonomi* (Vol. 29, No. 1, pp. 55-66).

[24] Carroll, A. B., & Shabana, K. M. (2010). The business case for corporate social responsibility: A review of concepts, research and practice. *International journal of management reviews*, *12*(1), 85-105.

[25] Yunas, N. S. (2019). Implementasi konsep penta helix dalam pengembangan potensi desa melalui model lumbung ekonomi desa di Provinsi Jawa Timur. *Matra Pembaruan: Jurnal Inovasi Kebijakan*, *3*(1), 37-46.

emphasizes the efficient and creative use of resources.[26] The involvement of business people provides direct learning to students about the importance of sustainability and resource management.

The presence of H. Mad Ali in this innovation also reminds us of the concept of social entrepreneurship, where business people not only focus on achieving profits, but also have a positive impact on the community and environment. As a school alumnus, H. Mad Ali feels connected to the development of education at the school which has given him many benefits in the past. The contribution is not only in the form of goods, but also in the form of moral support and motivation for students to understand the importance of agriculture in everyday life. This reflects the importance of direct involvement of individuals in the community in supporting sustainable and applicable education programs.[27]

In further analysis, the success of this innovation program also illustrates the importance of business involvement in pentahelix. Although business actors' contributions often focus on funding or material donations, these findings show that their involvement in the form of providing facilities, used goods, and direct guidance can have a very significant impact on the success of the program. This is consistent with previous findings by Ixtiarto[28] which showed that active participation from business actors in the education sector can create mutually beneficial relationships between schools, society and business.

4. Community Element: Parents

This research reveals the important role of the surrounding community in supporting agricultural-based school innovation at SDN Banyoneng Dajah 2. Elements of the surrounding community involved in this innovation are represented by parents/guardians of students who are active as class community administrators. One example of a significant contribution is Mrs. Sumiati, a student parent who gave a positive response to this school innovation. According to him, innovations involving agriculture in schools have succeeded in changing children's eating behavior, especially in consuming vegetables. Before farming activities were introduced at school, many students did not like eating vegetables. However, after participating in the harvest program, the children started to like eating vegetables because they were directly involved in the process of planting and harvesting these plants. This is in accordance with previous findings

[26] Setyawan, A. (2024). *Berkebun Kreatif: Wirausaha Hijau di Sekolah*. CV. Mitra Edukasi Negeri.
[27] Setyawan, A. (2024). *Berkebun Kreatif: Wirausaha Hijau di Sekolah*. CV. Mitra Edukasi Negeri.
[28] Ixtiarto, B. (2016). Kemitraan sekolah menengah kejuruan dengan dunia usaha dan dunia industri (Kajian aspek penhgelolaan pada SMK Muhammadiyah 2 Wuryantoro Kabupaten Wonogiri). *Jurnal Pendidikan Ilmu Sosial*, *26*(1), 57-69.

which state that children's direct involvement in the agricultural process can increase their awareness of the importance of vegetable consumption and health.[29]

Apart from that, Mrs. Sumiati also explained that on Saturdays, after harvest, teachers process the harvested vegetables for consumption together at school. In this activity, students are only asked to bring white rice and a food container. This concept not only supports the success of agricultural programs in schools, but also creates an atmosphere of togetherness between students and teachers. This is in line with research by Waluya[30], which states that the integration of agricultural activities in schools can create stronger ties between students and their environment, as well as increase family involvement in their children's education.

The active participation of the local community can also be seen from the involvement of other parents in caring for the garden planted by the students. Mrs. Lia Munati, one of the student parents, explained that she and the other student parents had bought barriers to prevent the local chickens from destroying the plants the students had planted. Parents' participation in caring for these plants shows that there is close collaboration between the school and the community in supporting the success of this program. Community involvement in maintaining school agricultural gardens also reflects the strengthening of the values of mutual cooperation and togetherness which are important aspects of social development.[31]

The existence of this barrier, which was purchased by the student's parents, also indicates great attention to the sustainability of the plants in the school. This shows that the local community not only supports the program passively, but also actively involves itself to ensure the successful implementation of the program. This community contribution is very important, considering that the success of agricultural-based educational innovation does not only depend on the school, but also on support from the surrounding environment.[32] Therefore, synergy between schools and society is the main key in creating sustainable innovation.

