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The Influential Factors of Organic Fertilizer Adoption among Farmers: A Review

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Abstract

It is impossible to fulfill the rising food demands of expanding population. As the organic fertilizer is the only and sustainable choice. Numerous types of research in agriculture are the significant evidence of organic fertilizer adoption. So, the whole emphasis of this paper is on assessing the most influencing predictors of organic fertilizers adoption among farmers. The review is based on secondary data and information available in the scientific domains and the time is limit to the years 2001 to 2022. The results revealed that farmers' knowledge, attitude, practice (KAP), extension services, market availability, sources of information, and many demographic factors such as education, farm size, etc. play a crucial role in organic fertilizer adoption. The results further explored as the organic fertilizers are the slow release of organic matter but their nutrients are long-lasting. It is required for all relevant organizations in each country all over the world to pave the way of educational programs to improve farmers' information, extension services, knowledge, and ease the access to marketabout organic fertilizer adoption. However, it is required to hold various approaches like training, incentive programs, field work with farmers, and supply of (brochures, leaflets, magazines, etc.) for the target group to facilitate the said important factors for the farmers to adopt organic fertilizer adoption. There is a need for a scientific study to find the exact requirement of organic fertilizer in agricultural farms' land. Thus it will result in a high yield of diverse crops, clean and sustainable environment.

Keywords: Organic Fertilizer, Adoption, Extension Services, Market availability, Sources of Information

Introduction

Agriculture growth is impossible to fulfill the rising food demands of expanding population groupings without technological solutions to increase yields (Khonje et al., 2015). In addition, farmers continue to experience declining per capita food availability due to declining soil fertility, which is a major biophysical cause (Mugwe et al., 2009). Composts, manures, cover crops, green waste, etc., which alter the organic matter of the soil, can be a valuable source of nutrients for crops while also enhancing soil quality and health, adding extra key elements, and enhancing soils' capacity to absorb nutrients and water. Healthy soil decreases problems with food safety, volatilization, and leaching losses (Company & Gradziel, 2017). According to previous research, organic fertilizers are one of the greatest alternatives to chemical fertilizers. Thus, organic fertilizers are utilized instead, due to the high cost of chemical fertilizers, timely availability of organic fertilizers, the convenience of use, unavailability of chemical fertilizers, quick action of organic fertilizers, and soil contamination by chemical fertilizers (Etim & Benson, 2016). However, the overuse of chemical fertilizers has unintended environmental impacts and makes plants more vulnerable to pests and infections since there is an excess of nitrogen in the soil (Chen, 2006).

All the organic fertilizers outweigh conventionally. Operations using organic fertilizers offer a potential means of reducing the negative environmental consequences of excessively applying chemical fertilizer (Bhatt et al., 2019). Furthermore, using organic fertilizers as an alternative to chemicals, can improve the quality of vital minerals, use less chemical fertilizers, and prevent environmental contamination from chemical fertilizers' widespread usage. In general, using organic fertilizers as a suitable substitute for chemical fertilizers can boost production (Janmohammadi et al., 2014), organic fertilizers support a variety of beneficial soil microbial communities and are ecologically friendly (Bulluck et al., 2002; Islam et al., 2017; Mehdizadeh et al., 2013; Muhammad et al., 2017; Wilkinson, 2005).

