ISSN 2579-7298

Traditional Fishermen's Productivity Amid Fluctuations in the Increase in Subsidized Fuel Oil

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ARTICLE INFO

Article history
Received
Revised
Accepted

Keywords
Traditional Fishermen's Productivity,
Fluctuations in Fuel Oil Increases,
Subsidies

ABSTRACT

The purpose of this research is to determine the Productivity of Traditional Fishermen in the Midst of Fluctuations in the Increase in Subsidized Fuel Oil. In this study, the author optimally uses two data sources related to this study, namely. Primary data sources and secondary data sources. The main sources of this research are books and scientific journals on Traditional Fishermen Productivity. At the same time, this research is supported (secondary) by other works of thought related to the results of research related to the Fluctuation of Subsidized Fuel Oil Increases. The results of this research are that the fuel subsidy policy has a very important role in supporting the continuity of traditional fishermen's businesses, especially in the face of frequent fluctuations in fuel prices. By reducing operational costs, fuel subsidies help fishermen maintain productivity, improve social welfare, and support the sustainability of the fisheries sector. However, to achieve maximum benefits, it is important for the government to manage subsidies in a targeted, efficient, and supportive manner of using environmentally friendly technologies that reduce dependence on fossil fuels Dependence on fuel oil (BBM) has a major impact on the resilience of the traditional fisheries sector, both in terms of economy and environment. This dependence not only creates dependence on limited natural resources but also increases environmental damage, pollutes waters, and contributes to global warming. Therefore, it is important for fishermen and governments to develop more efficient and environmentally friendly energy alternatives to reduce dependence on fuel and support the sustainability of natural resources and marine ecosystems that depend on environmental balance.

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1. Introduction

The increase in fuel prices has a significant impact on fishermen, especially traditional fishermen who depend on fuel to carry out their fishery operations. (Syarif et al., 2017) The background of this impact can be explained in several aspects, namely: Dependence on Fuel for Operations, Fishermen, especially fishermen who use boats or motorboats to catch fish, are highly dependent on fuel oil (BBM) to run their boats. Every time fuel prices rise, fishermen's operational costs will increase directly, as they need to buy more fuel for each fishing trip.(Lasut et al., 2019) (Veronica & Usman, 2023)

Increase in Production Costs, Increase in fuel prices leads to an increase in production costs in the fishery business. Fishermen who usually spend most of their income on fuel will face economic difficulties. This price increase not only affects fuel costs, but can also affect other operational costs, such as ship maintenance, fishing gear, and other needs. Declining Income, Due to increased operational costs, fishermen are forced to reduce the frequency of fishing or reduce the reach of their

fishing areas to reduce costs. This leads to a decrease in catches and ultimately decreases their income. In many cases, fishermen's income becomes insufficient to meet their living needs.(Sininiri et al., 2024)

Impact on Fish Prices, The increase in fishermen's operational costs will affect the selling price of fish. To cover the increased costs, fishermen will tend to increase the price of the fish they sell. This can lead to the price of fish in the market becoming more expensive, which in turn reduces consumer purchasing power. When people's purchasing power decreases, the fish market can also experience a decrease in demand.(Waroy et al., n.d.)

Economic Inequality in the Fisheries Sector, The increase in fuel prices also causes inequality between large fishermen and small or traditional fishermen. Large fishermen who have more efficient and larger boats, and can buy larger quantities of fuel at lower prices, may not be too affected. In contrast, small or traditional fishermen who use small boats are more vulnerable to the impact of rising fuel prices, because they do not have enough financial capacity to bear the higher costs.(Latif, 2015)

Worker Migration and Social Influence, The impact of rising fuel prices can also cause fishermen to choose to find alternative jobs that are more profitable, both in other sectors and by migrating to better economic areas. This can reduce the number of workers in the fisheries sector and have an impact on the overall decline in fish production, as well as affect the welfare of coastal communities.(Tawari et al., n.d.)(Kartia et al., 2023)

Environmental and Natural Resources Impacts, Rising fuel prices can also encourage fishermen to operate in areas farther or deeper in the ocean to fish, which can have an impact on overfishing or overfishing. In the long run, this can damage marine ecosystems and reduce sustainable catches. Overall, the impact of the increase in fuel oil prices on fishermen is significant, including increased operational costs, decreased income, and inequality in the fisheries sector. Therefore, government policies that can mitigate these negative impacts, such as fuel subsidies for fishermen or improved fuel efficiency, are important to support the sustainability of fishermen's livelihoods and the fisheries sector as a whole.(Tadete et al., 2023).