Parents also hope that this innovation can change their children's mindset regarding farming. They hope that their children will not be embarrassed to farm at home, especially by utilizing the land around their house. By learning about farming at school, it is hoped that children will see farming not as a lowly job, but as a profession that is important and relevant to their lives. This hope shows a change in mindset in society regarding the importance of

[29] Harumawati, D. M., Subrata, H., & Puspita, A. M. I. (2024). Edukasi Pengenalan Budidaya Sayuran kepada Siswa Sebagai Inovasi Muatan Lokal di Sekolah Dasar. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *9*(2), 233-242.
[30] Waluya, B. (2007). *Sosiologi: Menyelami fenomena sosial di masyarakat*. PT Grafindo Media Pratama.
[31] Hidayat, U. S. (2021). *Urgensi Penguatan Pendidikan Karakter Dalam Menyiapkan Generasi Emas 2045: Strategi Membangun Generasi Cerdas, Berkarakter dan Berdaya Saing di Abad 21*. Nusa Putra Press.
[32] Sutrisno, H. E. (2019). *Budaya organisasi*. Prenada Media.

agriculture for food sovereignty. These findings support the results of research by Ansya[33], which shows that agriculture-based education can increase students' understanding and appreciation of the importance of agriculture in everyday life, as well as encourage them to apply the knowledge gained at home.

Furthermore, the use of smart pots proposed by the parents is also part of the innovation that is expected to be implemented at home. Smart pots are a planting medium that allows people, especially those with limited land, to farm in an efficient and effective way. The hope that children will not be embarrassed to farm using smart pots reflects the drive to create a more sustainable lifestyle in society. This concept is in line with the urban farming approach which prioritizes the use of technology in farming, even in limited spaces.[34] This shows that the community is not only involved in programs at school, but also applies the values taught to increase food sovereignty in their homes.

Furthermore, these findings also reveal the importance of social change that can be achieved through agricultural-based education. When the community, especially parents, are directly involved in supporting agricultural programs in schools, they not only provide material support, but also contribute to profound changes in attitudes and mindsets towards agriculture. This finding is relevant to the theory of social change put forward by Rogers (2014), which states that changes in society often start with individuals involved in certain social programs, and then expand into broader cultural or social changes.

5. Media: YouTube and Instagram

This research reveals that social media plays an important role in supporting agricultural-based school innovation at SDN Banyoneng Dajah 2. In this context, the media used are YouTube and Instagram channels, which were chosen because they are cheap and easily accessible platforms for conveying information to the public. The principal of SDN Banyoneng Dajah 2, Agung Cahyoutomo, S.Pd., explained that by utilizing these two social media, schools can disseminate agricultural innovation activities and results carried out by students and teachers to the general public. This shows that social media has become an effective tool for introducing school programs and inviting wider public attention.

The choice of YouTube and Instagram as social media platforms was based on their popularity and accessibility, which allows schools to reach a larger audience. YouTube as a video

[33] Ansya, Y. A. U., Salsabilla, T., & Rozi, F. (2024). *Etnosains dan Lingkungan Strategi Pembelajaran IPA di SD*. Cahya Ghani Recovery.
[34] Soedarto, T., & Ainiyah, R. K. (2022). *Teknologi Pertanian Menjadi Petani Inovatif 5.0: Transisi Menuju Pertanian Modern*. Uwais Inspirasi Indonesia.

platform allows schools to share content in the form of documentation of farming activities carried out by students, from the planting process to harvest. Meanwhile, Instagram, which is more visual, allows schools to show interesting images of agricultural products and related activities. This is in accordance with the findings presented by Wicaksono[35], who stated that social media, especially visual-based platforms, can increase the effectiveness of conveying information and attract the attention of a larger audience, including parents and the public.