Subsequently, many of the authors found vital factors in scientific research that have an impact on farmers applying organic fertilizer in farms. The authors (Muluneh et al., 2022; Musafiri et al., 2022; Sapbamrer & Thammachai, 2021; Serebrennikov et al., 2020) found that the adoption of organic fertilizer is heavily influenced by the demographic parameters of household gender, education, age, family size, farm size, and livestock ownership. Followed by (Musafiri et al., 2022) that found the adoption of ecologically friendly and sustainable technologies was impacted by access to weather information, the availability of arable land, perceptions of climate change, infertile soil, and continuous soil erosion. However, a comprehensive literature review by (Sapbamrer & Thammachai, 2021) found that the adoption of organic fertilizers and organic farming are positively influenced by psycho-behavioral and psychosocial factors, such as a positive outlook and moral obligations, as well as supporting factors like training, technology support, farmers who use organic fertilizers, association membership, information acquisition, and extension contacts and extension agents, farm groups, and the government were identified by the researcher as being three drivers that are crucial to the long-term adoption of organic farming. In addition, Chen et al (2020) found the three aspects are so important to persuade people for using organic fertilizer adoption are: first enough information about fertilizers, second complete pricing system of fertilizers, and the last one is relevant regulations that encourage and facilitate the market of adoption organic fertilizer. The acceptance of organic farming is strongly influenced by the

variables of economic and environmental attitudes as well as the sources of information (Serebrennikov et al., 2020). When compare the small-scale farmers, large-scale farmers are more inclined to use organic fertilizer and raise the use intensity, and the diversity of farmers also influences how farmers apply organic fertilizer (Chen et al., 2022). Furthermore, the available number of sales channel encourages the use of organic fertilizer and maximize production (Fang et al., 2021). The use of organic fertilizer is positively correlated with agricultural expertise (Muluneh et al., 2022). The results of scientific research further explored that the agricultural extension services and extension agents are essential in providing knowledge via training and assisting traditional farmers to switch to organic farming (Musafiri et al., 2022; Qiao et al., 2022; Sapbamrer & Thammachai, 2021).

Remarkably, some of the famous researchers used scientific approaches that help in identifying the significant factors toward organic fertilizer adoption and the technology as a whole. So the author (Wasil et al., 2022) used the Technology Acceptance Model TAM and Theory of Planned Behaviour TPB and found knowledge and practice positively influence organic fertilizer adoption and the researcher (Wang et al., 2021) used the approaches of attachment and environmental cognition that positively affect farmers to adopt organic fertilizer.

The benefits of organic fertilizer over conventional and inorganic fertilizers for the environment, ecosystems and human health are widely documented. So the negative consequences of chemical fertilizers are on both the environment and people. On the other hand, organic fertilizers are attracting global recognition because of their environmentally friendly, nutritious, and beneficial to human health characteristics (Baghdadi et al., 2018). However, this study examines the factors from every angle that most influence farmers to use organic fertilizer. Therefore, a comprehensive review was conducted to investigate the following objective

i. To determine the most influential factors impact on organic fertilizer adoption.

Methodology

This comprehensive review paper on influential factors towards organic fertilizer adoption is constructed on secondary data and information available in the scientific domain mainly Google Scholar where all the high-quality papers are visible and accessed there. As mentioned before in this study we chose the Google scholar collection core as the database and a very fewer number of papers are from other browsers so the search rule is that “organic fertilizer or manure” and its’ “adoption” which show in the title and the time is limit to the years 2001 to 2022 As the adoption of organic fertilizer still has not much attention so the researchers of this study broadly used various keywords to cover the whole topic in a scientific manner such as “determinants or factors of organic fertilizer adoptions”, “organic fertilizer adoption”, and “ influential factors of organic fertilizer adoption” and collected all the most important scientific work related to the study topic in the time range. And the research is not limited to one search but tried many times to include an updated work till the more generalizable to the topic in the specific time. Every single paper is well reviewed in the light of the study topic and deeply discussed for the study.

Organic Fertilizers

Fertilizers are crucial ingredients in raising agricultural output. Any combination or material used to supply the soil with nutrients needed by crops and derived from the leftovers of dead or decaying plants or animal manures is referred to as organic fertilizer (Solontis, 2013). In

addition, all of the essential elements required by crops are provided by manure or organic fertilizer, although the quantities are not always following the necessary measurements. (Averbeke & Yoganathan, 2003; Solontis, 2013).

