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Research Article

Determinants of Organic Fertilizer Adoption in Moretna Jeru District, Northern Ethiopia

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Agriculture is the backbone of Ethiopia's economy. It is responsible for 35.45% of the country's total domestic output. This means that the sector is critical for enhancing the lives of the wider population. Despite its importance, Ethiopia's agricultural sector produces little. The Ethiopian government has focused on increasing the usage of organic fertilizers to improve this and overall economic growth. Organic fertilizer use is still inadequate in most parts of Ethiopia, including Moretna Jeru District in North Shewa Zone, Amhara region. The main objective of this study was to investigate factors that influence the adoption (use) of organic fertilizer technology in Moretna Jeru District. For this study, primary data were acquired from 192 smallholder farmers who were chosen at random throughout the 2020/21 growing seasons. The factors influencing organic fertilizer adoption were investigated using a probit model. Farmers' characteristics such as extension contact, number of livestock, landownership via title deed, and household size have a favorable and significant impact on organic fertilizer usage. Farmers should be encouraged to use manure technology. This would be attainable if the government, nongovernmental organizations, and other stakeholders focused more on improving extension services and providing better information and training on the use of organic fertilizers.

1. Introduction

Agriculture has been playing a critical role in the nation's economic growth and development. It contributes to a livelihood as an economic activity and as a provider of a suitable environment for human life, making the sector a vital tool for economic growth and development. It employs more than 40% of the active labor force worldwide. Agriculture provides a livelihood for an estimated 86 percent of rural people in sub-Saharan Africa. It employs 1.3 billion small-scale farmers and landless laborers [1].

Agriculture is used as a source of growth for the country's economy, as seen by the promotion of private-sector investment opportunities, and as a major driver of agriculture-related industries. Because agriculture is a source of income for the majority of the rural poor, it aids them in achieving food security. The majority of the population of sub-Saharan Africa, in particular, lives in rural areas where poverty and deprivation are extreme. Around 70% of the rural poor are believed to rely on agriculture for their living, either directly or indirectly [2]. Agriculture accounts for around 86 percent of Ethiopia's overall export profits [3]. The sector makes a substantial contribution to the national economy and provides a solid platform for future growth.

In Ethiopia, soil erosion and diminishing soil fertility are the two most significant problems or bottlenecks to agricultural productivity and economic progress [4]. According to research findings, the primary drivers of climate variability were variations in crop yields, soil fertility loss, water scarcity, and crop diseases [5–7]. The average annual soil removal across the country was projected to be around two billion tons [4]. As a result, it is vital to use a technique that promotes soil fertility while also preventing erosion and introducing crop insurance programs in the region [8]. Soil conservation and organic fertilizer use are two of the best solutions for addressing these concerns, increasing productivity, and subsequently improving smallholder market participation by producing surplus products. Ethiopia aspires to develop, and one technique for doing so is agricultural reform. As a result, organic fertilizers, such as manuring technologies and the utilization of adaptive crops, should be used to increase agricultural productivity. Fertilizers are made from organic materials, and the adoption of this technology is important in creating more income and improving the well-being of smallholder farmers, which helps to alleviate poverty.

Agriculture in Ethiopia accounts for the majority of the economy and has stronger ties to the rest of the economy than to the nonagricultural sector. Due to low soil fertility, farmers in rural areas of Ethiopia are less productive. As a result, increasing smallholder farmers' productivity through the use of better agricultural technology is critical to transforming Ethiopia's agriculture from subsistence to market-oriented output [9]. The implementation of agricultural technology is a crucial step toward enhancing agricultural output and, in turn, the level of food security [10–12].

Previous studies made a research on the determinants of adoption of different agricultural technologies as the whole and at individual crop level [13–21], respectively. However, the applicability of different agricultural technologies depends on the socio-economic capability of farmers. Ethiopia's government has implemented a variety of agricultural policies to increase smallholder farmers' productivity and income, including herbicides, improved seed, irrigation, row planting, and the use of inorganic and organic fertilizers. Even though Ethiopia's government tries to implement the aforementioned agricultural technologies, due to the incapability of farmers to purchase modern agricultural inputs, the majority of the agricultural technologies have not been implemented. Organic fertilizer is more cost-effective (less expensive) and long-lasting than chemical fertilizer. Because it requires less skill, farmers can obtain this type of fertilizer at a lesser cost and prepare it on their farms. However, in most regions of Ethiopia, including Moretna Jeru District (study area), organic fertilizer use is still minimal. The usage of manure as a replacement is crucial [22]. To the best of the researcher's knowledge, scant research has been conducted on the determinants of organic fertilizer adoption in Ethiopia, and nothing in the study area. Therefore, the main objective of this study was to investigate factors that influence the adoption (use) of organic fertilizer technology in Moretna Jeru District.

