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Improving the Effectiveness of Agricultural Vocational Training for Rural Workers in the Context of Digital Transformation and Sustainable Agricultural Development in Vietnam

Author Details:

Tuan Anh Luong

National Economics University

Abstract:

This study focuses on evaluating the effectiveness of agricultural vocational training for rural workers in Bac Ninh province in the context of digital transformation and sustainable agricultural development. On the basis of synthesizing secondary data in the period 2010–2024 and in-depth interviews with 86 state managers and representatives of vocational training institutions, research was conducted to clarify the achievements, limitations and factors affecting training effectiveness. The results show that Bac Ninh has made significant progress, with more than 60,000 rural workers supported for training in the period 2021–2024, the employment rate after training reached 81%, contributing to raising the rate of trained workers in the province to 62% in 2023 and reducing the rate of poor households. However, the training effect is still unsustainable due to many seasonal jobs, the training content is still heavy on theory, lack of digital skills and business linkage, and there is no set of standard criteria for comprehensive evaluation. Research and propose the development of a multi-dimensional set of criteria, innovating training content and methods, strengthening the link of the "four houses" and promoting the application of modern training technology.

Keywords: *Effectiveness of agricultural vocational training, rural labor, digital transformation, sustainable agriculture, Vietnam*

1. Introduction

In the context of international economic integration and digital transformation taking place strongly, the development of high-quality agricultural human resources is a prerequisite to improve productivity, product quality and competitiveness of Vietnam's agricultural industry. According to a report by the International Labour Organization (ILO, 2020), about 65% of Viet Nam's rural workforce does not have formal vocational training, which limits access to new technologies, reduces sustainable employment opportunities, and increases the risk of poverty.

Agricultural vocational training for rural workers has been considered by the Party and the State as one of the key solutions in the strategy for the development of agriculture, farmers and rural areas (Resolution 26-NQ/TW). However, many studies have shown that the effectiveness of vocational training is still limited: the percentage of post-training workers with stable jobs is not high, the training content is not associated with market demand and digital transformation, and the teaching methods are still heavy on theory (Nguyen & Pham, 2021).

Meanwhile, modern agricultural trends such as smart agriculture, precision agriculture, and circular agriculture require rural workers not only to have traditional production skills but also to be knowledgeable about technology, data, and value chain management (Food and Agriculture Organization (FAO), 2018). Improving

the efficiency of agricultural vocational training associated with this context is of urgent significance to meet the requirements of sustainable development and labor restructuring in rural areas.

Although there are many studies on vocational training in Vietnam, most of them only focus on assessing the scale, number of trainees, and the rate of employment after training. There is little in-depth research to develop a set of criteria for evaluating the effectiveness of multi-dimensional agricultural vocational training, associated with income, innovation capacity, ability to apply digital technology and community impact. This gap shows the need for a study to provide scientific evidence and recommend policies to improve the effectiveness of agricultural vocational training for rural workers in Viet Nam.

The structure of the article outside the introduction includes: Literature review, research method, results and conclusion.

2. Literature review

2.1. Concept of rural labor

Rural workers are understood as a part of the working-age population living in rural areas, mainly involved in agricultural production, forestry, and fishery activities, as well as some local non-agricultural activities (World Bank, 2020). In Vietnam, rural areas account for more than 60% of the population and contribute significantly to the country's labor force (General Statistics Office, 2022). However, rural workers are often characterized by limited education and skills, few opportunities to access science and technology, lack of soft skills and modern production management skills (Nguyen & Do, 2019).

According to the definition of the International Labour Organization (ILO, 2019), rural workers are vulnerable in the labor market due to unstable working conditions, low incomes, and heavy dependence on seasonal factors. Therefore, improving vocational skills for rural workers through vocational training is considered a strategic solution to promote sustainable livelihoods, poverty reduction and rural development.

2.2. Concept of agricultural vocational training effectiveness

The effectiveness of agricultural vocational training can be understood as the degree of achievement of vocational training objectives in improving the knowledge, skills and attitudes of rural workers, and at the same time improving the ability to create jobs, increase incomes and adapt to changes in the modern agricultural production environment (Truong, 2021).

