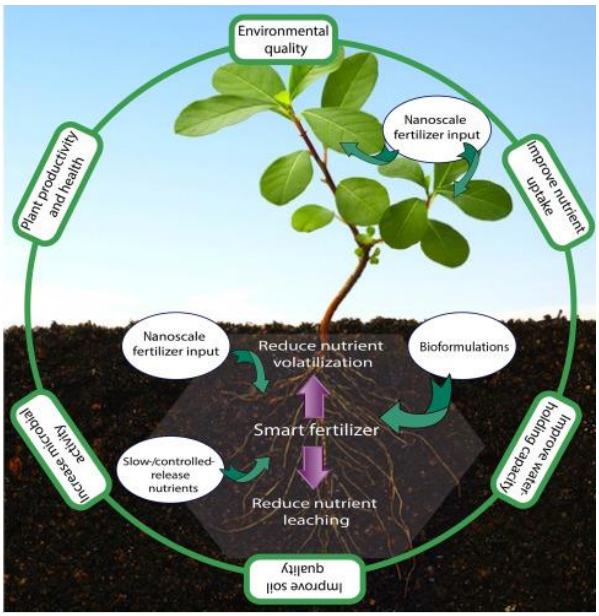
PREVENTION OF OVERUSE OF CHEMICAL FERTILIZERS IN BANGLADESH



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CERTIFICATE

The policy paper on Prevention of Overuse of Chemical Fertilizers in Bangladesh written by Md. Manik Sarker has my approval as mentor assigned by BIGM to submit the paper.

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EXECUTIVE SUMMARY

Bangladesh is a country with a high population density and limited arable land, yet its agriculture sector has seen significant growth in the past 30 years. This is credit goes to our farmers, who are the backbone of agriculture and effective implementor of agricultural technologies.

To boost agricultural production in Bangladesh, one strategy is to increase the use of modern agricultural inputs like chemical fertilizers and pesticides. According to data from the Food and Agriculture Organization (FAO), the total consumption of chemical fertilizers in Bangladesh was only 15 kg per hectare in 1970, but by 2020, this had increased to 320.9 kg per hectare. The average recommended dose of chemical fertilizers in Bangladesh is 181 kg per hectare stated in Fertilizer Recommendation Guide - 2012. However, the data shows that farmers are using a significantly higher number of chemical fertilizers to achieve higher yields.

The overuse of chemical fertilizers in Bangladesh has become a pressing issue in recent years. Bangladesh is an agriculture-based country where most of the population relies on farming for their livelihoods. To increase crop yields, farmers have been relying heavily on chemical fertilizers. However, this has led to soil degradation, water pollution, and health hazards for both farmers and consumers. The overuse of chemical fertilizers has also resulted in the depletion of soil nutrients, leading to reduced soil fertility over time. The negative impact of chemical fertilizers on the environment and human health has become a cause for concern, highlighting the need for alternative and sustainable farming methods in Bangladesh.

The goal of this paper is to examine the reasons behind the excessive use of chemical fertilizers in Bangladesh and suggest the most practical policy solution to address this issue. The objective is to ensure food security and align with the United Nations Sustainable Development Goals (SDGs) of Zero Hunger (SDG 2), Good Health and Well-being (SDG 3), Clean Water and Sanitation (SDG 6), Responsible Consumption and Production (SDG 12), and Life on Land (SDG 15) by 2030.

In this policy paper, the problems, solutions, and justifications have been organized into different chapters. Chapter One provides an overview of the situation and challenges related to the overuse of chemical fertilizers in Bangladesh.

The main problem of excessive use of chemical fertilizers in Bangladesh is due to government subsidies on fertilizers, the absence of efficient and scientifically sound fertilization methods, and a lack of capacity and awareness among farmers in the country. To overcome these challenges, it is important to find an efficient and environmentally friendly fertilization method that will reduce overuse and protect our environment from harm.

The issue of excessive use of chemical fertilizers in Bangladesh was studied using a qualitative approach that involved reviewing literature, academic journals, workshop proceedings, existing policy papers, reports, articles from local and international newspapers, websites, publications, and best practices from neighbouring countries. The analysis also took into consideration the perspectives of stakeholders and included a SWOT and PESTLE analysis.

To thoroughly understand the context and the main problem, I used a scientific method called context exploration and problem tree analysis. This involved dissecting the core issue and determining its causes and their effects on overuse of chemical fertilizers in Bangladesh.

After examining the root causes of the issue through a problem tree analysis, three potential policy options were proposed. These options are Option 1: Replace of traditional fertilization methods by Fertigation, Option 2: Increase fertilizers price by reducing government subsidy, and Option 3: Capacity building & awareness raising. Out of these viable options, the best one was selected based on its operational feasibility and effectiveness.

