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Analysis of Labor-Intensive Microenterprises Using the Cobb-Douglas Production Function: Insights from Microenterprises in West Nusa Tenggara

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ABSTRAK

Microenterprises in Indonesia play a significant role in regional employment creation and economic development, especially in rural and semi-urban areas. West Nusa Tenggara is one of the provinces in Indonesia that faces a classical challenge in terms of improving such productive microenterprises to meet their potential. Many microenterprises run under their productive potential due to constraints in technology provision, labor management, and business scaling strategies. This study assesses four labor-intensive microenterprises in West Nusa Tenggara (NTB) using a qualitative case study approach, supported by Cobb-Douglas production function modelling. Through in-depth field analysis and interviews of owners of UD Batako Sejahtera, UD Muslim Kerupuk Kulit, UD Berkah Beton, and Artshop Kodong Sasak, we examine the relationship between labor, capital, and output, recognize forms of return to scale in each enterprise, and propose tailored strategies to enhance productivity. Findings revealed that most enterprises initially experience increasing returns to scale, yet they encounter diminishing productivity due to inefficiencies of input allocation and lack of strategic planning. Thus, these findings suggest that modest investments in relevant technology, structured work systems, and incentive programs can significantly increase output and sustainability.

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Microenterprises in Indonesia play a significant role in regional employment creation and economic development, especially in rural and semi-urban areas. West Nusa Tenggara is one of the provinces in Indonesia that faces a classical challenge in terms of improving such productive microenterprises to meet their potential. Many microenterprises run under their productive potential due to constraints in technology provision, labor management, and business scaling strategies. This study assesses four labor-intensive microenterprises in West Nusa Tenggara (NTB) using a qualitative case study approach, supported by Cobb-Douglas production function modelling. Through in-depth field analysis and interviews of owners of UD Batako Sejahtera, UD Muslim Kerupuk Kulit, UD Berkah Beton, and Artshop Kodong Sasak, we examine the relationship between labor, capital, and output, recognize forms of return to scale in each enterprise, and propose tailored strategies to enhance productivity. Findings revealed that most enterprises initially experience increasing returns to scale, yet they encounter diminishing productivity due to inefficiencies of input allocation and lack of strategic planning. Thus, these findings suggest that modest investments in relevant technology, structured work systems, and incentive programs can significantly increase output and sustainability.

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1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) have a pivotal role in the economy of Indonesia. It is proven that MSMEs contribute not only to economic activities but also play a significant role in creating job opportunities. According to the report from Ministry of Cooperatives and Small and Medium Enterprises, there are over 90% of Indonesian business units that employ more than 97% of the national workforce (Yanuarta et al., 2023). There is an increasing trend of the number of MSMEs based on provincial regions across Indonesia, including the province of West Nusa Tenggara (Ditya et al, 2023). MSEs not only act as economic drivers but also act as custodians of local skills, cultural products, and informal social protection.

Despite the significance of MSMEs, these enterprises often lack access to capital, managerial skills, and productivity-enhancing technologies (Fridayani et al., 2024). Furthermore, some studies established reasons of micro and small businesses failure, particularly microenterprises that are considered as labour-intensive among which are ranging from constraints in production structure and scalability limitations (Lukitaningrum et al., 2017). This leads to the low productivity of microenterprises. The challenges could be associated with informality. The World Bank (2019) estimates that in emerging nations, informal MSMEs make up over 80% of all microenterprises.

Maintaining continuity of production is one of the necessities of guaranteeing the sustainability in MSMES and making long-term business profits for MSMEs' survival (Lukitaningrum et al., 2017). MSMEs frequently find it difficult to make the shift from subsistence-level operations to more robust and competitive businesses in the absence of reliable and scalable manufacturing procedures. According to recent studies, a better comprehension of the constraints and production structure to microenterprises in resource-constrained environments is required (Kamutando et al., 2024; Biswas et al, 2025). Because of MSMEs' limited access to financial support, skilled labour, and technology, numerous microenterprises work in conventional spheres, which results in low productivity and inefficient use of resources.

Low productivity hindering the sustainability of Micro, Small, and Medium Enterprises (MSMEs), particularly those operating in labour-intensive is often rooted in a combination of limited access to modern technologies, inadequate workforce skills, ineffective use of inputs, and weak managerial capacity (OECD, 2018; ILO, 2021). In the cases of West Nusa Tenggara (NTB) Province nowadays, microenterprises in NTB seem to heavily rely on manual labour and traditional production techniques, which can hinder their ability to scale operations or even meet the market demand consistently.

Addressing these issues needs more than capacity-building interventions. This should be grounded in analytical frameworks that identify the specific restrains in production systems. Using several samples of various microenterprises in NTB Province, the analyses focus on MSMEs' production structure and identification of scalability constraints, which are elaborated using the Cobb-Douglas production function within the case study approach. This study will propose feasible productivity strategies to focus on factor substitution and returns to scale at the end.