Girawale & Naik (2016) researched that for soil fertility growth and sustained crop yield, organic fertilizers are thought to be an alternative to chemical fertilizers. Further explains, it is believed to be extremely important as a supplement to or alternative to chemical fertilizers and improves crop productivity, and is sustainable for agriculture. Organic fertilizers are one of the ways to achieve optimal agricultural output (Girawale & Naik, 2016). According to (Kassie et al., 2008) the enhancement of natural resources such as increasing soil organic material without affecting production levels, enabling fields to function as a sink for carbon dioxide, improving the soils' capacity to retain water, and minimizing soil erosion are some of the potential advantages of organic fertilizer.

In the meantime, the risks related to the use of mineral fertilizers are significantly decreased by the use of organic fertilizers. To improve and sustain the soil's physical, biological, and chemical qualities during ongoing and intense agriculture, organic fertilizers offer organic carbon (Sudradjat et al., 2018). Moreover, by controlling decay, using more organic fertilizers offers options to control public waste and greenhouse gas emissions. Additionally, experts advise using farmlands as carbon sinks for the biodegradable fraction of urban trash (Daadi & Latacz-Lohmann, 2021; Galgani et al., 2014).

Nearly all of the basic plant nutrients needed for plant growth are provided by organic fertilizers, as well as offer non-nutrient advantages including food for soil microbes, different organic acids that promote plant growth, improved soil structure, increased water-holding capacity, etc. However, because its significance was generally assessed in terms of nitrogen or nutrients alone, its real impact is not well understood (Verma et al., 2019).

An increasing body of research has examined how slowly organic fertilizers may give nutrients, how little nutritional content there is in the aforementioned manures, and how much organic fertilizer is required to meet crop needs. Even organic fertilizers take several years to provide benefits due to their labor-intensive techniques and delayed nutrient delivery. Therefore, in commercial agriculture, producers must move quickly to take advantage of the nutrient supply provided by organic fertilizers (Verma et al., 2019).

Adoption of Organic Fertilizer

Rogers (Rogers Everett M., 1995) claimed that the acceptance of innovation is linked to the process of decision-making that a person goes through from first being aware of innovation and developing an attitude toward innovation, deciding to accept or reject innovation, introducing new ideas, and affirming an innovation choice.

The amount and quality of agricultural inputs must be available and accepted to boost the productivity of agriculture. Moreover, fertilizers are a crucial component in increasing agricultural output (Girawale & Naik, 2016). Several authors Zondo (2020) proposed that a more practical, affordable solution, such as using organic fertilizer or manure, is one way to increase efficiency without harming the environment.

The adoption of organic fertilizers is vital for boosting production, which raises agricultural revenue. This was made achievable by increasing production while just slightly increasing the overall cost of using organic fertilizer (Gelgo et al., 2016; Lavison, 2013). Likewise, the researchers Lu et al (2019) found that to increase yields, enhance the quality and safety of agricultural goods, and promote environmentally friendly agricultural development, farmers must employ organic fertilizers. Therefore, organic fertilizer should be used to increase

agricultural yields, reduce total spending, reduce food consumption, and reduce hunger (Chatsika, 2016).

According to some academics, there are significant barriers to the use of organic fertilizers, including the lengthy process of preparing organic manure, a lack of available information, a lack of understanding, and a high learning curve (Raghuwanshi & Mazhar, 2017). In addition, there are insufficient animal holdings, insufficient labor, a lack of experience in organic fertilizers, excessive service costs, and insufficient knowledge and resources (Verma et al., 2019). Additionally, farmers that are interested in it may continue to learn more about it and eventually adopt organic fertilizer.