After that I define all three solution and to find out the most viable policy option impact and risk analysis are done separately. Then I did multi-criteria analysis to identify the preferred policy option by giving value and weight. Finally, I ranked all the three options based on score given by risk analysis, PASTLE analysis and multi-criteria analysis (MCA) and found that Policy option 1: Replacing traditional fertilization methods with Fertigation is ranked first, followed by Policy option 3: Capacity building and awareness raising in second place, and Policy option 2: Increasing fertilizer prices by reducing government subsidies came in third.

For the top-ranked policy option, I identified a risk of farmers not accepting or being unwilling to implement it. To address this risk, I plan to use a motivation and belief-based approach, including on-field demonstrations, to encourage adoption.

After choosing the best policy option, I created a plan to make sure it's successfully put into action. This plan includes steps for implementing the policy, monitoring its progress, and evaluating its effectiveness. This will be done through a pilot project.

Finally, this policy paper proposes the adoption of a fertilization method called Fertigation as a solution to reduce the excessive use of chemical fertilizers in Bangladesh. Fertigation involves applying fertilizers through an irrigation system and is considered an effective means to achieve this goal. The implementation of these policy measures is crucial to meeting the Sustainable Development Goals by 2030, as well as ensuring food security and protecting soil health, human health, and animal health.

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CHAPTER I: INTRODUCTION

1.1 Introduction and background of the issue

Agriculture, the main sector in Bangladesh where half of the population is primarily engaged in agriculture, with more than two-third of its land are dedicated to crop cultivation. The population of the country growing up day by day to feeding them agriculture sector is now facing many challenges. As Fertilizers is considered the primary input for crop production. Fertilizers play a crucial role in supplying the necessary plant nutrients for enhancing the yield of food grains and other crops in agriculture. Fertilizer helped increase crop production by at least 50% in the 20th century [1]. Chemical fertilizers are increasingly being used on crops around the world, but overuse is causing significant harm to both the environment and human health [2].

The cultivable land of Bangladesh decreases by one percent annually due to accommodation of growing population. As a result, the total cultivated land area is declining, although the cropping intensity of Bangladesh increases due to shifting from single and double cropped area to triple cropped area. This large number of populations needs to be feed which is only possible when we grow more yield per unit area. To grow maximum yield per unit area farmers are applied excessive number of chemical fertilizers in their field. Excessive fertilizer use is a big problem for agriculture in Bangladesh. According to the Fertilizer Recommendation Guide- 2018, farmers are using too much urea, and fertilizer usage has gone up 555% in the last 40 years. This type of consumption of chemical fertilizers are alarming for your sustainable agriculture.

The Food and Agriculture Organization (FAO) reported that in 2020, Bangladesh had a fertilizer consumption of 320.9 kilograms per hectare. Over the period from 1971 to 2020, Bangladesh saw significant growth in fertilizer consumption, increasing from 12.9 kilograms per hectare to 320.9 kilograms per hectare.

Soil health of our agricultural lands has been decreasing day by day. In recent decades, studies have shown that the decline in soil health is due to the excessive and constant use of chemical fertilizers. Farmers use chemical fertilizers to improve crop production, but recent research shows that it is lowering soil quality, which will ultimately decrease soil productivity and make it harder to grow crops in the future.

So, it is the right time to take initiative to stop imbalanced use of chemical fertilizers by the government for sustainable crop production in Bangladesh and to protect soil health, soil-related ecosystem, and environment. Unfortunately, Bangladesh lacks efficient and sustainable fertilization technologies. So, farmers and growers struggle to find effective and environmentally friendly ways during fertigation.

We must formulate policy on sustainable fertilizer management, to prevent excessive and non-judicial use of chemical fertilizers. After that, Department of Agricultural Extension (DAE) implement it at the field level.

1.2 Problem Statement

Excessive and unproportionate use of chemical fertilizers creates detrimental effect to soil, human health, animal health and environment which results in soil degradation, reduces soil fertility and productivity, contaminates air and water.

Overuse of chemical fertilizers releases different greenhouse gasses which are responsible for global warming. As a result of profuse using of chemical fertilizers government need to import in more quantity which create huge pressure on foreign currency.

To reduce the overuse of chemical fertilizers as well as ensuring food security it needs to be addressed and take some effective initiatives for protecting soil health and reduces pressure on foreign currency.