2. Materials and Methods

2.1. Study Design, Period, and Description of Area. The study was conducted at Moretna Jeru District of the North Shewa Zone, which is located 195 km north of the capital city of Ethiopia, Addis Ababa. Moretna Jeru is one of the districts found in North Shewa Zone of the Amhara region state, Ethiopia. It was named after the historic area of Shewa, Moret, which was located between the Jamma River and Shewa Meda District. Moretna Jeru is bordered on the south by Siyadebrina Wayu, on the southwest by Ensaro, on the northwest by Merhabete, on the northeast by Menz Keya Gebreal, and on the east by Basona Werana. The study area's locations are 39°19′24″E and 10°6′2″N, with an altitude range of 1,500 to 2694 m above sea level and an annual rainfall of 850 mm, with temperatures ranging from 5.2°C in November to 28.8°C in July [23]. Moretna Jeru District has a total population of 110,927 of which 58,484 are males and 52,443 are females [24]. The district is 706 square kilometers in size. More than 87 percent of the land in this district is suitable for cultivation. A combined crop-livestock agricultural system characterized the farming system [24]. Farmers in the district grow a variety of crops to supplement their family's food supply and offset other household expenses. In Moretna Jeru District, organic fertilizer technology is only applied in rural parts of the district. Because of the availability of manure, the study was limited to the rural areas of Moretna Jeru District.

2.2. Sampling Technique and Sample Size Determination. To find respondents, we used purposive and simple random sampling approaches. In the first stage, in collaboration with the District's Agricultural Office, manure adopter (user) kebeles were identified, and three kebeles were chosen at random. Those Kebeles were namely Yewelo, ymedeb, and lamwasha. Then, 192 samples were chosen at random from the three kebeles that had been chosen. The Yamane formula was used to calculate the number of sample households. If the target population in the study area is known, the Yemen formula is advised [25].

$$n = \frac{N}{1 + N\left(e^2\right)} = \frac{3120}{1 + 3120\,(0.07)^2} = 192. \tag{1}$$

In the above equation, n is the sample size, N is the population size (total number of the households in three kebeles), and e is the acceptable margin of error (level of precision). The margin of error shows the percentage at which the behavior of the sample departs from the total population.

2.3. Data Types, Sources, and Methods of Data Collection. The study was based on both primary and secondary data. A systematic questionnaire interview schedule was used to obtain primary data. Cross-sectional data collected from randomly picked households were the primary source of primary data for this investigation. Secondary data were gathered from reports of comparable research, and information was gathered at various Woreda agricultural office levels. The Internet, books, unpublished materials, journals, official publications, and reports of international and regional organizations were also used to access important literature on the adoption of organic fertilizer.

2.4. Data Management and Statistical Analysis. For analysis, the data were cleaned, coded, and imported into Stata version 13. The results were presented using descriptive and inferential statistical approaches. Farmers' decisions to apply organic fertilizer are influenced by a variety of factors, according to an econometric model. Because the outcome variable data in this study are binary, the researcher used the

Table 1: Comparison between key socio-economic characteristics by adoption category.

Variable name	Adopter ($n = 73$)		Nonadopter ($n = 119$)			t-Test value
	Mean	SD	Mean	SD	Overall mean	
(1) Age	57.5	10.4	57.2	9.5	57.4	-0.35^{ns}
(2) Extension contact	4.45	1.7	2.6	1.14	3.3	-8.88^{***}
(3) Household size	7.45	1.86	4.9	1.49	5.89	-10.3^{***}
(4) Farm size	6.22	1.54	3.4	0.83	4.48	-16.42^{***}
(5) Household income (ETB indicates Ethiopian currency birr)	29654	6916	26156	6476	27486	-3.5^{***}
(6) Tropical livestock unit (TLU)	5.8	1.13	2.6	0.7	3.8	-24.15^{***}