The theory of production

A key idea in microeconomics is the theory of production, which examines how businesses use a specific technological process to convert inputs like labor, capital, and raw materials into outputs (Metcalfe et al., 2024). To achieve the maximum amount of output is generated by a combination of a particular set of inputs and technology. The Cobb-Douglas production function was proposed by the Swedish economist Knut Wicksell, who lived from 1851–1926, and was tested by Charles Cobb and Paul Douglas in 1928, is still one of the most popular types of production functions in empirical economics.

Douglas estimated the expansion of the American economy between 1899 and 1922 in a study considering a simplified economic theory in which production output is determined by the amount of capital and labor invested. His model has shown remarkable accuracy, even though economic success is influenced by numerous factors. According to Cobb and Douglas (1928) and Hušek (2007).

Productivity of MSMEs

Productivity is one of the main indicators of enterprise performance, which reflects how efficiently inputs such as labor, capital, and materials are transformed into outputs. In the context of Micro, Small, and Medium Enterprises (MSMEs), productivity improvements are narrowly associated with firm subsistence, profitability, and the ability to scale (OECD, 2017). However, MSMEs in developing nations, including Indonesia, frequently experience consistently poor productivity levels in comparison to larger companies and global standards, despite their crucial role in reducing poverty and creating jobs (Tambunan, 2019).

Several empirical studies on MSEs in Indonesia unveil that while many microenterprises operate under increasing returns to scale, their growth is often deterred by low access to technology and capital misallocation (Andriyansah et al., 2024; Hartono, 2024). Meanwhile, studies by Marampa & Tangkeallo (2024) emphasize the role of human capital interventions in boosting productivity, particularly through training, incentives, and ergonomic adjustments.

However, a lack of studies shows the combination of economic modelling with grounded case studies. This research addresses that gap by presenting a multi-case qualitative analysis enriched with production function modelling on several selected MSMEs in Lombok Island.

Small-Scale Labor-Intensive Enterprises

Small-scale labour-intensive enterprises are essential to job creation and poverty alleviation (Quataert, 1988). In particular developing countries, these typical enterprises are predominantly contributing to the job creation in informal ways such as food processing, garment production, handicrafts, and informal services, and rely heavily on manual labor rather than advanced technology (Fridayani et al, 2024). However, small-scale labor-intensive enterprises often face difficulties such as productivity constraints due to limited access to financing, outdated technology, informal management structures, and weak linkages to formal value chains (Lukitaningrum et al., 2017). Furthermore, the concentration of low-skilled labor within these enterprises exacerbates the challenge of enhancing overall productivity.

Several studies suggest that holistic interventions such as vocational training, microcredit access, and integration into supply chains can increase productivity and operational resilience of such small-scale labour-intensive enterprises (Berner et al., 2012). The advancement in technological use, operational management, and capacity building have also proven effective in developing output without reducing employment (Gindling & Newhouse, 2014). Moreover, the use of Cobb-Douglas production function (1928) enables researchers to to quantify input-output relationships and measure returns to scale within these enterprises. Such models provide a foundation for scheming evidence-based interventions tailored to the specific production structures and limitations challenged by Small-scale labor-intensive enterprises.

2. METHODOLOGY

Research Design and Data Collection

Given the complexity of current production practices and understanding the context in small-scale labor-intensive enterprises (i.e. how could enterprises boost their productivity), the authors adopted an exploratory research approach (Lee et al., 1999). The authors employed a qualitative case study design (Yin, 2018), integrating field observation, interviews, and cost and production records for data collection, to examine each enterprise holistically.

Case Study Selection

Four labor-intensive microenterprises were selected purposively from different sectors within NTB (Table 1). These enterprises were chosen for study according to their small workforce size, which is typically fewer than 15 workers (Mead & Liedholm, 1998). Moreover, the selection of these typical SMEs based on their primary manual or semi-mechanical production methods represents typical microenterprise constraints in NTB. From the perspective of the production lens, these enterprises run their businesses with restricted capital and workforce, which makes them fit for productivity

and returns to scale analyses using the Cobb-Douglas production function (Cobb & Douglas, 1928).

Table 1. Selected Microenterprises

Enterprises	Description	Location	Entrepreneurial opportunities (in terms of products)
UD Batako Sejahtera	This business relies primarily on human labor for mixing, molding, and drying processes, making it typical of microenterprises in the informal construction supply chain.	**East Lombok Regency**	Construction materials (manual brick production)
UD Muslim (Kerupuk Kulit)	The business relies on manual techniques to produce leather crackers, ranging the production from cleaning, seasoning, sun-drying, and frying. This characteristic of labor-intensive food processing enterprises established in local culinary traditions.	Seganteng, Mataram City	Cow and buffalo leather crackers
Berkah Beton	The business runs with simple machinery and relies heavily on manual labor for molding, finishing, and curing processes, indicating typical characteristics of microenterprises in the construction and decoration materials sector.	Pagesangan, Mataram City	Construction and decoration products
Artshop Kodong Sasak	Artshop Kodong Sasak is a traditional craft business unit that focuses on the production and marketing of Lombok pottery, which has become an important part of the local cultural identity of the Sasak people.	Banyumulek, West Lombok	Handcrafted pottery and earthenware Artshop, *Sasak* craft products

Source(s): Table created by authors

Analytical Framework

Production behavior was analyzed using the Cobb-Douglas model. Its functional form is commonly stated as:

$$\mathbf{Q=AL^{\alpha}\ K^{\beta}}$$

Where:
Q is the total output,
A is the technology level,
L is the labor input,
K is the capital input,
α is the elasticity of production relative to labor input,
β is the elasticity of production with respect to capital input.