2. Method

This research is a type of literature research; This means that the information materials used come from library sources in the form of books, encyclopedias, magazines, journals, newspapers, journals, journals, and others (Sutrisno Hadi, 1987) The form of this research is descriptive, analytical, and critical. Therefore, the author can comprehensively describe how the Productivity of Traditional Fishermen in the Midst of Fluctuations in the Increase in Subsidized Fuel Oil. In this study, the authors optimally use two data sources related to this study, namely. Primary data sources and secondary data sources. The main sources of this research are books and scientific journals on Traditional Fishermen Productivity. At the same time, this research is supported (secondary) by other works of thought related to research results related to the Fluctuation of Subsidized Fuel Oil Increase.

3. Results and Discussion

Traditional Fishermen's Productivity Amid Fluctuations in the Increase in Subsidized Fuel Oil

The productivity of traditional fishermen in Indonesia is highly dependent on various external factors, one of which is the price of fuel oil (BBM), especially those subsidized by the government. The increase in subsidized fuel prices can have a direct impact on the operational costs of traditional fishermen who usually use fuel to run their boats and fishing gear. Here are some aspects that need to be considered regarding the influence of fuel price fluctuations on the productivity of traditional fishermen (MUSDALIPA, 2021):

Increased Operating Costs

The increase in fuel prices can lead to increased operational costs for traditional fishermen. Most fishermen use motorboats to forage for fish, and fuel is a major component in their operational costs.

If fuel prices rise, fuel costs will increase, potentially reducing the number of trips or the duration of time fishermen can go to sea. This results in a reduction in catches and ultimately reduces fishermen's income.(Titin, 2016)

Increased Operational Costs Due to Rising Fuel Prices

The increase in fuel oil (BBM) prices affects almost every sector of the economy, including the fisheries sector, especially for traditional fishermen who rely on fuel for the operation of their boats and boats. Here are details on how the increase in fuel prices affects the operational costs of traditional fishermen:

Fuel as a Main Cost Component

Traditional fishermen, especially those who use motorboats, rely heavily on fuel to go to sea. This fuel cost is often one of the largest components of their operating budget. The increase in fuel prices immediately increases their expenses every time they go to sea. If the price of fuel rises, then the cost of buying fuel for the boat increases, although the catch is not always proportional to the cost incurred.(Febryanti & Nurcholisah, 2021)

Frequency and Duration of Going to Sea

The increase in fuel prices affects the number of days fishermen can go to sea. The more expensive the price of fuel, the less time can be spent looking for fish, as high fuel costs reduce fishermen's ability to go to sea every day. This causes fishermen to reduce the frequency of trips, or even look for closer fishing locations even though the catch is less.

Decreased Profit Margin

In the fisheries sector, traditional fishers' profit margins are highly dependent on the ratio between operational costs and income from fish catches. The increase in fuel prices has led to higher operating costs, but fish sales have not necessarily experienced a comparable increase. If the price of fish in the market does not rise in line with the increase in fuel prices, then the profit margin of fishermen will be drastically reduced. In some cases, rising fuel costs can force fishermen to work harder but with diminishing profits.

Increased Costs for Boat Maintenance and Repair

The increase in fuel prices can also affect the cost of maintaining boats and fishing gear. When fishermen have to save money on fuel, they may not be able to perform routine maintenance on the boat or motor engine used. This can lead to damage or deterioration in the boat's performance, which in turn adds to the cost of greater maintenance or repairs in the future.

Impact on Resource Availability for Fishermen

When fuel prices rise, traditional fishermen are often forced to reduce their catch. This can lead to them only being able to catch fish in areas closer to the coast, which is often associated with a decrease in the number of catches. This creates a tension between the need to reduce fuel expenditure and the need to get enough catch to meet the needs of life and the market.(Sugiardi et al., 2021a)(Sugiardi et al., 2021a)

Dependence on Fuel Subsidies

Many traditional fishermen in Indonesia rely on fuel subsidies to reduce the impact of rising fuel prices. The government provides fuel subsidies to maintain price stability for fishermen and other vital sectors. However, if fuel subsidies are reduced or not enough to cover rising global or domestic prices, fishermen will feel a greater impact on their operating costs.

Other Spending Cuts Possible

To offset rising fuel costs, fishermen may have to cut other expenses, such as the cost of buying new fishing gear or food during the trip. In some cases, fishermen can even reduce salaries for crew members or cut costs related to safety and training, which can be a risk to job safety and the quality of the catch.