Note. ***indicates significance at a 1% probability level; ns indicates nonsignificance; and SD denotes standard deviation. Source: own survey data (2020/21).

probit model. The probit model is represented as Prob $(y = 1|x) = \Phi(x\beta)$, where Φ indicates the cumulative standard normal probability distribution function. The probit model assumes that the function $F(\cdot)$ follows a normal (cumulative) distribution, $F(x) = \Phi(x) = \int_{-\infty}^{\infty} \varphi(z)\mathrm{d}z$, where $\varphi(z)$ is the normal density function,

$$\varphi(z) = \frac{\exp\left(-\left(z^2/2\right)\right)}{\sqrt{2\pi}}. \tag{2}$$

Marginal effects for the probit model: $(\partial p/x_j) = \varphi(x\prime\beta)\beta_j$.

The probit model can be derived from a latent variable model. Let y^* be an unobserved or latent variable determined by $y^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_i$.

$$Y_i = X_i\beta_i + \mu_i, \quad \mu_i \approx N(0, 1), \tag{3}$$

$Y = 1$, if $y^* > 0$—adopter of organic fertilizer; $Y = 1$, if $y^* \leq 0$—nonadopter of organic fertilizer, where Y_i is the latent dependent variable, which is not observed. X_i are vectors of variables that are expected to affect the probability of adoption of the organic fertilizer. β_1 is a vector of an unknown parameter in the adoption equation. U_1 is residuals that are independently and normally distributed with zero mean and constant variance.

3. Results and Discussion

3.1. Descriptive Analysis. To analyze, compare, and check the association of dependent variables with independent variables, descriptive statistics (means, standard deviation, frequencies, and percentages) and inferential statistics (independent t test and chi-squared test) were used in this study. The chi-squared test and frequency counts are used to offer a descriptive comparison between categorical variables and dependent variables. Organic fertilizer is one of the agricultural technologies that have been believed to lower direct production costs, improve environmental benefits, and raise crop yields, according to [26]. Despite these advantages, farmers in Moretna Jeru District use an organic fertilizer at a low rate. Adopters made up about 38% (73 sample households) of the total sampled farmers in Moretna Jeru District.

The demographic and socio-economic characteristics of the sampled respondents are presented in this section. These qualities have been proven to be extremely useful in terms of clearly displaying the respondents' different backgrounds and the impact that this diversity has had on the descriptive and econometric outcomes. The results of continuous socio-economic variables are given in Table 1. Extension service refers to training and advice provided to the farmers mainly by development agents and other agricultural specialists. It was measured in terms of the frequency of farmers' contact with extension workers/experts during the previous agricultural season. The survey result indicated that the overall average frequency of extension contact was about 3.3 per season (Table 1).

In comparison, organic fertilizer adopters had an average frequency of extension contact of around 4.5 every production season, while nonadopters had an average of about 2.6. At a 1% level, the difference in average extension contacts between organic fertilizer adopters and nonadopters (1.9) was significant. The findings suggest that organic fertilizer adopters had greater access to extension services on average than nonadopters, implying that the higher frequency of extension contact may have influenced organic fertilizer adoption. Farmers that have more frequent interaction with agricultural experts are more likely to adopt agricultural innovations, according to [26]. The average age of the sample household head is 48 years, according to the findings.

In terms of farm size, the average farm size among the households examined was 4.48 tsimad. 4tsimad is equivalent to 1 hector of land. Organic fertilizer adopters possess around 6.21 tsimad of farmland, whereas nonadopters own approximately 3.4 tsimad (Table 1). Farmers with greater farm sizes are more likely to use organic fertilizer, according to the current study. The results showed that households with more farms were more likely to utilize organic fertilizer, probably because the marginal cost was lower. At a 1% level, the mean difference in farm size between organic fertilizer adopters and nonadopters of organic fertilizer was significant.

According to [26], an increase in cultivation plots is linked to financial constraints for smallholder farmers in Ghana, resulting in lower chemical fertilizer adoption. In Ethiopia, less chemical fertilizer could lead to increased organic fertilizer use. The outcome of this study was the polar opposite of the outcome of the previous study [26]. The main reason for the disparity in outcomes between the two investigations was differences in technology. This suggests that excrement was received from animals in the study area, and animals require feed. As a result, some land is required

Table 2: Comparison between key socio-economic characteristics by adoption category.