In the context of disseminating information, the school principal also emphasized his hope that by utilizing social media, the school can obtain constructive input from netizens, namely social media users who provide responses or comments. This hope is very relevant to the idea that social media not only functions as a one-way communication tool, but also as a platform that allows two-way interaction between schools and society. This is in accordance with the view that social media can strengthen relations between educational institutions and society and provide space for the public to engage in discussions and provide constructive feedback.[36]

Apart from that, the use of social media also allows schools to obtain support from other parties who are interested in collaborating or providing suggestions for the development of this innovation program. Comments and input from netizens who are competent in the fields of agriculture or education can help improve the quality and impact of the program. This approach reminds us of the concept of crowdsourcing, where ideas or solutions come from a large group of people, and are expected to contribute to the improvement and development of innovation.[37] By utilizing social media as a tool for crowdsourcing, schools can open up opportunities for broader and deeper collaboration.

The use of social media in agricultural-based educational innovation at SDN Banyoneng Dajah 2 also plays a role in building public awareness about the importance of agricultural education to support food sovereignty. Through content shared on YouTube and Instagram, information about the benefits of farming, food sustainability, and the importance of agriculture-based education can be disseminated to the wider community. This is in line with

[35] Wicaksono, P. N., Kusuma, I. J., Festiawan, R., Widanita, N., & Anggraeni, D. (2020). Evaluasi penerapan pendekatan saintifik pada pembelajaran pendidikan jasmani materi teknik dasar passing sepak bola. *Jurnal pendidikan jasmani Indonesia*, *16*(1), 41-54.

[36] Rivaldy, N., Ma'mur, I., & Firdaos, R. (2023). Membangun Reputasi Pendidikan Dasar Islam Melalui Public Relation di Era Revolusi Industri 4.0 (Studi pada Sekolah Dasar Islam Terpadu di Kabupaten Bekasi). *Al-fahim: Jurnal Manajemen Pendidikan Islam*, *5*(2), 16-34.

[37] Brabham, D. C. (2013). *Using crowdsourcing in government* (pp. 1-42). Washington, DC: IBM Center for the Business of Government.

the results of research by Prasadi[38], who found that social media can be used as a tool to spread educational and social campaigns aimed at changing people's behavior in maintaining environmental and food sustainability.

Apart from that, the use of social media also allows schools to continuously monitor and evaluate the impact of this innovation. With the interactions that occur on social media platforms, schools can obtain data regarding the level of community involvement and response to the activities carried out, both in the form of likes, comments and content sharing. Analysis of this data can help schools evaluate the effectiveness of communication and delivery of messages about the agricultural innovations being implemented. This is in line with findings by Fitriani (2021), who emphasizes the importance of using social media in evaluating and analyzing the results of educational programs, so that more targeted improvements can be made.

Overall, these findings show that social media, especially YouTube and Instagram, have great potential to support the dissemination of information and interaction in agricultural-based school innovation. The success of this program is not only determined by the innovations carried out in schools, but also by the school's ability to utilize digital technology to expand reach and increase community participation. By utilizing social media, SDN Banyoneng Dajah 2 can optimize communication with the public, obtain valuable input, and increase community involvement in the agricultural programs carried out.

6. Pentahelix Synergy and Food Sovereignty

Pentahelix synergy, which involves elements of academia, government, business people, society and the media, has an important role in developing agricultural-based school innovations that support food sovereignty. Based on the findings at SDN Banyoneng Dajah 2, collaboration between these elements shows that efforts to achieve food sovereignty do not only require an approach from one sector, but must also involve contributions from various parties. This pentahelix synergy leads to strengthening agricultural-based education which can increase community awareness and skills in managing natural resources, while encouraging sustainability in food production.

The role of academics in this synergy is very important because they act as facilitators who guide and direct innovation in schools. Lecturers from the Faculty of Social and Political Sciences, Surabaya State University, for example, facilitate the development of relevant

[38] Prasadi, A. H., Wiyanto, W., & Suharini, E. (2020). The implementation of student worksheet based on STEM (science, technology, engineering, mathematics) and local wisdom to improve of critical thinking ability of fourth grade students. *Journal of Primary Education*, *9*(3), 227-237.

agricultural curricula, as well as providing assistance to schools directly and online. Sustainability-based education requires the involvement of academics to design curricula that encourage behavioral changes and applicable skills. With academic guidance, students can understand the importance of agriculture for food sovereignty, and these values can be applied in everyday life.