Influential Factors of Organic Fertilizer Adoption

Some factors of organic fertilizer adoption and technology adoption as a whole run through farmers in different regions, while others can vary from location to location based on the current conditions (Bonabana-Wabbi, 2002). In addition, not all variables may refer to the adoption of a given technology, regression analysis is a method to determine which ones will apply in a certain situation (Lavison, 2013). In terms of adoption, some researchers used specific approach theories such as the TPB, the TAM, innovation adoption, etc. which more clearly outlined the elements that influence the adoption of new technology. These factors include local conditions, institutional factors, economic pressures, environmental concerns, and government policy (Bonabana-Wabbi, 2002), and knowledge, attitude, and practice KAP that knowledge and practice are the influential factors of organic fertilizer adoption (Wasil et al., 2022).

Researchers who conducted scientific research without reference to a particular theory discovered that education, the frequency of farmer-based associations meetings, the rate of extension visits, the availability of credit, business involvement, off-farm activities, fertilizer use, knowledge of soil fertility, access to media, and ownership of cell phones all play significant roles in the adoption process (Armel Nonvide, 2020), institutional, unique economic, and human factors (Mwangi & Kariuki, 2015), extension, association participation, family size, manure usage at work, animal ownership, and off-farm income in relation to the use of inorganic and manure (Makokha et al., 2001), information sources, financial state of smallholder farmers, changes in the region's economic situation, and the net benefit of adopting new technology. The length of time spent in formal schooling, the size of the household, and also the number of extension visits received over the most recent growing season all had a positive impact on adoption decisions. In contrast, the adoption decisions were negatively impacted by agrarian knowledge and experience, farm size, and distance to the source of supply of industrial organic fertilizer (Ajewole, 2010), the most significant factors of farmers' ability to pay for organic manure were age, education, farm size, and farm income (Etim & Benson, 2016), while the adoption of organic fertilizer was positively influenced by the amount of animals, extension contact, access to information sources, and participation in farmer-based groups (Gelgo et al., 2016). In addition, the results of (Bacha et al., 2001) also revealed that Manure utilization is positively impacted by the number of engaged family members, the agro - environmental zone, literacy levels, and the quantity of cattle kept.

As a result, the major factors that either directly or indirectly influence respondents' decisions are thoroughly examined about the adoption of organic fertilizer and new technology in general.

Extension Services

The word "extension" is frequently used to refer to cooperative extension, consulting services, technological transfer, agricultural and rural development, as well as the interchange and sharing of useful knowledge (Altalb et al., 2015). In addition, the definition of agricultural extension varies from one country and one agricultural organization to another as in Australia and New Zealand it refers to agricultural advisory services, while in the USA it is a cooperative extension service (Hamisu et al., 2017). To create novel farming methods and rural knowledge, agricultural extension services are crucial. Particularly in developing nations, which often have more need for such advisory services, these services are essential for educating and influencing rural family decisions to embrace new agricultural technology (Wesa, 2002). However, a state's agricultural extension program is a crucial agrarian and political tool that encourages the expansion of agricultural production. A possible explanation for this is that access to extension services for adopters enriches users with knowledge about organic fertilizers, giving farmers an advantage in implementing the technology with best management practices that ultimately enhance productivity. Extension services also increase the adoption of technology and the productivity of crops (yield, output per capita). This makes a considering sense that farmers may utilize extension services as a valuable resource for knowledge on how to make better farming decisions, such as best farming management techniques (Makate & Makate, 2019; Wossen et al., 2017). Additionally, it is thought that access to extension services will close the gap between crop yields achieved using organic fertilizers and those that might be achieved. Another significant factor in the low level of technology adoption is the lack of proper access to extension services. Therefore, farmers learn about new technology that increases productivity and agricultural revenue through extension contacts (Anang et al., 2020). However, farmers are more likely to adopt new agricultural technology if they have access to advising services and are members of agricultural organizations. Therefore, agricultural extension services must be created to encourage farmers to learn new information and expand their agricultural abilities. farmers also need to teach farmers how to communicate effectively (Altalb et al., 2015). To handle common agricultural issues including low levels of yield and productivity as well as unfavorable economic conditions impacting levels of output, the demand for extension services became urgently imperative. Farmers should provide assistance to overcome such challenges or to adapt to the situation (Altalb et al., 2015).