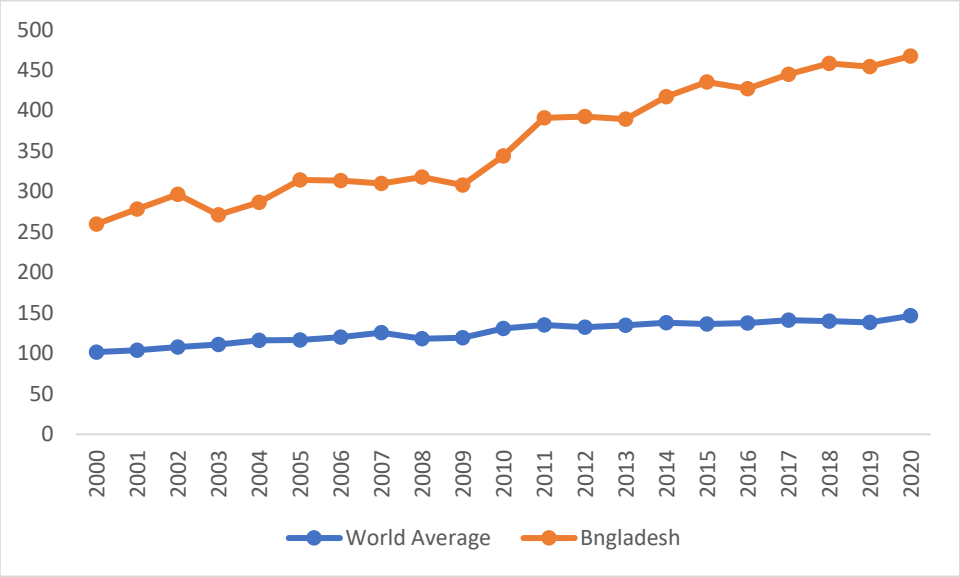


Fig: Fertilizer consumption: world average and Bangladesh, 2000–2020 (Source: Food and Agriculture Organization, electronic files, and web site)

1.3 Objectives of the Study

The core objective of this policy paper is to **find ways to reduce the overuse of chemical fertilizers in Bangladesh**. Here are some of the benefits that can be achieved if we succeed:

- Prevent abuse of chemical fertilizers
- Increase soil health
- Ensure sustainable crop production
- Increases fertilizer use efficiency
- Money saved

1.4 Methodology

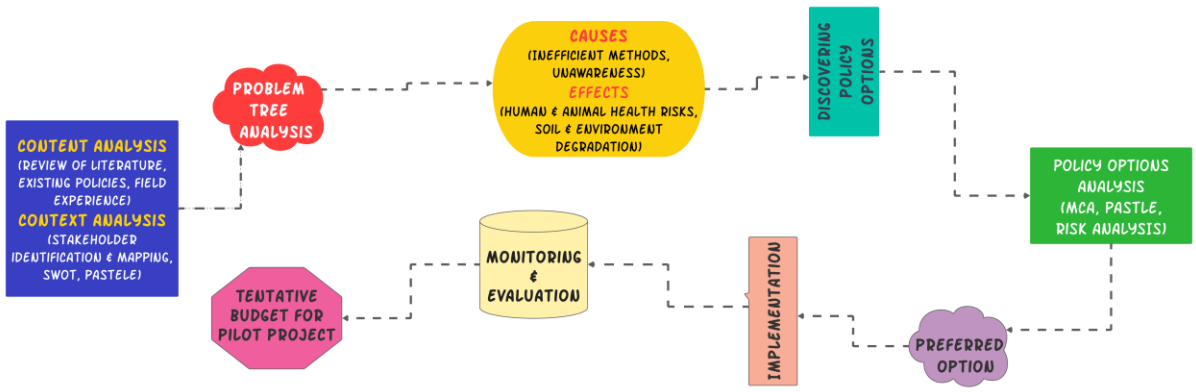
This research is an empirical qualitative in nature. The context of chemical fertilizers overuse has been analyzed by SWOT Analysis, Stakeholder analysis, Stakeholder Matrix, and context Analysis to understand the overall overuse of chemical fertilizers in Bangladesh. Appropriate policy options had identified to reduce overuse of chemical fertilizers in Bangladesh using PESTEL Analysis and multi-criteria analysis (MCA) and each policy option is evaluated by Risk Analysis and Multi Criteria Analysis to recommend preferred policy option for policy implementation.

1.5 Sources of Data

The policy paper is made by using secondary data from different journals, workshop proceedings, papers, policy papers, reports, local and international newspapers, article, and website.

1.6 Policy Model

This policy paper goal is to judicial and efficient use of chemical fertilizers for protecting soil health and reduces fertilizers subsidies by the government. The policy framework can be represented by following diagram:



1.7 Scope and Limitation of the paper

The soil in Bangladesh is incredibly fertile, making it possible to grow a wide range of crops with high yields. There are many hybrid varieties available, making it simple and cost-effective to produce various agricultural products, compared to other developed and developing nations. Bangladesh has become self-sufficient in food production and for sustainability we have choose appropriate fertilization technologies that will ensure our soil health, environment, animal and human health. This policy paper is prepared based on secondary data source it would be best if I can use primary data for making policy decisions. Another limitation is that I found very limited time to make this policy paper.