Strategies for Dealing with Rising Costs

To cope with this increase in costs, traditional fishermen may try several strategies, such as: Finding closer fishing areas to reduce fuel expenditure, although sometimes the results are less than optimal. Diversify your business, for example by selling by-products such as shrimp or shellfish to increase your income. The use of fuel-efficient technology, although this requires an initial investment that is not always affordable for fishermen.

Impact on Revenue and Business Sustainability

The increase in fuel prices affects fishermen's income. With increased operational costs and limited catches, traditional fishers can struggle to achieve a balance between cost and income. If the price of fish in the market is not high enough to cover the increase in costs, then the profit margin of fishermen will be thinner. In the long term, this can threaten the sustainability of traditional fishers' businesses, especially those that rely on limited capital.(Sukiyono et al., 2022)

Impact on Revenue and Business Sustainability Due to Fuel Price Increase

The increase in fuel prices, especially subsidized fuels used by traditional fishermen, has a direct impact on their income and business sustainability. The following is an explanation of the impact of the increase in fuel prices on the income and survival of traditional fishing businesses:

Effect on Net Income

The increase in fuel prices directly increases the operational costs of fishermen. Most traditional fishermen use motorboats that require fuel to go to sea. As fuel prices rise, the cost of each trip to sea also increases, so that the net income of fishermen, calculated from the catch minus operational costs, decreases.(Sugiardi & Ellyta, 2021)

If the cost of fuel increases but the price of fish in the market does not rise significantly, the profit margin of fishermen will shrink. In many cases, fishermen must reduce the number of trips or duration of their trips to avoid greater expenses, which in turn impacts their total catch and income.

Reduction in Purchasing Power

The increase in fuel prices not only has an impact on the operational costs of going to sea, but also on the purchasing power of fishermen for other items they need, such as food, fishing gear equipment, and boat maintenance equipment. This reduction in purchasing power leads to limited resources available for fishermen's business continuity in the long term. For example, fishermen may have to reduce investment in fishing gear repairs or boat maintenance which can reduce the efficiency and success of fishing operations.

Risk of Declining Business Sustainability

The increase in operational costs caused by rising fuel prices can threaten the sustainability of traditional fishermen's businesses. Declining income makes it difficult for many fishermen to survive in their fishing business. If fuel costs continue to rise and fishermen are unable to cover expenses, some fishermen may be forced to stop going to sea or switch to other, more lucrative jobs. This can lead to a decrease in the number of active fishermen and reduce the economic resilience of the traditional fisheries sector.(Sugiardi et al., 2021b)

Pressure on Capital and Investment

To continue their business, fishermen need to have enough capital to buy fuel and carry out their operations. Rising fuel prices could force fishermen to seek loans or delay investment in boat repairs and maintenance. Without adequate investment, the equipment used by fishermen can become inefficient or even damaged, which will further reduce the catch. On the other hand, fishermen who are unable to access loans or credit with low interest rates risk losing their business.(Sugiardi et al., 2024)

Impact on the Fish Market and Income

The increase in fuel prices can also affect the price of fish in the market. If fishermen's operational costs increase and they have to increase the price of fish to cover additional costs, then

consumer purchasing power could decrease. The decline in demand for fish in the market could add pressure to fishermen's income. In some cases, if the price of fish cannot rise in proportion to the increase in fuel costs, fishermen may choose to reduce the quantity of their catch or even stop going to sea.

Potential Conflict between Fulfilling Life Needs and Business

Traditional fishermen often face a dilemma between maintaining business sustainability and meeting their daily needs. When income from the catch is not enough to cover operational costs, many fishermen are forced to work harder in the hope of increasing their income. However, if the increase in fuel prices cannot be offset by the increase in catch, they will find it difficult to meet their family's needs and pay their debts or daily living expenses.

Adaptation and Diversification Strategies

To maintain income and business sustainability, some fishermen may try to adapt by reducing operational costs, such as finding a closer catch location or using a more fuel-efficient boat. On the other hand, some fishermen can also start diversifying their businesses, for example by catching other types of fish that are easier to reach or switching to side businesses such as aquaculture or marine tourism. Nonetheless, diversifying a business requires new skills and additional investments, which may not always be available to traditional fishers.

The Role of Government Policies in Maintaining Sustainability

To ensure the sustainability of fishermen's businesses, the government can play an important role in stabilizing fuel prices by providing fuel subsidies or policies that support the use of cheaper and environmentally friendly alternative fuels. In addition, providing more efficient training and technology for fishermen can also help them reduce expenses and increase productivity.

Decreased Productivity

Fluctuations in subsidized fuel prices that continue to increase can cause fishermen to reduce the frequency of going to sea or even switch to other sources of income to cover living costs. Lack of time at sea or less catch will certainly affect overall productivity. This productivity could also decline because fishermen may prefer to look for fish closer to the location with cheaper fuel costs, but with limited catches.