Variable name	Adopter ($n = 73$)		Nonadopter ($n = 119$)		Chi-squared test
Attribute	Frequency	(%)	Frequency	(%)	
Credit access					
Yes	12	16.4	75	63.03	39.6***
Otherwise	61	83.56	44	36.97	
Off-farm income					
Yes	29	39.7	49	41.2	0.039ns
No	44	60.27	70	58.8	
Soil fertility					
Bad	25	34.3	3	2.5	
Medium	41	56.2	83	69.8	
Good	7	9.6	33	27.7	39.7***
Ownership of land					
By title deed	65	89.04	50	42.02	0.148ns
Ranted land	8	10.96	69	57.98	
Gender					
Female	17	23.3	28	23.5	
Male	56	76.7	91	76.5	0.001ns

Note. ***indicates statistically significant differences at a 1% level, and ns implies no significance. Source: survey data (2020/21).

for animal feeding. Therefore, having a large land size increases the likelihood of organic fertilizer adoption compared to sample households with small land sizes.

The average annual household income from the farm was found to be 27486.46 birr across the respondents. The average farm income among respondents who used organic fertilizer was around 29654.79 birr. The average agricultural income of nonadopters of organic fertilizer was 26156.3 birr (Table 1). The fact that organic fertilizer adopters have a higher average farm income may explain why they are more dependent on agricultural operations. Farmers are increasingly worried about yield-increasing technology, such as the use of organic fertilizer, because of their dependence on agricultural activity (manure).

In terms of household size, the respondents' average household size was found to be 6. The average household size was roughly 7 among organic fertilizer users, compared to about 5 among nonadopters. When we compare adopters to nonadopters, the average household size was larger (Table 1). The results are supported by the fact that organic fertilizer requires more labor than other types of fertilizer. According to Ajewole [27], having a larger family provides more opportunities to apply organic fertilizer technology.

According to the findings of this study's survey, the average livestock unit among farmers was around 3.849 TLU units. Adopters had an average livestock unit of 5.823, whereas nonadopters had an average livestock unit of 2.638 (Table 1). It is known that the cattle are the primary means (source) for preparing the organic fertilizer. As a result, higher average animal holdings among adopters may have accelerated organic fertilizer adoption relative to farmers with lower livestock holdings. The change was substantial at a 1% level, demonstrating the relevance of animals in organic fertilizer adoption. The technology was practiced in the research region by preparing byres (corrals) for their animals on their land. In accordance with the availability of potential resources (animal excrement) for livestock, the fact that the livestock has the potential resources (animal manure) for organic fertilizer preparation could make the number of livestock units to be quite important for the adoption of organic fertilizer [28].

3.2. Comparison between Socio-Economic Characteristics by Categorical Variable. In terms of gender, female-headed households made up 23.29 percent of organic fertilizer adopters, compared to 76.71 percent of male-headed households. Nonadopters of organic fertilizer, on the contrary, made up roughly 23.53 percent of households, while the remaining 76.47 percent were led by men (Table 2). The findings show that the proportion of male-headed families was higher than the proportion of female-headed households among organic fertilizer adopters and nonadopters. According to [29], men heads are more likely than female heads to attend community meetings and visit demonstration plots or research sites. As a result, male-headed households may utilize organic fertilizer more frequently.

According to [30], education is a potential source of knowledge that enables people to comprehend instructions, gain access to, and grasp new technology information. In this study, 80.82 percent of organic fertilizer adopters were illiterate, whereas 13.70 percent and 5.48 percent of organic fertilizer adopter households, respectively, had read and write and elementary school educational levels. Nonadopters had educational levels of 79.83 percent, 19.33 percent, and 0.84 percent, respectively, of illiteracy, read and write, and primary school. The prevalence of illiterate households was found to be higher among organic fertilizer adopters and nonadopters than among read-write and primary educated-headed families, according to the data (Table 2).

In terms of marital status, the adopters had 78.08 percent married household heads, with the remainder of 15.07 percent and 6.85 percent being widowed and divorced, respectively. Nonadopters, on the contrary, were married, widowed, and divorced in proportions of 78.99, 14.29, and

Table 3: Determinants of adoption decision of organic fertilizer.