Marketing Availability

Market access has grown to be a significant factor in plans to increase the uptake of innovative technology in rural and distant locations. As a result of the interdependence between farmers' decisions to engage in the market and the farmers' decisions to accept new technologies, both the market and technology adoption are equally significant. The characteristics of the market might also affect the results of the use of organic fertilizer. A large price risk may exist owing to the increased crop output brought on by the adoption of high-yielding inputs or technology.

The use of technology by smallholder farmers is largely influenced by access to markets and market intelligence. To locate markets for farmers' products and inputs like organic fertilizer, farmers have high transaction costs that may be significantly reduced by having quick access to and availability of market information. However, the likelihood of farmers embracing new technologies is pretty high when farmers have access to market information (Khonje et al., 2015). The researcher (Khonje et al., 2015) suggests that it is simpler for farmers to get the

greatest rewards from the use of high-yielding technology if respondents have access to market information. According to (Kinyangi, 2014) that found fertilizer acceptance and agricultural technology adoption, in general, are positively and significantly impacted by market availability. It is commonly accepted that poor agricultural production in rural regions of developing nations is caused by restricted market access, making it more difficult to get inputs that increase output (Hall & Khan, 2003). However, it appears from the research that market accessibility is a key requirement for the adoption of organic fertilizer and that the market is the first location where organic fertilizer may be accessed.

Source of Information

The source of knowledge that influences the adoption of organic fertilizer is the next intriguing factor. Before considering adoption, farmers must be aware of new technology. Additionally, there is a connection between the availability of information and the adoption of technology. Furthermore, it is commonly accepted that participation in such programs and access to information have a significant impact on the adoption of agricultural technology. Toma et al (2018) found that adequate information and knowledge about the accessibility and appropriateness of resources are required for the adoption of agriculture. several authors Khonje et al (2015) found In scientific research, information access is a tool for the adoption of agricultural technology. However, organic fertilizer is a method of agricultural production that has been demonstrated around the world that it is both safer for the environment and more effective. Last but not least, there are many resources for agricultural information, including other farmers, agricultural extension, printed materials like leaflets, brochures, newspapers, and books, and information communication technologies (ICT), which include radio, television, and the internet and are useful tools for technology adoption (Mwalukasa, 2013). As extension agents are the source of information (Anang et al., 2020) found extension agents are the main source of knowledge for farmers on new production techniques and advances. The duties of extension workers include connecting farmers with agricultural training programs and courses so the respondents may learn a lot about many facets of agriculture.

Knowledge

It is assumed that farmers need to be aware of the importance of using organic fertilizers. A coherent body of information is the technical knowledge that is relevant to the wider population (Gernier, 1998).

Additionally, knowing organic fertilizers is essential to farmers' agricultural operations since it improves communication between farmers, technicians, and researchers and gives everyone a common language to discuss advances. The majority of farmers have experimented with the production of organic fertilizer either independently or as part of research or development projects. Local technical competence is reinforced by interacting with others' knowledge, incorporating external knowledge, and blending popularized practices, therefore it is far from being a system of fixed conventional information (Blanchard et al., 2013).

This is the fact that farmers have been forced to rely solely on personal opinions and recommendations from fertilizer dealers and associates to make decisions on the application of fertilizers due to the lack of scientific knowledge about fertilizers and the paucity of guidance from agricultural extension services. Consequently, agricultural technical training has a favorable impact on growers' adoption of organic fertilizer since it is a useful method

for enhancing farmers' scientific understanding of fertilizing and motivating target groups to practice environmentally friendly agriculture (Lu et al., 2019). Overall, farmers have been idiosyncratic in the usage of fertilizers with minimal acceptance of better technology for the use of fertilizers (Yang & Fang, 2015).