Decreased Productivity Due to Fuel Price Fluctuations

Fluctuations in fuel oil (BBM) prices can cause a decrease in the productivity of traditional fishermen which has an impact on their catch, operational efficiency, and business sustainability. Here are some ways fuel price fluctuations can affect the productivity of traditional fishermen:

Increased Operational Costs

Fluctuations in fuel prices have a direct impact on fishermen's operational costs. Because most traditional fishermen use motorboats that require fuel to go to sea, the increase in fuel prices will immediately increase the cost of traveling to sea. The more expensive the cost of fuel, the less time fishermen can spend at sea, which reduces the number of catches and affects the total yield obtained. With higher operating costs, fishermen may be forced to limit the number of trips or choose closer catches even with fewer results.

Decrease in the Number of Trips and Duration of Going to Sea

When fuel prices rise, many traditional fishermen choose to reduce the frequency or duration of going to sea to avoid spending too much. With less time at sea, fishermen's productivity decreases because they have fewer opportunities to catch fish. The reduction in fishing time can also cause fishermen to lack adequate catches to meet their living needs. In some cases, fishermen may choose to stop going to sea temporarily if the cost of fuel does not allow them to continue operating.

Reduction in Quality and Quantity of Catch

Fluctuations in fuel prices often force fishermen to look for closer or more accessible fishing locations to save on fuel costs. However, closer locations may have fewer or not as good catches as

farther away locations. This decrease in the quality and quantity of catches will have a direct impact on fishermen's income, which in turn will reduce their productivity. In the long run, this can threaten the sustainability of their business.

Influence on Investment Decisions

When fuel prices fluctuate and are volatile, traditional fishermen may be hesitant to invest in new fishing gear, boat maintenance, or more efficient technology. This can lead to decreased productivity, as older or less efficient equipment tends to reduce catch. Without investment to maintain operational efficiency, fishermen will have difficulty facing the challenges of fuel price fluctuations and maintaining optimal catches.

Economic Uncertainty

Fluctuations in fuel prices create uncertainty that can affect fishermen's business planning. When fuel prices rise suddenly and unpredictably, fishermen find it difficult to plan the right amount and time of travel. This uncertainty can make fishermen reluctant to go to sea or even temporarily stop their business, leading to a decrease in productivity. Limitations in planning cause fishermen to not be able to take full advantage of the potential of marine products.

Difficulties in Maintaining Revenue Consistency

Large and unexpected fluctuations in fuel prices can cause fishermen's income to be inconsistent. When fuel prices rise, fishermen may reduce their catch because they reduce the frequency of their fishing or choose a location with less yield. This reduces their revenue stream. With uncertain incomes, it is difficult for fishermen to meet their daily needs and maintain the sustainability of their businesses. This uncertainty exacerbates the decline in productivity, as fishermen are unable to plan their businesses properly.

Dependence on Fuel Subsidies

Many traditional fishermen rely on fuel subsidies provided by the government to reduce the burden of operational costs. However, if the government reduces or removes the subsidy, or if the subsidy does not cover the entire cost needed, the fisherman will have to bear the higher cost of fuel. This causes them to face a decrease in productivity due to the increasingly expensive operational costs that must be borne without a comparable increase in catch. Thus, dependence on subsidies can be a determining factor in maintaining fishermen's productivity.

Decline in Competitiveness

In the traditional fisheries sector, cost efficiency is essential to maintain competitiveness. High and unstable fuel price fluctuations can lower the competitiveness of fishermen, as they are unable to produce as many catches as other fishermen who may have access to cheaper fuels or more efficient technology. This decline in competitiveness causes traditional fishermen to have difficulty competing in local or even international markets, which in turn reduces their productivity.

Changes in Consumption Patterns and Reduction in Quality of Life

In an effort to reduce spending due to fluctuations in fuel prices, fishermen may be forced to reduce the consumption of health or well-being related items, such as nutritious food or spending on education. This can reduce their quality of life and impact their physical and mental ability to carry out their daily tasks. This decrease in quality of life can lead to a decrease in the motivation and energy of fishermen in carrying out their work, which in turn will reduce their productivity.

D. Changes in Capture Patterns and Technology Adaptation

Some traditional fishermen may try to adapt by using more efficient technologies in fuel use, such as using boats with higher fuel efficiency or switching to more energy-efficient fishing methods. However, this requires investments that are not always affordable for traditional fishers, who often have limited access to technology and funding.