Meanwhile, the government, in this case the role of lecturers who act as facilitators of innovation development, helps connect schools with broader education and agricultural development policies. Government involvement at the academic level also shows how education and agricultural policies can work together to support national goals, namely achieving food sovereignty. Synergy between academics and government in developing agricultural-based educational innovations can have a positive impact in creating long-term solutions to the problem of food dependency, especially at the community level. This collaboration is not only limited to creating a curriculum, but also increasing the capacity of teachers in teaching agricultural skills to students.

Business people also play a significant role in this pentahelix synergy. Through their contributions, such as those made by H. Mad Ali, the owner of a used goods business who supports the school by providing the materials it needs, they show that the business sector is not only focused on profits, but also on community empowerment. The contribution of business actors in the form of used goods and the facilitation of school-based agricultural activities is in accordance with the concept of Corporate Social Responsibility (CSR), which not only benefits the company, but also brings benefits to the wider community. In this context, business actors play a role in ensuring sustainability and food sovereignty by providing easier access to resources that can be used by schools and communities to strengthen agricultural activities in schools.

From the community side, the involvement of parents in supporting agricultural activities at school shows the important role of the community in creating social change. Parents, as stated by Mrs. Sumiati and Mrs. Lia Munati, not only help maintain the school garden but also direct their children to apply farming knowledge at home. Their hope that children will not be embarrassed about farming at home reflects a change in mindset about the importance of farming in order to achieve food sovereignty. Parental involvement in agricultural-based education programs can increase their understanding and awareness of the importance of agriculture as a sustainable food source, as well as encourage behavioral changes that support a healthy and independent lifestyle.

Apart from that, the role of social media, which is part of the media elements in pentahelix, functions as a tool to disseminate information about agricultural innovation in schools to the wider community. By utilizing platforms such as YouTube and Instagram, SDN Banyoneng Dajah 2 can attract public attention and build awareness about the importance of agricultural education. Social media also provides space for netizens to provide input that can improve program quality. Social media plays a role in accelerating the information process and collaboration between various parties, as well as encouraging constructive interactions between educational institutions and the community. In this context, social media functions as a bridge that connects schools with the community, as well as providing space for continuous improvement and development of these innovation programs.

This pentahelix synergy also contributes to achieving food sovereignty through a sustainable education model based on local expertise. By integrating agriculture into school curricula and facilitating community and business involvement, this innovation not only has a positive impact on students, but also on families and society as a whole. Pentahelix in the context of agriculture-based education and development can accelerate the achievement of food sovereignty at the local level, because it involves all levels of society in creating changes that have a broad impact.

CONCLUSION

In closing, the pentahelix synergy that exists between elements of academia, government, business people, society and the media has been proven to play a key role in encouraging agricultural-based school innovation at SDN Banyoneng Dajah 2. Through close collaboration between various parties, this program not only has a positive impact on education, but also creates greater awareness about the importance of agriculture in supporting food sovereignty. Each element has a complementary contribution, ensuring that the innovation produced is sustainable and able to achieve the big goal of independent food sovereignty, both at the family and wider community level.

In the future, this kind of synergy needs to continue to be strengthened and expanded, considering the increasingly complex challenges of food sovereignty. By optimizing the role of all parties in the pentahelix, it is hoped that agricultural-based education will not only become learning at school, but also become a lifestyle implemented by society in everyday life. Through sustainable collaboration, food sovereignty can be achieved as a whole, providing a broader positive impact on the welfare of society, as well as creating a more sustainable future for future generations.

ACKNOWLEDGMENT

Research is supported by funding from the Institute for Research and Community Service (LPPM), Universitas Negeri Surabaya. Therefore, we would like to thank the Director of LPPM Unesa and the Rector's of Unesa for their support.

REFERENCE

Ansya, Y. A. U., Salsabilla, T., & Rozi, F. (2024). Etnosains dan Lingkungan Strategi Pembelajaran IPA di SD. Cahya Ghani Recovery.

Aprilliyanti, A., & Riyanto, S. (2020). Analisis Peran Media Sosial Dalam Pemasaran Sayur Di Tingkat Petani Desa Dalisodo Kecamatan Wagir Kabupaten Malang. Jurnal Indonesia Sosial Sains, 1(03), 173-179.

Armevia, N. G. B., Zakkiya, N. H., & Rahman, F. (2025). Socialization of Hydroponic Wick System in Mlorah Village: Exploring the Potential of Pakcoy Cultivation with AB Mix Nutrition. PROFICIO, 6(1), 41-47.