Correspondingly, some researchers discovered that farmers' knowledge about organic fertilizers contributes to a deeper understanding of the procedures used in the production and application of organic fertilizers by farmers and that knowledge level is related to the adoption of organic fertilizer technologies (Mishra & Das, 2018) The decision to use organic fertilizers is positively influenced by information about the said fertilizer (Okon & Idiong, 2016).

Attitude

Farmers may be aware of the value of livestock fertilizer, but attitudes and a desire to switch to organic farming are more important. The existence of the attitude relies on the cognitive part, which is primarily dependent on the knowledge, perceptions, and facts associated with the attitudinal object (Ajzen, 1989). The cognitions are established to lead to an affective component that determines whether to feel good or negative, ultimately leading to a conative or behavioral component, i.e. intervention (Ajzen, 1989). However, attitude is a dimension of appraisal that determines whether or not people want to do anything (Ruaykijakarn et al., 2018). Similarly, farmers are experiencing a process of understanding or comprehension of organic fertilizers-associated technologies, developing positive or negative views of livestock fertilizer, and eventually determining whether to apply organic fertilizers or not (Prokopy et al., 2008).

The research listed below shed light on the factors that are crucial in determining farmers' perceptions of organic fertilizers. (Wasil et al., 2022) found there is no statistically positive impact of attitude toward organic fertilizer adoption. However, many scholars pointed out that there is a remarkable association between attitude and the adoption decision. While (Zulqarnain et al., 2020) found a statistically significant negative relationship between attitude and technology acceptance.

Practice

The shortage of adequate land resources has stopped farmers from resting on the land between seasons. Alternative methods for restoring nutrients lost during planting and harvesting had to be established. Farmers used a variety of fertilization techniques, including slash-and-burn farming residue, incorporating organic material into plant beds after harvest and before planting, composting, crop rotation, and self-experimentation, which led them to discover that incorporating organic plant matter back into the soil after harvest increased the soil's nutrient content (Hart, 2007).

Farmers have traditionally utilized organic fertilizer as a standard component of farming, especially for fruit trees and cash crops. Natural fertilizer is used while farmers are planning the field before planting and organic fertilizers are used in the same way in September and October before planting. However, Organic fertilizer usage in agricultural production is mostly derived from livestock (cattle, chickens, etc.), green manure, and human discharge, and also agriculture is the primary absorption bank for animal waste and human waste. Despite the absorption potential of each portion depending on the soil's properties, the demand for vegetables, seasonal farming, and farming techniques used by farmers (Phuong et al., 2006).

Researchers have long believed that using manure and other organic additions is more environmentally friendly than only using fertilizers with petroleum-based ingredients. The vulnerability of agricultural operations to unfavorable weather conditions is increased, yet waste also contributes as fertilizer. Manure application improves soils' capacity to hold onto water and modifies the temperature of buffers (Gilles et al., 2013). As a result, applying manure reduces crop damage brought on by extended dry spells and mitigates the impacts of frost events. Organic inputs and information on how to modify these procedures to fit certain situations, with the main objective of maximizing the application of nutrients and enhancing crop production (Mutua-Mutuku et al., 2017).

Farmers' organic fertilizer practices can directly affect how organic fertilizers are used, and active participation can successfully reduce moral risks and improve governance performance (Lu et al., 2019). The researcher (Wasil et al., 2023) found in a scientific study most of the farmers have enough awareness about the environmentally friendly characteristics of organic fertilizer and prefer to adopt it over chemical and synthetic fertilizers.