CHAPTER II: CONTEXT ANALYSIS

2.1 Literature Review

In the early 1950s, Bangladeshi farmers only used organic manures on their crops [3]. During that time, agricultural production was lower, but the agricultural ecosystem system was sustainable and in balance. In 1965, the government started the "Grow More Food" campaign and provided chemical fertilizers and pesticides at discounted prices [4]. In the 1980s, farmers noted that the use of chemical fertilizers and pesticides dramatically improved crop yields, leading to an increase in the frequency of fertilizer application. These practices are still continued [5]. In Bangladesh, farmers use chemical fertilizers to improve crop yield. But they often use more chemical fertilizers than recommended by Bangladesh's fertilizer guidelines [6].

According to Fertilizer Recommendation Guide-2012, The average recommended dose of chemical fertilizers per hectare in Bangladesh is 181 kg. Comparing the applied dose with recommended dose, it is revealed that farmers of the country are using excessive amount of chemical fertilizers to obtain higher productivity [7]. Use of chemical fertilizers kg per hectare of arable land Bangladesh rank 20 among the 161 countries of the world and 1st in South Asian Association for Regional Cooperation (SAARC) countries. It is revealed that farmers of Bangladesh apply around two to five times more chemical fertilizers in production of various crops compared to the recommended amounts [6].

This is because many Bangladeshi farmers are uneducated, untrained, small landowners who are unaware of the impact on their health and the environment. [4]. Farmers in some developing countries use too much fertilizer without consideration due to lack of training on continuous innovations [8]. Bangladesh is one of the developing countries where the use of fertilizers is not sustainable and judicial. On the other hand, some developed countries apply inorganic fertilizers effectively because they are using effective fertilizers management technology [8]. So above literature clearly indicates that there is no doubt about overuse of chemical fertilizers in Bangladesh.

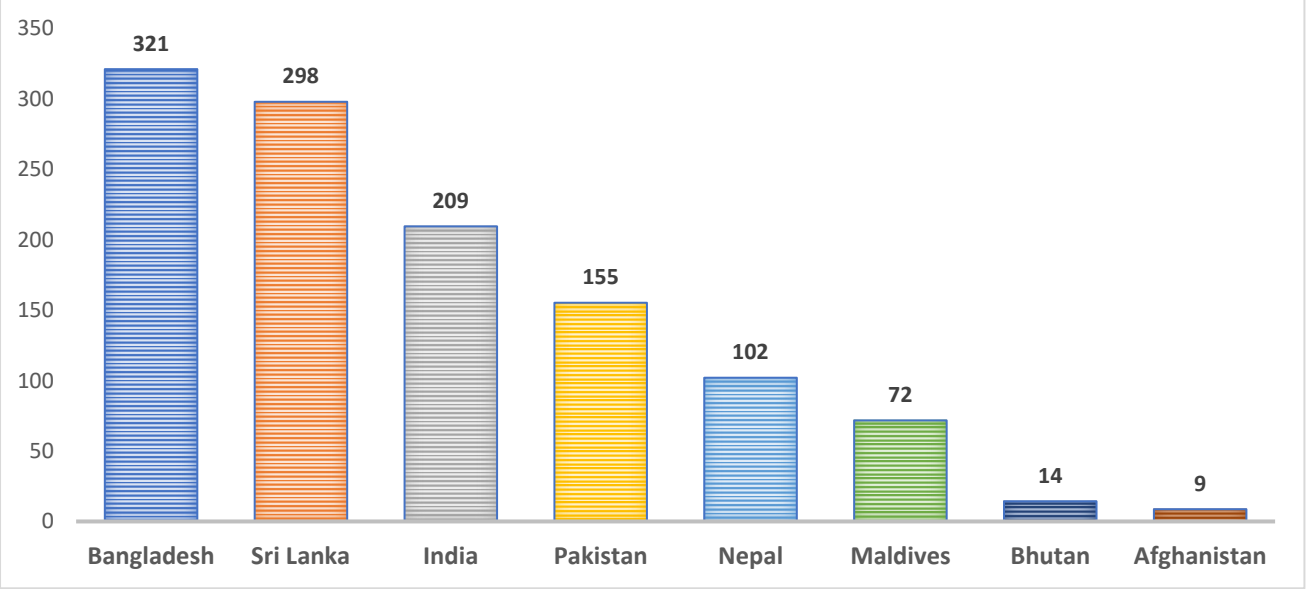


Fig: Fertilizer use, kg per hectare of arable land in 2020 of SAARC countries (Source: FAO)

2.2 Efficient Fertilizer Application Method

There are many reasons for the excessive use of chemical fertilizers in Bangladesh, and one major factor is inefficient methods. Around Seventy five percent of farmers in Bangladesh use the traditional fertilization method broadcasting. The impact of broadcasting fertilizers too widely is strongly linked to excessive use [7].