According to Kirkpatrick & Kirkpatrick (2006), training effectiveness can be measured at many levels: reaction (learner satisfaction), learning (acquisition of knowledge/skills), behavior (changes in practical work), and end result (impact on productivity, income and organization). Applied to the field of agriculture, the effectiveness of vocational training is not only measured by the number of workers participating and the rate of employment after training, but also evaluated on the basis of the ability to apply new farming techniques, the capacity to innovate in production, etc the level of participation in the agricultural product value chain, and the spillover impact in rural communities (FAO, 2018).

Some recent studies have also emphasized that the effectiveness of agricultural vocational training must be associated with sustainability, including all three aspects: economic (increasing productivity and income), social (reducing poverty, improving community capacity), and environment (rational use of resources, reducing emissions, protecting ecosystems) (Le, 2020; FAO, 2018).

3. Research method

The study was conducted in a qualitative approach to explore and deeply analyze the perspectives, experiences, as well as evaluations of stakeholders on the effectiveness of agricultural vocational training for rural workers in Bac Ninh province. The qualitative method is particularly relevant in this research context because it allows the researcher to delve into the social, policy and practice of vocational training implementation, thereby identifying the influencing factors and gaps that exist (Creswell & Poth, 2018).

The subjects of the study are state managers and leaders of agricultural vocational training institutions in BAC Ninh province. These are people who have a direct role in policymaking, organizing the implementation and

monitoring of the vocational training process, and are knowledgeable in practice and able to accurately reflect the effectiveness of training programs.

The study sample consisted of 86 in-depth interviewees, of which:

- 42 state management officials at the provincial, district and commune levels (under the Department of Labor, War Invalids and Social Affairs, the Department of Agriculture and Rural Development, the People's Committees of districts, the Employment Service Center, the New Rural Program Management Board).
- 44 managers and lecturers at agricultural vocational training institutions (vocational schools, vocational training centers, agricultural extension centers, cooperatives participating in training).

The sample selection was conducted according to the purposive sampling method to ensure the diversity of management levels, types of training institutions, as well as the work experience of the interviewees (Patton, 2015).

Data were collected through semi-structured in-depth interviews. The interview questionnaire is designed based on the framework for analyzing the effectiveness of vocational training (Kirkpatrick & Kirkpatrick, 2006) and refers to previous studies on agricultural vocational training in the context of digital transformation (FAO, 2018). The interview content focuses on topic groups:

1. Objectives and orientations of agricultural vocational training for rural workers.
2. Evaluation of the practical effectiveness of training programs (knowledge, skills, employment, income, community impact).
3. Factors affecting training effectiveness (policies, program content, teaching methods, facilities, business-cooperative linkage, market demand).
4. Orientations and solutions to improve training efficiency in the coming time, especially in the context of digital transformation and sustainable agricultural development.

Each interview lasts an average of 60–90 minutes, is recorded (with the consent of the participants) and carefully recorded to ensure accuracy and completeness.

After collection, the interview data is converted into a transcription and analyzed using content analysis combined with thematic coding (Braun & Clarke, 2006). The analysis process includes:

1. Read the interview transcript carefully to capture the overall picture.
2. Encrypting data according to key topics (e.g., policies, training content, job performance, digital technology factors, and difficulties – challenges).
3. Develop subtopics and concepts from practical data.
4. Synthesize and interpret and compare with the theoretical basis and previous studies.

In order to increase reliability and validity, the study applies the triangulation method between multiple data sources (state management, training institutions), multiple management levels (provinces, districts, grassroots), and refers to secondary documents (reports, statistics, policy documents).

The research adheres to the principles of scientific ethics: ensuring the anonymity and confidentiality of the participants; all interviews are conducted on a voluntary basis and with prior consent; the research results only serve academic and policy development purposes.

4. Results

According to the report, Bac Ninh province aims to train over 15,000 rural workers in the period 2021–2025, in order to contribute to creating jobs and improving sustainable income for people in rural areas. By 2024, the whole province has supported vocational training for more than 60,000 workers, achieving significant effectiveness with a post-training employment rate of up to 81%, showing the great efforts of the locality in implementing vocational training programs. Districts such as Cao Loc recorded a rate of trained workers reaching 65.1% (up 1.4 percentage points compared to 2022) and a job rate of over 90%, thereby helping to reduce the rate of poor households from 8.29% in 2022 to 5.27% in 2023. Nationwide, from 2022 to now, 12,419 employees have been organized in 354 vocational training classes, contributing to raising the rate of

trained workers in the province to 62% in 2023 (an increase of 2 percentage points compared to 2022) and reducing the rate of poor households from 8.92% to 6.02%.