Variables	Coefficient and std. err.	Marginal effect and standard error	Variable mean value
Demographic factors			
(1) Gender (male = 1)	0.137 (0.509)	0.039 (0.147)	0.766
(2) Age (years)	0.025 (0.019)	0.007 (0.006)	57.354
(3) Educational level			
Read and write_2	−0.521 (0.563)	0−.150 (0.164)	0.172
Primary school_3	0.431 (0.479)	0.124 (0.134)	0.026
(4) Off-farm income (ETB)	−0.686* (0.354)	−0.198* (0.096)	0.406
(5) Marital status			
Widowed_2	−1.900** (0.808)	−0.547** (0.230)	0.146
Divorced_3	−0.457 (0.599)	0−.132 (0.173)	0.068
(6) Household size	2.458*** (0.805)	0.707*** (0.247)	1.712
Farm-level factors			
(7) Farm size()	2.614*** (0.668)	0.753*** (0.179)	1.425
(8) Household income (ETB)	−0.669 (1.157)	−0.193 (0.340)	10.202
Fertility (medium)	−0.280 (0.414)	−0.080 (0.119)	0.646
Farm fertility (God)	−1.655 (0.438)	−0.477*** (0.128)	0.208
(9) Ownership of land	1.324 (0.594)	0.381** (0.169)	1.401
(10) Tropical livestock unit	1.242 (0.234)	0.358*** (0.061)	3.849
Institutional factors			
(11) Farm credit	−1.820 (0.449)	−0.524*** (0.121)	0.453
(12) Extension contact (hour)	0.611*** (0.152)	0.176*** (0.038)	3.3125
Constant	−10.345 (12.549)		
Observations	192		192

*** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. Log likelihood = −9.9570027; Prob > chi^2 = 0.0000; Wald chi^2 [17] = 91.00; pseudo-R^2 = 0.9219. Source: survey data (2020/21). *Note.* ETB indicates Ethiopian birr.

6.72 percent, respectively. The percentage of married sample households was higher among organic fertilizer adopters and nonadopters than among divorced and widowed sample household heads, according to the findings. Farmers' concern for home welfare grows as a result of marriage, according to [31]. This enhances farmers' participation in agricultural technology adoption. Giving credit is one of the government's methods (mechanisms) for reducing poverty in Ethiopian rural households (Table 2).

In the study area, access to credit was obtained by making a group only (it was not obtained separately) from the group after receiving the money; if one could not pay, the remaining members were responsible for paying that person's debit. The survey result indicated that organic fertilizer adopters used credit less than nonadopters. They become less ambitious to obtain credit access as a result of their fear of this form of risk. Nonadopters had gotten, on average, more credit than adopters. Amhara Credit and Saving Institution (ACSI) and relatives/friends were the main sources of credit for the sample families in the study area.

In this study, soil fertility refers to a family's opinion of their land's fertility. According to Table 2, 34.25 percent, 56.16 percent, and 9.52 percent of organic fertilizer adopter households considered their farms to be bad, medium, or (good) fertile, respectively. Nonadopters thought their farms were bad, medium, and fertile (good) in proportion to 2.52 percent, 69.75 percent, and 27.73 percent, respectively. According to the findings of this study's survey, farmers with medium and low agricultural fertility are more likely to use organic fertilizer. Low farm fertility has been recognized as a key barrier to agricultural productivity by an increasing number of farmers in Ethiopia, according to [32]. This shows that one of the reasons for using organic fertilizer is the farm's low fertility.

The majority of the households owned land with a title deed. According to the findings, 89.04 percent of organic fertilizer adopters and 42.02 percent of nonadopters hold their land by title deed, while 10.96 percent of adopters and 57.98 percent of nonadopters own their land through the rented property. The findings suggest that organic fertilizer adopters had more landownership than nonadopters and that landownership by title deed boosts organic fertilizer adoption rates when compared to landownership through rent.

3.3. Factors Affecting the Adoption of Organic Fertilizer (Manure). A probit model is used to determine the characteristics that influence organic fertilizer adoption decisions. The variables (frequency of extension contact, farm size, off-farm income, the number of livestock units, household size, landownership by title deed, farmer perception of farm fertility, and marital status) were found to have a significant impact on the farmer's decision to adopt manure technology, as shown in Table 3. In this study, the probit model is used to examine the decision to use organic fertilizer (manure). Farmers were given 1 if they use organic fertilizer and 0 if they do not. The probit model's results are shown in Table 3.