The traditional method of spreading fertilizers by hand across the surface of fields, known as broadcasting, leads to inefficient fertilization because it cannot control the amount of nutrients being used [7]. Broadcasting increases production costs by about 33%, greenhouse gases by 60%, and decreases yields by about 15-18% [9]. Two-thirds of the urea broadcast in wetland rice production is lost to the environment [9]. Traditional broadcasting methods often result in much of the fertilizer being lost through rain, irrigation, or being transformed by sun radiation. [10].

Bangladesh farmers are accustomed to using higher rates of fertilizer through broadcasting in order to achieve high yields, regardless of the potential environmental harm. In this case, efficient fertilizer application methods and modern technologies may be suitable options to prevent excessive use of chemical fertilizers in Bangladesh. There is a strong connection between widespread use of inorganic fertilizers and lack of technological advancement, insufficient scientific knowledge, a shortage of proper information, and the size of small-scale farming operations. [9].

Fertigation can be an alternative to broadcasting methods. Fertigation involves applying fertilizers through irrigation systems, while top dressing involves applying fertilizers directly to the soil surface. To solve the problem of excessive use of chemical fertilizers, a system of "fertigation" has been developed. This method precisely controls the supply of both nutrients and water to plants and has shown successful results. [11]. The fertigation system provides multiple benefits, including high efficiency in providing nutrients to plants, cost-saving on labor and fertilizer, and being environmentally friendly. It is a more balanced solution to the imbalanced use of chemical fertilizers. [12]. This is widely used in many countries around the world, including Israel, India, China, the United States, South Korea, Japan, Thailand, Vietnam, Malaysia, Indonesia, Philippines, and many others. This method of fertilization has gained popularity in many countries due to its efficiency in delivering nutrients directly to the roots of crops and its ability to reduce waste and leaching.

2.3 Contributions to Achieve Sustainable Development Goals (SDGs)

Though this policy paper suggested the effective policy regarding prevention of overuse of chemical fertilizers, contributes to sustainable development by addressing several Sustainable Development Goals (SDGs). By preventing overuse, the soil remains fertile and can continue to produce food that will ensure food security and help to achieve goal SDG 2 (Zero Hunger). SDG 3 indicate Good Health and Well-being its possible by reducing the use of these chemicals, the risk of contamination is reduced, leading to better health outcomes. SDG 6 (Clean Water and Sanitation) achieve also possible

by preventing overuse, water sources remain clean and safe for use. This policy will also help to Ensure sustainable consumption and production patterns that is the goal of SDG 12. SDG 14 (Life Below Water) will meet by reducing the use of these chemicals, marine ecosystems are protected, promoting biodiversity and sustainable use of ocean resources. Finally, the most importantly this policy will contribute to SDG 15 (Life on Land) through ecosystems remain intact and wildlife continues to thrive, promoting the conservation and sustainable use of land resources.

2.4 Stakeholder Analysis

Many Stakeholders are directly and indirectly involved in overuse of chemical fertilizers in our country. Stakeholder analysis helps to identify and understand the interests, needs, and influence of different groups of people who may be affected by a policy.