Changes in Catch Patterns and Adaptation of Fuel Oil Technology in Traditional Fishermen

Frequent fluctuations in fuel prices have forced traditional fishermen to adapt so that their businesses remain sustainable. One way to adapt is to change fishing patterns and adopt new, more efficient technologies, especially those related to fuel use. Here are some changes in fishing patterns and technological adaptations that can be done by traditional fishermen in the face of changes in fuel prices:

Changes in Capture Patterns, Reduction of Mileage, and Closer Location Search

One of the ways traditional fishermen can reduce fuel use is by changing their fishing patterns. Fishermen are starting to look for fishing locations closer to the coast or places that do not require long trips to save fuel. While this can reduce operational costs, the catch may be less or not as good as in more distant locations. Therefore, this fishing pattern requires fishermen to be smart in choosing the right time and location so that they can still get enough results even though they reduce the distance traveled.

Decrease in Duration of Going to Sea

To reduce fuel use, fishermen can also choose to reduce the duration of going to sea in one trip. With less time at sea, even if they can't get the maximum catch, they can minimize fuel expenditure. This is a difficult choice because even though the cost is lower, the income from the catch is also reduced.

Diversification of Catch Types

Given the fluctuation in fuel prices, fishermen may switch or add types of fish or seafood that are easier to reach or do not require long trips. Diversifying catch types, such as switching to more fishing near the coast or catching smaller, easier-to-net types of fish, can help reduce reliance on high fuel costs.

Decrease in Frequency of Going to Sea

The increase in fuel prices has forced fishermen to reduce the frequency of trips to sea. They only go to sea a certain number of days a week, or in more favorable weather conditions, to avoid wasting fuel. This leads to a decrease in catch volume and a decrease in income.

Technology Adaptation to Reduce Fuel Use

More Efficient Use of Machines

Many traditional fishermen are starting to switch to more fuel-efficient boat engines. Engines with lower fuel consumption can help reduce operating costs without compromising the performance of the boat. New, more fuel-efficient engine technology can also help fishermen go further to sea with less expense.

Application of Alternative Propulsion Technology

Eco-friendly technologies that reduce dependence on fuel are growing. Some fishermen are starting to turn to alternative propulsion technologies, such as gas-fired or solar-powered engines. These engines that use renewable energy help reduce dependence on fuel oil and costs associated with fuel price fluctuations. Although this technology is still in the development stage in many regions, its application is a potential long-term solution for the sustainability of fishermen's businesses.

Boat Repair and Maintenance

More efficient technology also includes the use of lighter and more durable materials in boat building, which can reduce fuel consumption. In addition, more regular maintenance of boats and motor engines will improve fuel efficiency. By ensuring that the boat is in good condition, fishermen can optimize the use of fuel.

More Efficient Use of Fishing Gear

Fishermen can also switch to more efficient and environmentally friendly fishing gear to increase their catch without having to go to sea further. For example, fishing gear such as nets or traps designed to minimize energy waste can increase productivity without increasing fuel costs.

Use of Technology-Based Fish Navigation and Search System

Technologies such as sonar, GPS, and other fish finder devices can help fishermen find fishing locations more quickly and precisely, reducing the time spent at sea. This also means fuel savings as fishermen can go straight to locations with higher catches without having to search for potential fishing grounds for a long time.

Changes in Resource Management and Cooperation Between Fishermen

Cooperation Between Fishermen

Fishermen can increase productivity by working together in groups to share resources, such as boats, engines, or other more efficient technology. Through fishermen's cooperatives or organizations, they can gain access to more sophisticated fishing gear and reduce operational costs, including fuel. This kind of cooperation helps them be more efficient in finding fish and reduce operational costs.

Implementation of a Sustainable Marine Resources Management System

To support business sustainability, fishermen need to adopt a more sustainable approach to managing marine resources. The implementation of an environmentally friendly and ecosystem-based fishing system will improve long-term yields and reduce pressure on existing fish resources. This sustainability, while requiring initial investment in education and technology, can support the stability of fishermen's production and income despite fluctuating fuel prices.

Policy Approach and Government Support

The government has an important role in supporting fishermen's adaptation to fluctuations in fuel prices. Policies that support the development of fuel-efficient technologies, such as incentives for switching to fuel-efficient engines or the use of renewable energy, can help fishers reduce their dependence on fuel. Subsidies or assistance programs to purchase more efficient fishing gear and other technologies could also accelerate this transition.