The frequency of extension contact was found to have a positive impact on the adoption of organic fertilizer. One additional contact hour with extension specialists enhances the likelihood of organic fertilizer uptake by 17.6 percent, according to the marginal effect of the probit model results. One of the most essential functions of the extension service is to increase farmers' understanding of agricultural productivity by providing them with important information on agricultural technology adoption. The findings were consistent with those of ([26]), who claimed that farmers who have regular contact with agricultural experts are more motivated to participate in agricultural technology adoption because of the extensive knowledge they may receive from the experts. As a result, the findings of the study suggest that enhanced information dissemination through extension workers could encourage organic fertilizer use by raising knowledge of the benefits of new technology. As a result, the more frequently a family meets with extension workers, the more probable it is that they will use organic fertilizer. At a 1% level, the data were statistically significant. Farm size had a substantial positive effect on adoption decisions for organic fertilizer (manure) technology in this study ($p = 0.001$).

According to the survey data probit model's marginal effect, a tsimad increase in farm size increases the likelihood of using organic fertilizer by 75.3 percent (Table 3). Organic fertilizer is often used by farmers with larger farms because it is less expensive than inorganic fertilizer. These could have influenced farmers in the study area to utilize organic fertilizer. The findings of this study matched those of another study [26]. They pointed out that owning farmland increases the certainty of future access to investment returns, boosting the likelihood of adopting organic fertilizers such as compost.

Off-farm income had a negative and significant impact on farmers' likelihood of using organic fertilizer ($p = 0.053$), as expected. According to data from the marginal effect, each additional dollar made from nonfarm activities reduces the likelihood of farmers utilizing organic fertilizer by 19.8%. Off-farm farmers are less likely to spend (invest) time in employing organic fertilizers. Rural households' nonfarm incomes can come from casual labor hire, wage employment, self-employment, or remittances, all of which have a negative correlation with the use of organic fertilizers.

According to the findings, increasing the quantity of livestock by only one animal increases the likelihood of using organic fertilizer by 35.8%. At a 1% level, the findings were statistically significant. The positive relationship between livestock ownership and organic fertilizer adoption may be explained by the availability of more animals as the number of livestock units increases. As a result, households with a large number of livestock herds are more likely to use organic fertilizer and receive more manure. Organic fertilizer could be made from animal manure. It is the most crucial component in the composting process. This was identical to the conclusion reached by [28]. Because they have more access to animal manure, households with a lot of animals are more likely to utilize organic fertilizer, according to the researchers. Domestic animals are a valuable source of organic manure that can be utilized as an alternative to chemical fertilizer, according to [33]. Credit is a critical source of income for agricultural technology adoption. The Amhara Credit and Saving Institution (ACSI) is the most popular source of credit in Moretna Jeru District.

At a 1% level, the survey data demonstrated that the availability of credit has a negative and significant impact on farmers' probability of adopting organic fertilizer. The use of organic fertilizer (manure) has reduced by 52.4 percent as a result of a transition from a lack of credit to access to credit. The negative indicator implies that having financial resources reduces the likelihood of adopting organic fertilizer. Because the majority of the sample households in the research area were illiterate and had no knowledge of how to manage the money gathered from borrowers, several of them wasted time and money by spending the borrowed money on booze. They grow frail and insensitive as a result. This causes them to become weak and less sensitive when it comes to organic fertilizer adoption, which is labor-intensive and requires patience and time. As a result, credit accessibility would limit the probability of organic fertilizer adoption.

Landownership had a statistically significant influence on organic fertilizer adoption at a 5% level. When compared to rent-based ownership, title deed ownership improved the likelihood of organic fertilizer usage by 38 percent. This suggests that individual sample households with landownership by title deed are more likely to utilize organic fertilizer than those with landownership via rent. The positive sign indicated that having title deed ownership gives sample farmers confidence (guarantee) in using organic fertilizer. Because the land was purchased through rent, they had no idea what happened the next year or whether the land was passed to other farmers. They choose to use inorganic fertilizer instead of organic fertilizer for this reason, as organic fertilizer is labor-intensive and time-consuming.

Farmers' perceptions of agricultural fertility had a negative and significant impact on their decision to use organic fertilizer, with a "$p = 0.001$" significance level. Farm fertility in this study refers to the household's assessment of their farm's fertility. According to the marginal effect of the survey data regression result, having a positive perception of soil fertility reduces the likelihood of organic fertilizer adoption by 47.7% when compared to having a negative perception of soil fertility.

