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Smallholder Farmers' Health, Occupational Nutrition, and Sustainable Agriculture

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Cover Page Footnote

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Editorial

**Smallholder Farmers' Health, Occupational Nutrition,
and Sustainable Agriculture**

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Agriculture is one of the main economic sectors in many countries, including Indonesia. Even though the agricultural sector supports economic growth, it is generally recognized that smallholder farmers face several challenges in terms of their financial security and productivity. It can be argued that more than any other occupational group, agricultural workers, especially those in the small-scale sector are exposed to various hazardous occupational and environmental exposures, with exposure to chemical pesticides being one of the most significant. Smallholder farmers and agricultural workers may suffer from many forms of health problems. These conditions may trigger the cycle of inadequate dietary intake (e.g., malnutrition), poor health conditions, low working capacity, and low incomes. For that situation, goal number 2 of the Sustainable Development Goals (SDG2) adopted by the United Nations: "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture", is particularly relevant. SDG2 also acknowledges that empowering smallholder farmers is one of the main keys to building sustainable agriculture. Therefore, the commitment to empower farmers should aim not only to protect them from uncertainty and stabilize their income but also to maintain their nutritional adequacy and health.

In agriculture, chemical pesticides are frequently applied to control pests. According to a prior study, smallholder farmers typically handle pesticides poorly, as seen by a more frequent application, usage of complex pesticide combinations, and rarely use of the proper personal protective equipment (PPE).¹ They need to be made aware that the use of pesticides should be a part of a comprehensive strategy for pest control. In light of this, improper pesticide use can negatively affect humans and the environment. Skin contact, inhalation, or ingestion are the primary possible ways to be exposed to pesticides. The leading causes of occupational pesticide exposure in the agricultural sector are mixing and spraying pesticides, re-entering sprayed lands, cleaning used equipment, and harvesting crops that might be contaminated with pesticides.² Additionally, farmers can be exposed to pesticides by consuming contaminated food. Food contamination is a severe problem, as the high concentrations of chemicals i.e., pesticides, present in food can pose serious health risks.³ The interactions of several determinants, including pesticide toxicity, pesticide handling practices, and genetic polymorphisms that may influence xenobiotic metabolism in the human body, lead to the deleterious consequences of pesticide exposure.⁴ For that reason, it was known that farmers and workers in the agricultural sector, especially pesticide applicators, are at risk of experiencing health problems associated with exposure to pesticides, including neurotoxicity, respiratory problems, hematological alterations, and endocrine disruptions.^{5,6} Not only that but unsafe pesticide handling practices are also known to increase farmers' likelihood of acute poisoning.⁷

Some ways can be applied simultaneously to maintain the smallholder farmers' health. First, exposure control can be implemented through proper pesticide handling practices. The hierarchy of control established by the National Institute for Occupational Safety and Health (NIOSH) starts with the most effective measures, hazard elimination, followed by substitution, engineering control, administrative control, and the least effective measure is the use of PPE.⁸ Second, conducting occupational surveillance, which is a program of medical examinations and tests designed to detect early warning signs of harmful exposure. For this purpose, a comprehensive occupational surveillance program should include industrial hygiene, medical, and biological monitoring when appropriate.^{9,10} Third, an occupational nutrition approach ensures adequate nutritional intake, leading

to good health and higher productivity.¹¹ However, in many circumstances, those crucial programs are rarely implemented due to financial considerations and other reasons.

By highlighting the above conditions, multisectoral collaboration through participation and support from the government, private sector, and non-governmental organizations is essential to provide the following but not limited to: 1) alternative pest control methods that are safer and have the most negligible health impact, 2) appropriate applied agricultural technologies, 3) adequate water supply, hygiene and sanitation systems, 4) administrative control in the form of increasing knowledge about the potential health impacts of pesticide exposure and comprehensive training and assistance on the proper handling of pesticides, 5) appropriate PPE and encourage its use, 6) at a minimum, a periodic medical examination needs to be carried out considering the potential for chronic health effects that arise after prolonged exposure to pesticides, 7) education on nutritional adequacy and policies to promote dietary diversity, increase consumption of fruits, vegetable, dairy products and micronutrients, and 8) availability and access to nutritious, safe and affordable food. Through the involvement of all parties, it is hoped that smallholder farmers can be truly empowered, their health is maintained, and their nutritional adequacy is fulfilled so that the goals of sustainable agriculture can be realized.

DECLARATION

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