The Role of Government Policy

Fuel subsidy policies are very important to maintain cost stability for traditional fishermen. However, these policies often undergo unpredictable changes, which can make it difficult for fishermen. Special assistance or subsidy programs for fishermen, such as subsidized fuel distribution or more efficient fishing gear, can help reduce the negative impact of rising fuel prices on their productivity.

The Role of Government Policy in Fuel Subsidy Policy for Traditional Fishermen

The fuel subsidy policy has an important role in maintaining the survival and sustainability of traditional fishermen's businesses. For many fishermen, fuel is one of the biggest costs in their operations, and rising fuel prices can risk reducing productivity and income. Therefore, the fuel subsidy provided by the government can help reduce the burden of fishermen's operational costs and ensure that the traditional fisheries sector continues to run. Here are some of the important roles of fuel subsidy policies in supporting traditional fishermen:

Reducing the Burden of Fishermen's Operational Costs

Fuel subsidies can directly reduce the operational costs of fishermen who are highly dependent on fuel to go to sea. With subsidies, fishermen can buy fuel at more affordable prices, which allows them to stay at sea more often and further away without worrying about wasting money. This is especially important because the higher the cost of fuel, the less revenue they receive after reducing operating costs. These subsidies help maintain fishermen's profit margins and reduce the economic pressures they face.

Maintaining the Availability of Marine Food

Traditional fishermen often supply local food needs with their marine catch. With fuel subsidies, fishermen are better able to maintain stable production levels and stay at sea for longer, so that the supply of fish and other marine products can remain available in the market at more affordable prices. Without adequate subsidies, the availability of fish and other seafood can be reduced, which affects food prices and disrupts the food security of local communities.

Encouraging Economic Stability in the Fisheries Sector

Fuel subsidies not only reduce the direct burden on fishermen, but also provide stability for the fisheries sector as a whole. When fuel prices rise sharply, many fishermen can be forced to reduce the frequency of going to sea or even stop working, leading to instability in the fishing market. Subsidies can help prevent a decline in fish production caused by an increase in fuel prices, so that the stability of the fisheries sector can be better maintained.

Improving the Sustainability of Fishermen's Businesses

With fuel subsidies, traditional fishermen can operate longer and more efficiently without having to reduce their time at sea or replace more expensive fishing gear. The sustainability of fishermen's businesses is highly dependent on their ability to survive fluctuations in fuel prices. The subsidies that fishermen receive can give them longer time to adapt to new technologies or adopt more efficient business strategies without worrying about losing their source of income soon.

Helping Smallholder Fishermen Vulnerable to Fuel Price Increases

Smallholder or traditional fishers often do not have access to sufficient resources, such as capital to buy more efficient engines or large quantities of fuel at lower prices. Fuel subsidies provide direct assistance to this group of fishermen, who are very vulnerable to rising fuel prices. Without this support, many small fishers will not be able to survive in the long term and will be forced to exit the fishing sector. Subsidies can extend the working life of small fishers and ensure that they remain active in the fisheries sector.

Supporting the Development of Environmentally Friendly Technologies

Fuel subsidies can also be provided with a focus on environmentally friendly and fuel-efficient technologies. The government can provide special incentives or subsidies for fishermen who switch to more efficient technologies, such as more energy-efficient or renewable energy-based boat engines. Thus, fuel subsidies not only help reduce operational costs but also encourage innovation and adaptation of more environmentally friendly technologies in the fisheries sector.

Improving the Social Welfare of Fishermen

Proper fuel subsidies can help improve the social welfare of fishermen, reduce economic inequality, and improve their living conditions. Without subsidies, many fishermen are forced to choose between meeting their family's basic needs or continuing their business at sea, which is often unprofitable. With subsidies, fishermen can more easily meet their living needs, while continuing their fishing business that supports the family economy.

Preventing an Increase in Unemployment in the Fisheries Sector

As operational costs get higher, many fishermen choose to stop going to sea or switch to other jobs that are more profitable. This can increase the unemployment rate in the fisheries sector, which has an impact on the local economy, especially in areas that are heavily dependent on the fisheries sector. Fuel subsidies serve as a tool to keep fishermen able to work and the fisheries sector does not lose its workforce.

Improving the Success of Social Policy Programs

Fuel subsidy policies that are integrated with broader social policies, such as social security for fishermen or alternative skills training, can increase the success of government efforts to reduce poverty and improve the quality of life of fishermen. Fuel subsidies can be part of a larger policy to support the sustainability of traditional fishermen's livelihoods.

Reducing Dependence on Other Natural Resources

Fuel subsidies can play a role in reducing fishermen's dependence on other natural resources, such as fish in certain areas. When fuel costs are more affordable, fishermen have more flexibility to go further or longer to the sea in search of fish. This can reduce pressure on local fish resources and help maintain the balance of marine ecosystems.