Farmers' insights about their land soil fertility were based on the previous year's production period or their expectations at the time of plowing. If the land produces more in the preceding year or two, they consider it fertile and do not need to use any more agricultural technology, such as the use of organic fertilizer (manure). However, if the farmer believes his farm's fertility is low, it is concerned about obtaining and using any agricultural technology/mechanisms, such as manure adoption, that improve soil fertility and crop productivity.

At a 5% significance level, the econometric result revealed a negative and significant relationship between the sample household head's marital status and adoption of organic fertilizer (manure), as hypothesized. When comparing married and widowed households, the marginal effect of the probit model regression result revealed that being widowed reduced the likelihood of organic fertilizer adoption by 29%. The negative sign indicates that manure preparation requires a lot of effort in the study region. The land chosen for manure adoption by the sample household was far from home, and there were several wild animals in the area, including hyenas, tigers, and lions, who offended/attacked humans.

The above-mentioned wild creatures attempted to kill and consume the domestic animals within the silo/byre at night. By and large, widowed women did not participate much more unless they had children who lived with their mothers and were mature enough to use technology.

According to the findings in Table 3, household size had a favorable and significant impact on the likelihood of organic fertilizer adoption in the research region. Organic fertilizer adoption is labor-intensive or requires a large household. Organic fertilizer adopters had a larger family size than nonadopters of organic fertilizer, according to descriptive statistics (Table 1). According to the marginal effect of the probit model, adding one more family member/man who was mature enough to accept this technique raised the likelihood of organic fertilizer (manure) adoption by 70.7 percent. The positive indicator indicated that individual sample families with more family members eligible for this job encourage farmers to utilize manure and generate enough production to meet the family's basic needs.

4. Conclusions and Policy Implications

The use of organic fertilizer increases smallholder farmer income/productivity and enhances soil health. Despite its importance, the district of Moretna Jeru has a substantially lower adoption rate of this technology. Using the binary probit model, this study attempted to determine the primary determinants influencing organic fertilizer usage. Organic fertilizer adoption was positively influenced by extension contacts, tropical livestock units, landownership by title deed, farm size, and household size, while other factors such as off-farm income, credit access, soil fertility, and marital status of sample household negatively influenced organic fertilizer adoption.

The results of this study's conclusions were based on cross-sectional data from the years 2020/21. Time series data should be used to examine the impact of both the currently significant variables and the nonsignificant variables. The adoption of organic fertilizer in various parts of the nation needs to be further investigated. Additionally, it was found that the majority of farmers were unsure of how frequently organic fertilizer should be applied and I recommended the upcoming studies on investigating the determinants of other technological package in agriculture (i.e., improved seed with pesticide, improved seed with row planting, pesticide with row planting, and the combinations of improved seed, pesticide, and row planting) adoption decisions. Thus, additional research is needed to close these gaps.

The study made the following policy recommendations based on the above findings: government and other volunteer groups should pay special attention to agricultural experts. In addition to assigning extension workers to the appropriate kebeles in the district, special emphasis should be given to ensuring that farmers receive the services they expect. It would be better if the government and other nongovernmental organizations provided frequent opportunities for extension agents to improve their skills in packaging and introducing new technologies.

Organic fertilizer adoption is more likely in households with more tropical livestock units. Organic fertilizer is less likely to be used in households with little or no livestock. Manure fertilizer, in particular, necessitates a large number of animals and therefore was considerably better for farmers' income. As a result, it is preferable if the government provides chances for farmers to obtain financing by pledging their property as security for the purchase of cattle, hence increasing manure adoption because, as the researcher found in the study area, farmers were unable to receive the credit they required due to the restrictive nature of the credit standards. Organic fertilizer adoption, such as manure, was a significant agricultural tool in the research area for increasing farmers' farm productivity.

As a result, smallholder farmers should be encouraged to use organic fertilizer to boost their farm revenue, improve their living conditions, and ensure environmental sustainability. The government and other nongovernmental groups encourage farmers to use more manure in the future by offering various incentives, and the government promotes the employment of specific agricultural experts for manure adoption. In general, organic fertilizer has the potential to boost farmers' income. As a result, smallholder farmers should be encouraged to use organic fertilizer to improve farm income and living conditions.

Data Availability

The datasets used to support this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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