Azahari, D. H. (2008). Membangun Kemandirian pangan dalam rangka meningkatkan ketahanan Nasional. Analisis Kebijakan Pertanian, 6(2), 174-195.

Brabham, D. C. (2013). Using crowdsourcing in government (pp. 1-42). Washington, DC: IBM Center for the Business of Government.

Cantya, N., & Rahmawati, A. (2024). Implementasi Kebijakan dalam Pengelolaan Sampah Melalui Metode Biopori di Kota Yogyakarta. PAMARENDA: Public Administration and Government Journal, 4(2), 383-394.

Carroll, A. B., & Shabana, K. M. (2010). The business case for corporate social responsibility: A review of concepts, research and practice. International journal of management reviews, 12(1), 85-105.

Chairudin, M., & Widodo, L. (2024). Transformasi Dan Inovasi Perguruan Tinggi Islam Menjadi Universitas Kelas Dunia. DAARUS TSAQOFAH, Jurnal Pendidikan Pascasarjana Universitas Qomaruddin, 1(2), 146-155.

Diatmika, I. P. G., & Rahayu, S. (2022). Model Pemberdayaan Ekonomi Masyarakat Lokal dan Peran Pemerintah. Ahlimedia Book.

Fauzi, A. R., Ichniarsyah, A. N., & Agustin, H. (2016). Pertanian perkotaan: urgensi, peranan, dan praktik terbaik. Jurnal agroteknologi, 10(01), 49-62.

Fitriani, Y. (2021). Pemanfaatan media sosial sebagai media penyajian konten edukasi atau pembelajaran digital. JISAMAR (Journal of Information System, Applied, Management, Accounting and Research), 5(4), 1006-1013.

Harumawati, D. M., Subrata, H., & Puspita, A. M. I. (2024). Edukasi Pengenalan Budidaya Sayuran kepada Siswa Sebagai Inovasi Muatan Lokal di Sekolah Dasar. Pendas: Jurnal Ilmiah Pendidikan Dasar, 9(2), 233-242.

Hidayat, U. S. (2021). Urgensi Penguatan Pendidikan Karakter Dalam Menyiapkan Generasi Emas 2045: Strategi Membangun Generasi Cerdas, Berkarakter dan Berdaya Saing di Abad 21. Nusa Putra Press.

Huda, I. A. (2020). Perkembangan teknologi informasi dan komunikasi (TIK) terhadap kualitas pembelajaran di sekolah dasar. Jurnal Pendidikan Dan Konseling (JPDK), 2(1), 121-125.

Ixtiarto, B. (2016). Kemitraan sekolah menengah kejuruan dengan dunia usaha dan dunia industri (Kajian aspek penhgelolaan pada SMK Muhammadiyah 2 Wuryantoro Kabupaten Wonogiri). Jurnal Pendidikan Ilmu Sosial, 26(1), 57-69.

Karno, E. (2019). Mutu Pendidikan dan Inovasi Pembelajaran. Uho Edupress.

Miles, M. B. (1994). Qualitative data analysis: An expanded sourcebook. Thousand Oaks.

Mudiarta, K. G. (2011). Perspektif dan peran sosiologi ekonomi dalam pembangunan ekonomi masyarakat. In Forum Penelitian Agro Ekonomi (Vol. 29, No. 1, pp. 55-66).

Nafi'ah, D., Munawwaroh, S., & Pratiwi, R. (2024). Pengembangan Modal Sosial Berbasis Pentahelix untuk Penguatan Pengelolaan Sampah Berbasis Masyarakat. Aliansi, 19(2), 79-86.

Nugraha, R., Varlitya, C. R., Judijanto, L., Adiwijaya, S., Suryahani, I., Murwani, I. A., ... & Basbeth, F. (2024). Green Economy: Teori, Konsep, Gagasan Penerapan Perekonomian Hijau Berbagai Bidang di Masa Depan. PT. Sonpedia Publishing Indonesia.

Nugroho, T. T., Karima, T., & Hidayat, A. P. (2024). Pemodelan Pengaruh Pentahelix Terhadap Peningkatan Nilai pada UPT Pengembangan Agribisnis Tanaman Pangan dan Hortikultura Provinsi Jawa Timur. Mimbar Agribisnis: Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis, 10(1), 148-163.