Challenges in Fuel Subsidy Policy

Although fuel subsidies provide many benefits, there are several challenges in their implementation, such as: Waste and Inaccuracy: Fuel subsidies are often not on target and can benefit those who do not need it, such as fishermen who are able to access fuel at a lower price. Government Budget Limitations: Large fuel subsidies require a significant state budget, which can add to the fiscal burden. Therefore, it is important to ensure that subsidies are used effectively and efficiently. Environmental Impact: Continued fuel subsidies can increase fossil fuel consumption and contribute to environmental damage. Therefore, there is a need to direct subsidies on environmentally friendly and efficient technologies.

Dependence on Natural Resources and the Environment

In addition to fuel prices, other external factors that also affect the productivity of traditional fishermen are environmental conditions and marine natural resources. Environmental damage and deterioration in the quality of fish resources can worsen the conditions of traditional fishermen, although fuel prices remain stable.

Dependence on Natural Resources and the Environment Due to the Use of Fuel Oil (BBM)

The use of fuel oil (BBM) in the fisheries sector, especially by traditional fishers, has a significant impact on dependence on natural resources and the environment. This dependence can affect not only the sustainability of fishermen's businesses but also the condition of the ecosystem they rely on. Here are some important aspects related to fuel dependence on natural resources and the environment:

Dependence on Limited Natural Resources

Fuel is a form of limited natural resources, most of which come from fossils, such as petroleum. Fishermen's dependence on fuel as the main source of energy for going to sea creates a greater dependence on this fuel supply. Rising fuel prices or scarcity can have a direct impact on fishermen's ability to continue their business. Limited Natural Resources: Natural resources used to produce fuel (petroleum) are limited and can be depleted over time, which increases the risk of future energy supply shortages. The more fishermen depend on fuel, the greater the pressure on the fuel supply. Infrastructure Limitations: Infrastructure limitations for fuel distribution to remote or remote coastal areas can result in supply shortages, further exacerbating fishermen's dependence on fuel.

Impact on Marine Ecosystems and the Environment

The use of fuel in fisheries not only has an impact on dependence on fuel supply but also has a major impact on the marine environment and coastal ecosystems. Some of the impacts include: Marine Pollution: Oil leaks from boats used by fishermen can pollute marine waters, damage water quality, and threaten marine life. Fuel spilled into the sea can disrupt coastal ecosystems and local fisheries, which are actually the main resource for fishermen. Air Pollution: Exhaust emissions from boat engines that use fuel contain harmful pollutants such as carbon monoxide, nitrogen oxides, and fine particles that can pollute the air in coastal areas and have an impact on the health of fishermen and people living around the area. Global Warming and Climate Change: Fuel use contributes to an increase in greenhouse gas (GHG) emissions that accelerate climate change. The impacts of climate change, such as rising sea temperatures, changing weather patterns, and rising sea levels, can affect fish abundance and marine habitats that depend on stable environmental conditions.

Dependence on Non-Renewable Fossil Energy

Fuel is a non-renewable fossil energy, which means its supply is limited and will run out at some point. The dependence on fuel in the fisheries sector exacerbates this dependence on limited resources. The longer fishermen continue to rely on fossil fuels, the greater their reliance on non-

renewable natural resources. Energy Crisis: The high dependence on fuel makes the fisheries sector particularly vulnerable to an energy crisis, especially in the event of disruptions in global fuel supplies or sharp price increases. This also risks the sustainability of fishermen's businesses if fuel becomes more expensive or difficult to obtain. Alternative Renewable Energy: Dependence on fuel can drive the need for research and development of renewable energy alternatives, such as solar, wind, or biomass energy, that can replace fuel in the fisheries sector. Reducing reliance on fossil fuels will improve the resilience of the fisheries sector to fluctuations in energy prices and reduce environmental impact.

Dependence on Fuel Subsidy Policy

Many traditional fishermen rely on fuel subsidies to keep fuel prices affordable. This dependence on subsidies can create long-term problems for both fishermen and governments: Unsustainable Subsidies: Fishermen's dependence on fuel subsidies can exacerbate their dependence on fuel supplies that are constantly subsidized by the government. This has the potential to increase the government's fiscal burden, especially if there is a surge in global fuel prices. Dependence on Government Policies: Fishermen who depend on fuel subsidies can be directly affected if the subsidy policy is changed or stopped. This makes fishermen vulnerable to economic uncertainty caused by fluctuations in government policies.