2.4.1 Stakeholder List:

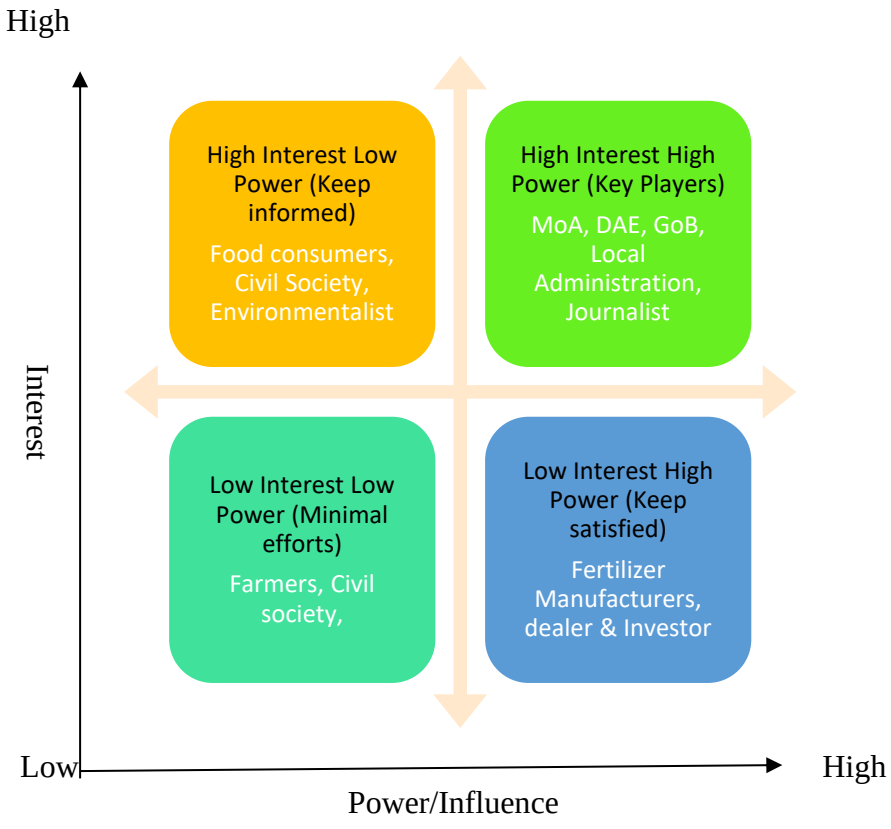
- Farmers
- Fertilizers Dealer
- Department of Agricultural Extension (DAE)
- Bangladesh Agricultural Development Corporation (BADC)
- Bangladesh Chemical Industries Corporation (BCIC)
- Ministry of Agriculture (MoA)
- Ministry of Industries (MoI)
- Electronic and print media
- Consumers (Mass People)
- Fertilizer Manufacturers
- Fertilizers and Pesticides Retailers
- Soil Resource Development Institute (SRDI)
- Bangladesh Agricultural Research Council (BARC)
- Political Parties
- Health & Public Health Department
- Ministry of Environment, Forest, and Climate Change
- Ministry of Food
- Suppliers of Raw Materials

- Investors
- Local Administration
- Farmers Group/ Organization
- Ministry of Public Administration
- Exporter
- Ministry of Fisheries and Livestock
- Transporter
- Bangladesh Fertilizer Association (BFA)
- Extension workers

2.4.2 Stakeholder Role

STAKEHOLDER TYPE	LIST OF STAKEHOLDERS
Approval	Government agencies: Who regulate the production and use of chemical fertilizers to ensure they are safe for the environment and human health.
Supporter	Farmers, Environmental regulatory agencies, Civil society, Consumers, Development partners
Collaborators	Farmers, Local Administration, Farmers Group, National and local media, Relevant departments, political parties
Constrainer	Fertilizer dealers, sub-dealer & retailers, Bangladesh Fertilizer Association
Opponent	Investors, Fertilizer Manufacturers
Beneficiaries	Mass people, Government, Farmers, Consumers, Society
Loser	Investors, Importer