As of 2024, Bac Ninh province has 53 vocational education institutions in operation, including colleges, intermediate schools, vocational education centers and other institutions with training functions. This shows that the local vocational training infrastructure is relatively dense and can create good conditions for the implementation of vocational training programs for rural workers with an increasingly improved scale and quality.

Based on the results of interviews with 86 people, including: 42 state managers at the provincial, district and commune levels (under the Department of Labor, War Invalids and Social Affairs, the Department of Agriculture and Rural Development, District People's Committees, Employment Service Centers, New Rural Program Management Boards) and 44 managers and lecturers at agricultural vocational training institutions (vocational schools, vocational training centers, agricultural extension centers, cooperatives participating in training), the results are encoded and analyzed according to the following content groups:

The effectiveness of vocational training is still limited in terms of sustainable employment

The interview results show that although the percentage of rural workers who are employed after participating in vocational training courses in Bac Ninh is quite high, most of them are seasonal or low-income jobs. This shows that vocational training only stops at the level of providing basic skills but is not really associated with the needs of the local labor market and the requirements of businesses. According to the ILO (2020), the sustainability of post-training employment depends heavily on the degree of linkage between training institutions and businesses, as well as on the ability of workers to adapt to technological and market changes. Therefore, the effectiveness of vocational training today still needs to be considered from the perspective of job quality instead of merely the employment rate.

The training content is not closely associated with digital transformation

An important result noted is that most of the current agricultural vocational training programs are heavy on traditional production theory, lacking knowledge and skills related to digital technology, mechanization, and smart agriculture. Many officials believe that this slow innovation makes it difficult for rural workers to apply modern production models. This statement is in line with the view of FAO (2018) that agricultural vocational training needs to integrate digital skills to help farmers effectively participate in global value chains and improve competitiveness. This indicates that updating training content in the direction of applying new technology is an urgent requirement.

Limited lecturers and facilities

Vocational training institutions in Bac Ninh admit that the quality of lecturers and facilities for teaching has not met the requirements of high-tech agricultural production. Many lecturers lack practical experience, and teaching equipment and tools are outdated. This makes teaching not create a solid practical capacity for learners. According to Nguyen & Pham (2021), one of the core factors determining the effectiveness of vocational training is the professional capacity and ability to update technology of lecturers. Therefore, investing in improving the capacity of lecturers and modernizing training institutions is a prerequisite for improving efficiency.

The link of the "four houses" is still loose

A striking finding is that the link between the State – Scientists – Enterprises – Farmers in agricultural vocational training activities in BAC Ninh is still loose. Enterprises and cooperatives are less involved in the development of training programs, nor do they play an active role in the reception of post-training workers. This leads to a gap between labor supply and demand in the market. Le's research (2020) also emphasizes that in order for agricultural vocational training to be effective, it is necessary to have the active participation of businesses to ensure practicality, market orientation and sustainable job creation. Therefore, strengthening the four-house link is an important solution to improve efficiency.

Learner characteristics affect training effectiveness

Another important result from the study shows that the level of education and awareness of rural workers strongly affects the efficiency of knowledge acquisition during training. The majority of learners have a low

general education background, leading to difficulties in accessing content related to new technologies or complex production techniques. In addition, many people have to balance their study time with household work and production, making training participation often interrupted. According to a study by the World Bank (2020), limitations in education and basic skills are one of the biggest barriers to improving the capacity of rural workers in the context of digital integration and transformation. This shows that it is necessary to customize the content and training methods in accordance with the characteristics of rural learners to improve efficiency.

Lack of a set of standard evaluation criteria for training effectiveness

Through the analysis of interview data, most managers and training institutions believe that there is currently no set of standard criteria to comprehensively measure the effectiveness of agricultural vocational training. Assessments are mainly based on the number of participants, graduation rates, and employment rates immediately after training, while important aspects such as income enhancement, innovation potential, community impact, and environmental sustainability have not been adequately considered. This leads to a biased assessment and does not reflect the actual effect. According to Kirkpatrick & Kirkpatrick (2006), the evaluation of training effectiveness should be carried out at multiple levels to ensure comprehensiveness, from learner responses, learning outcomes, behavior changes to the final impact on the organization and society.