Nurfatimah, S. A., Hasna, S., & Rostika, D. (2022). Membangun kualitas pendidikan di Indonesia dalam mewujudkan program Sustainable Development Goals (SDGs). Jurnal Basicedu, 6(4), 6145-6154.

Pangestika, M., Hohary, M., Agus, Y. H., Widyawati, N., Herawati, M. M., Sutrisno, A. J., ... & Nuswantara, B. (2020). Smart Farming: Pertanian di Era Revolusi Industri 4.0. Penerbit Andi.

Prasadi, A. H., Wiyanto, W., & Suharini, E. (2020). The implementation of student worksheet based on STEM (science, technology, engineering, mathematics) and local wisdom to improve of critical thinking ability of fourth grade students. Journal of Primary Education, 9(3), 227-237.

Prasetyanti, R., & Kusuma, B. M. A. (2020). Quintuple Helix dan Model Desa Inovatif (Studi Kasus Inovasi Desa di Desa Panggungharjo, Yogyakarta). Jurnal Borneo Administrator, 16(3), 337-360.

Purwantini, T. B. (2012). Potensi dan prospek pemanfaatan lahan pekarangan untuk mendukung ketahanan pangan. In Forum penelitian agro ekonomi (Vol. 30, No. 1, pp. 13-30).

Rahmah, N. A., Antiah, S. L., & Subandi, S. (2024). Peran Supervisi Manajerial dalam Meningkatkan Kualitas Pembelajaran di Sekolah. Indonesian Journal of Social and Humanities, 2(1), 32-40.

Rivaldy, N., Ma'mur, I., & Firdaos, R. (2023). Membangun Reputasi Pendidikan Dasar Islam Melalui Public Relation di Era Revolusi Industri 4.0 (Studi pada Sekolah Dasar Islam Terpadu di Kabupaten Bekasi). Al-fahim: Jurnal Manajemen Pendidikan Islam, 5(2), 16-34.

Setyawan, A. (2024). Berkebun Kreatif: Wirausaha Hijau di Sekolah. CV. Mitra Edukasi Negeri.

Soedarto, T., & Ainiyah, R. K. (2022). Teknologi Pertanian Menjadi Petani Inovatif 5.0: Transisi Menuju Pertanian Modern. Uwais Inspirasi Indonesia.

Sutrisno, H. E. (2019). Budaya organisasi. Prenada Media.

Syaifudin, M., Zuriah, N., & Taufik, M. (2016). Revolusi Mental melalui Model Pendidikan Karakter Bangsa untuk Penguatan Kemandirian Pangan dan Cinta Produk Indonesia. SOSIOHUMANIKA, 9(2), 221-234.

Tando, E. (2019). Pemanfaatan teknologi greenhouse dan hidroponik sebagai solusi menghadapi perubahan iklim dalam budidaya tanaman hortikultura. Buana Sains, 19(1), 91-102.

Triyanti, R., et.al (2023). Diversifikasi Usaha Mina Padi Mendukung Ketahanan Pangan dan Sumber Pertumbuhan Ekonomi Baru.

Waluya, B. (2007). Sosiologi: Menyelami fenomena sosial di masyarakat. PT Grafindo Media Pratama.

Wicaksono, P. N., Kusuma, I. J., Festiawan, R., Widanita, N., & Anggraeni, D. (2020). Evaluasi penerapan pendekatan saintifik pada pembelajaran pendidikan jasmani materi teknik dasar passing sepak bola. Jurnal pendidikan jasmani Indonesia, 16(1), 41-54.

Yunas, N. S. (2019). Implementasi konsep penta helix dalam pengembangan potensi desa melalui model lumbung ekonomi desa di Provinsi Jawa Timur. Matra Pembaruan: Jurnal Inovasi Kebijakan, 3(1), 37-46.

Yusgiantara, A., Asma'I, G., Basiroh, S., & Khuriyah, K. (2024). Inovasi Pendidikan Karakter Berbasis Kurikulum: Pendekatan Holistik untuk SD, SMP, dan SMA di Era Digital. Journal of Education Research, 5(4), 6023-6030.