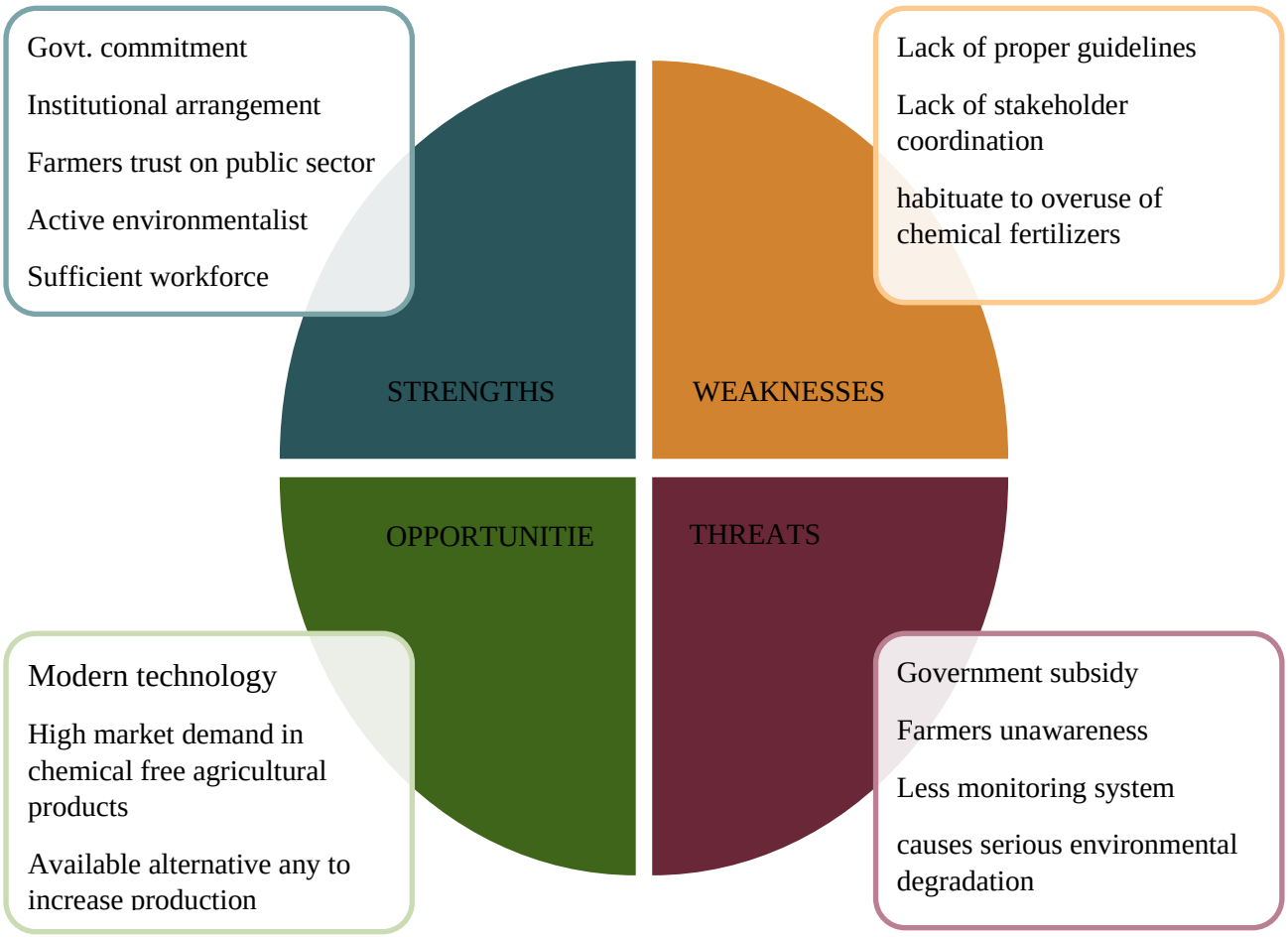
2.4.3 Stakeholder Mapping



2.5 PESTLE Analysis

Political Factors	**For the prevention of overuse of chemical fertilizers strong political commitment and mass people engagement needed.**
Economic factors	Due to overuse of chemical fertilizers huge economic losses occurred every year of Bangladesh government.
Social factors	Citizens will get healthy and quality life
Technological factors	Advanced fertilizers application technology required for the prevention of overuse of chemical fertilizers.
Legal factors	Legal issues are involved.
Environmental factors	Restoration of biodiversity and pollutions free environment for the living being.

2.6 SWOT Analysis



CHAPTER III: PROBLEM TREE ANALYSIS

3.1 Problem Analysis

The problem tree represents the causes (primary, secondary, and tertiary) and effects (primary, secondary, and tertiary) of overuse of chemical fertilizers in Bangladesh. A well-structured problem tree is given below.