Level of Education

Highly educated farmers are more conveniently supplied with technical information, as such farmers can assimilate information from various sources. on the other hand, education increases the effectiveness of the use of organic fertilizers (Genius et al., 2006). Likewise, farmers use increasingly more organic fertilizers as they more educated (Aderinoye-Abdulwahab & Salami, 2017; Blazy et al., 2017; Ullah et al., 2015). Additionally, many scholars also say that illiterate farmers use more organic fertilizers than literate ones. The unfavorable result may be explained by the fact that farmers with formal education tend to have more varied sources of income, which may be utilized to increase expenditure on chemical fertilizers. Farmers without formal education, however, have fewer sources of revenue and have utilized their organic fertilizers for farming instead (Abebe & Debebe, 2019). The adoption of decisions to practice organic agriculture is significantly and positively influenced by the degree of education (Okon & Idiong, 2016). Finally, the level of education has impacted the adoption of organic fertilizers (Blazy et al., 2017).

Constraints Using Organic Fertilizer

Previous scientific researchers have identified several obstacles to using organic fertilizers, including their foul odor, bulky nature for transportation, stress during composting, the debatable efficacy, scarcity, preference for inorganic fertilizers, and drying of organic fertilizers (Aderinoye-Abdulwahab & Salami, 2017; Alimi et al., 2006). Additionally, difficulties in the application of organic fertilizers (Babasola et al., 2017). However, the acceptance and intensity of the use of organic fertilizer have been negatively impacted by the distance to the source of the fertilizer (Ajewole, 2010; Zondo, 2020).

The expense of the practice and the lack of knowledge on the nature of the organic fertilizer are the key constraints demonstrated by the inability to adopt by the farmers (Blazy et al., 2017). The Weaknesses of the environmentally friendly fertilizers adoption are multi-faceted, including considerations related to the capacity to adopt in terms of many livelihood properties, knowledge or understanding of these land management techniques, and farm-related features.

Conclusion

Rather than inorganic fertilizers, this paper is based on influential factors pertinent to the adoption of organic fertilizers among farmers in agriculture. So in all agricultural soils, a high level of organic content is preferred. Moreover, various types of organic fertilizers extracted from animal and plant matter are discussed, as well as the factors that impact farmers' adoption of organic fertilizers.

Fewer researchers found that organic fertilizers release organic matter slowly. In this regard, if the organic fertilizer has a sluggish release of organic matter but is long-lasting. Because many studies show that soils treated with organic fertilizers have a greater capacity to retain product for a long period than soil treated with inorganic fertilizers.

As the usage of organic fertilizer in agriculture is a need to protect the soil, improved the yield, and sustainable improvement of agriculture. As well as w talks about the importance of the environment and sustainability. When environmental sustainability is so important then organic fertilizer is the component of environmental sustainability. Thus it was discovered that extension services, market availability, sources of information, KAP, and many demographic factors were the most important predictors of organic fertilizer adoption among farmers. Then it is required for the pertinent organizations like Departments of Agriculture (DOA) in each country all over the world to pave the way for educational programs to improve farmers' knowledge about organic fertilizer adoption. In this regard, it needs to hold various approaches training, incentive programs for target groups, etc. to facilitate the said important factors for the farmers to adopt organic fertilizer adoption. However, it will result in with high yield of diverse crops, clean and sustainable environment, and an ecosystem.

Recommendations

1-The finding of this study is based on a comprehensive review that suggests there is a need for a study to undertake in the light of scientific research approaches to find the most important factors (extension services, knowledge about organic fertilizer, market access, and social media) toward the toward organic fertilizer adoption in each state of all countries in the world to help not only in the achieving a high level of organic agricultural products but also getting to the sustainable development goals (SDGs) that are already discovered which are sustainable environment and climate action, etc.

2- In addition, the finding of the study recommends that there is a need for a study to find the exact requirement of organic fertilizer in agricultural farms' land so that it will help farmers easily know the amount required of organic fertilizer in farms.

3- Finally, it is also suggested from the study findings that the Departments of Agriculture (DoA) at the government level and the responsible non-governmental organizations have to provide programs for the target groups like training about organic fertilizer and organic farming at large to prompt the use and adoption of organic fertilizer.

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Conflicts of Interest

The authors declare no conflicts of interest.

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