Limitations in the application of modern training technology

Another finding is that the application of modern training technology (such as e-learning, online training, virtual reality simulation) in agricultural vocational training programs in Bac Ninh is still very limited. The main reason comes from the limitations of information technology infrastructure at some training institutions, lack of investment funds, as well as the weak capacity to use technology of both lecturers and trainees. This makes courses still highly dependent on traditional teaching methods, making it difficult to meet flexible learning requirements in the context of digital transformation. The research by Zhao et al. (2021) also emphasizes that the integration of digital training technology not only helps increase the accessibility of rural learners but also improves the practicality and effectiveness of the learning process. Therefore, promoting the application of modern training technology is an inevitable requirement to improve the quality and efficiency of agricultural vocational training in the new period.

5. Conclusion

Research on the effectiveness of agricultural vocational training for rural workers in Bac Ninh province has affirmed the strategic importance of developing agricultural human resources in the context of digital transformation and international integration. The results of secondary data analysis and qualitative data from in-depth interviews with 86 managers and training institutions show that Bac Ninh has achieved many remarkable achievements. In the period of 2021–2024, the province has organized vocational training for more than 60,000 rural workers, with a post-training employment rate of up to 81%, contributing to raising the rate of trained workers in the province to 62% in 2023, and at the same time reducing the rate of poor households from 8.92% to 6.02% (Bac Ninh People's Committee, 2024). These figures reflect the positive impact of vocational training programs on raising incomes, improving the quality of human resources, and promoting local socio-economic development.

However, the study also pointed out some limitations in the effectiveness of vocational training. Firstly, post-training jobs are still mainly seasonal, income is not stable, and there is little connection with businesses and agricultural value chains (ILO, 2020). Secondly, the training content and methods are still heavy on traditional techniques, not integrating much knowledge about digital technology, production management and entrepreneurship (FAO, 2018). Third, the lecturers and facilities at some training institutions have not kept up with the requirements of high-tech agriculture (Nguyen & Pham, 2021). In addition, learners' characteristics – such as low education level, limited time conditions – also significantly affect the ability to absorb and apply knowledge after training (World Bank, 2020).

An important finding is that there is still a lack of a set of criteria for comprehensively evaluating the effectiveness of agricultural vocational training. Assessment indicators often focus on the number of learners and employment rates, while other important aspects such as long-term income improvement, innovation

capacity, community impact and the environment have not been adequately measured (Kirkpatrick & Kirkpatrick, 2006). This leads to gaps in the accurate assessment of the impact of vocational training and the design of appropriate policies.

Limitations of the study

Although the study provides a lot of valuable evidence, there are still some limitations. Firstly, the scope of the study is only focused on Bac Ninh province, so the generalization of results for other localities is limited. Secondly, the qualitative method with in-depth interviews has advantages in exploring the context, but it is difficult to quantify the impact of each factor on training effectiveness. Thirdly, the research is mainly based on the opinions of managers and training institutions, not fully exploiting the views of students – the direct beneficiaries of the program.

Further research orientation

From the above limitations, some future research orientations are proposed. First of all, it is necessary to expand the study to many other provinces and cities to have inter-regional comparisons, thereby increasing the generality and reliability of the results. Secondly, quantitative methods should be combined with large-scale surveys of rural labor, in order to build and test models of factors affecting vocational training effectiveness. Third, it is necessary to focus on developing and testing a set of criteria for evaluating the effectiveness of agricultural vocational training in many dimensions (economic, social, environmental), which can be based on the multi-level evaluation theoretical framework of Kirkpatrick (2006) and the criteria for sustainable development of FAO (2018). Finally, future research should deeply analyze the impact of digital transformation and modern training technologies (e-learning, virtual reality) on training effectiveness, in order to make practical recommendations in line with the context of the Industrial Revolution 4.0.

This study not only contributes to providing a comprehensive view of the current situation and effectiveness of agricultural vocational training in Bac Ninh, but also contributes theoretically when pointing out the core influencing factors, gaps in effectiveness evaluation and proposing new approaches. In practice, the study makes specific recommendations to improve the quality of vocational training, promote sustainable employment and develop modern agriculture. This is of great significance to Bac Ninh in particular and other localities in Vietnam in general in the process of industrialization and modernization of agriculture and rural areas.

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