Damage to Marine Natural Resources Due to Fuel Use

The use of fuel can also cause further damage to marine and coastal natural resources. The process of extracting and utilizing petroleum to produce fuel often causes damage to the environment, both on land and at sea. Oil Exploration and Exploitation Activities: Petroleum mining, which is used to produce fuel, is often carried out in coastal or marine areas, which risks damaging marine ecosystems, such as coral reefs, mangrove forests, and coasts. This activity also has the potential to cause damage to fish habitats that depend on the ecosystem.

Inefficient Natural Resource Management

Dependence on cheap and easily available fuel can hinder the development of more efficient and environmentally friendly fisheries technology. Some fishermen may feel no need to invest in more efficient equipment or technology because of fuel subsidies and relatively affordable fuel prices. Lack of Incentives to Switch to Green Technologies: Reliance on subsidized fuels reduces incentives for fishers to switch to greener or renewable energy-based technologies. Without policies that encourage the energy transition, fishermen tend to continue to rely on fuel despite the negative impact on the environment and the sustainability of their business.

Dependence on Unsustainable Natural Resource Management Systems

The dependence of the fisheries sector on fuel also shows unsustainability in natural resource management. Excessive use of fuel for the exploitation of marine resources ignores the principle of sustainability in the management of fisheries and marine ecosystems. This can cause damage to the ecosystem which is the main resource for traditional fishermen.

4. Conclusion

The increase in fuel prices has a big impact on the operational costs of traditional fishermen. With the rising cost of fuel, fishers face a huge challenge to maintain the continuity of their businesses and achieve a balance between costs and income. Therefore, the government's appropriate cost management strategy and subsidy policy are essential to ensure the survival of traditional fishermen in the face of often unpredictable fluctuations in fuel prices. The increase in fuel prices has a huge impact on the income and sustainability of traditional fishermen's businesses. Higher operating costs reduce profits, threaten business survival, and create great economic pressure for fishermen. Therefore, policies that support fishers through fuel subsidies, efficiency training, and investment in green technologies are essential to ensure the resilience and well-being of the traditional fisheries sector in the future.

Fluctuations in fuel prices have a significant impact on the productivity of traditional fishermen. Increased operational costs, reduced frequency of seafaring, and uncertainty caused by fluctuating fuel prices have the potential to reduce catches and the sustainability of fishermen's businesses. To

address these impacts, more stable policies regarding fuel subsidies and efficient technologies are urgently needed to ensure the survival and productivity of the traditional fisheries sector Fluctuations in fuel prices are forcing traditional fishers to adapt to changing fishing patterns and adopt more efficient technologies to reduce operational costs. By changing fishing patterns, switching to more environmentally friendly and efficient technologies, and improving resource management, fishers can increase their productivity despite the challenges of fluctuating fuel prices. Government support and cooperation between fishermen are also important keys in creating the sustainability of traditional fisheries businesses amid uncertain changes in fuel prices.

The fuel subsidy policy has a very important role in supporting the continuity of traditional fishermen's businesses, especially in the face of frequent fluctuations in fuel prices. By reducing operational costs, fuel subsidies help fishermen maintain productivity, improve social welfare, and support the sustainability of the fisheries sector. However, to achieve maximum benefits, it is important for the government to manage subsidies in a targeted, efficient, and supportive manner of using environmentally friendly technologies that reduce dependence on fossil fuels Dependence on fuel oil (BBM) has a major impact on the resilience of the traditional fisheries sector, both in terms of economy and environment. This dependence not only creates dependence on limited natural resources but also increases environmental damage, pollutes waters, and contributes to global warming. Therefore, it is important for fishermen and the government to develop more efficient and environmentally friendly energy alternatives to reduce dependence on fuel and support the sustainability of natural resources and marine ecosystems that depend on environmental balance.

Fuel diversification in the fisheries sector is an important strategic step to reduce dependence on fossil fuels, improve efficiency, and reduce environmental impact. By adopting renewable energy, biofuels, and more efficient boat technology, fishers can reduce operational costs and maintain the sustainability of their businesses. Government support through policies, incentives, and counseling, as well as partnerships with the private sector, is critical to driving the success of fuel diversification in the fisheries sector.

Acknowledgment

The authors extend their sincere appreciation to all individuals who have contributed to this research through their assistance in the execution of the study.

Declarations

Author contribution. All authors contributed to the completion of this study.
Funding statement. Funding The research was independent, no one provided grant funding for this research.
Conflict of interest. The authors declare no conflict of interest.
Additional information. No additional information is available for this paper.

Data and Software Availability Statements

This paper provides data and software in support of the results reported in the article that were analyzed and generated during the research.

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