The sum of $\alpha+\beta$ was used to infer returns to scale. Non-numeric data was subjected to thematic analysis to pinpoint productivity tactics and bottlenecks.

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3. RESULT AND DISCUSSION

Production Characteristics

Each enterprise shows clear input structures where Batako Sejahtera operates with 2 workers producing 2,400 bricks/cycle manually. Muslim Crackers employs 9 workers producing 100 kg/day without mechanization. Berkah Beton blends manual and press tools to yield 400–550 units/day, absorbing 8 workers. Lastly, Kodong Sasak hires 5 permanent and 10 freelance artisans for 1,500 units/month.

The firm reliance on labor showcased by these enterprises indicates how vulnerable they are, which lead to productivity stagnation in the absence of the right tools, process innovation, or workflow optimization. These businesses are potentially having inefficiencies in terms of both time and productivity if the automation or organized task divisions are introduced, particularly when demand is high or labor fluctuates.

Production Function Estimates

The production function estimations for each enterprise were derived using the Cobb-Douglas functional form, enabling the analysis of input-output relationships and the calculation of **returns to scale** (RTS) through the sum of the output elasticities of labor (α) and capital (β). These estimates provide insight on the variations of input quantities distressoutput levels, as well as the potential scalability of each enterprise.

Table 2: Summary of Production Function Estimates for Selected Enterprises

Enterprise	Production Function	Labor Elasticity (α)	Capital Elasticity (β)	α + β	Returns to Scale (RTS)	Interpretation
UD Batako Sejahtera	$Q=1.0335 \cdot L^{0.65} \cdot K^{0.50}$	0.65	0.50	1.15	Increasing Returns to Scale	Production of bricks manually can scale effectively; as inputs are increased, output rises more than proportionately.
UD Muslim (Kerupuk Kulit)	$Q=0.00417 \cdot L^{0.60} \cdot K^{0.60}$	0.60	0.60	1.20	Increasing Returns to Scale	Despite lacking mechanization, traditional cracker manufacturing has significant scaling potential; a small investment can result in significant output increases.
UD Berkah Beton	$Q=75.82 \cdot L^{0.70} \cdot K^{0.30}$	0.70	0.30	1.00	Constant Returns to Scale	Labor is more effective than capital in semi-mechanized manufacturing, which can increase output in proportion to inputs.
Artshop Kodong Sasak	$Q=0.398 \cdot L^{0.40} \cdot K^{0.60}$	0.40	0.60	1.00	Constant Returns to Scale	The growth of handicraft manufacturing is more dependent on capital (materials, tools) than labor; scaling is feasible but linear.

Data processed by the authors

From the table above, it can be concluded that the production function estimates display varying levels of scalability and factor forces across enterprises. The two enterprises revealing increasing returns to scale (Batako Sejahtera and Muslim Crackers) have the most prospective for output expansion through improved resource allocation. This can be explained that proportionate increases in both labor and capital would generate more than proportional growth in output, as suggested by Mankiw (2021) and Varian (2014) that businesses operating under increasing return to scale (IRS) can benefit significantly from scaling operations.

In contrast, UD Berkah Beton and Kodong Sasak Pottery indicate constant returns to scale (CRS), which means having a linear relationship between input and output. It is suggested that these kinds of enterprises require further productivity improvements to arise solely from scaling up inputs. Instead, process innovation, technological upgrading, or work systems may be necessary to exceed the current productivity level (Kotulič & Pavelková, 2014). These findings underpin the significance of productivity strategies contextually, where scaling may benefit some enterprises while others require qualitative improvements in their production methods.

4. CONLUSION

This study confirms that typical labor-intensive microenterprises in NTB demonstrate changing degrees of scale efficiency which can be adjusted according to production structure, workforce organisation, and the effective use of capital. While the Cobb-Douglas model efficiently captures these patterns, qualitative field insights provide insights to the non-technical factors such as motivation, workflow design, and space optimization which can contribute equally in productivity outcomes. Targeted interventions may beneficial to improve the substantial performance of MSMEs particularly in the effective use of simple technologies, organized labor management, and incentive alignment. Therefore, it is essential for future MSMEs improvement with the specific productivity enhancement to shift from capital-heavy support to the provision of skilled labor by providing relevant training, the introduction of tool-smart equipment**,** and human-centered strategies for MSE development in rural Indonesia.

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