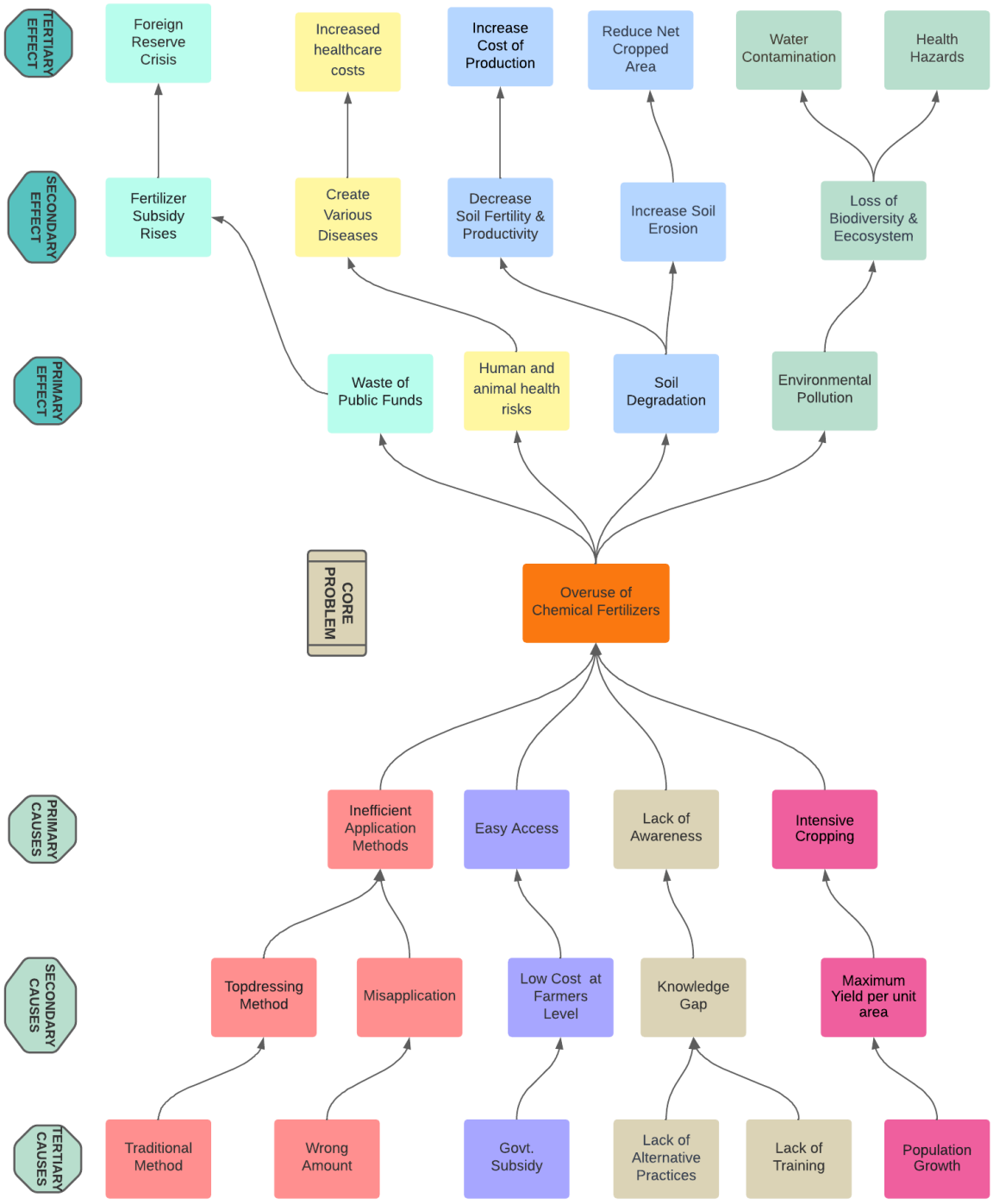


Fig: Problem tree for overuse of chemical fertilizers in Bangladesh

CHAPTER IV: POLICY OPTIONS ANALYSIS

4.1 Probable Policy Options

Based on the analyzed Problem tree, conducting literature review, stakeholders mapping and stakeholders' analysis to migrate the three primary causes of overuse of chemical fertilizer in Bangladesh the following three option have been identified to address the issue overuse of chemical fertilizer in Bangladesh. These options are mentioned below:

- **Replace of traditional fertilization methods by Fertigation**
- **Increase fertilizers price by reducing government subsidy**
- **Capacity building & awareness raising**

4.2 Policy Options Analysis

Sl. No	Policy Options	Defining Options
Policy Option 01	Replace of traditional fertilization methods by Fertigation	Fertigation has become a more efficient and effective alternative to traditional fertilization methods, such as broadcasting. Fertigation, a method of applying fertilizer and water simultaneously through irrigation systems. Fertigation is considered to be more efficient and effective than traditional methods because it allows for precise control of the amount, timing, and distribution of fertilizer, reducing waste and maximizing plant growth.
Policy Option 02	Increase fertilizers price by reducing government subsidy	Reducing government subsidies for fertilizers would likely result in an increase in the price of fertilizers. By reducing or eliminating these subsidies, the cost of producing and distributing fertilizers would likely increase, which would in turn cause the price of fertilizers to rise. This could have a significant impact on farmers, as fertilizers are an important input in agriculture and an increase in their price would increase production costs. This could lead to reduced overuse of chemical fertilizers.
Policy Option 03	Capacity building & awareness raising	It can be an effective way to promote the adoption of a specific technology or practice. Awareness programs can take many forms, including workshops, seminars, and field demonstrations. Providing training on the use of the technology and best practices can also help to ensure that it is used effectively and efficiently. This can lead to increased adoption of the technology and better outcomes, such as improved yields and reduced waste.

4.2.1 Policy Options with their corresponding impacts

Policy Options	Impacts					
	Administrative	**Fiscal**	**Economical**	**Social**	**Legal**	**Environmental**
Replace of traditional fertilization methods by Fertigation	- Legislative decision - Technical expertise Needed - Infrastructure development	- Initial investment costs GoB	- Increased efficiency - Cost effective - Time savings	- Improved food security - Access to technology - Labor market impacts	- Chemical regulations - Environmental regulations - Property rights	- Increase soil health - Limit greenhouse gas emissions - Prevent groundwater pollution
Increase fertilizers price by reducing government subsidy	- Increased administrative burden - Increased government revenue	- Less Budget GoB	- Reduce subsidy - Increased costs for farmers - Inflationary pressure - Constrained food production	- Reduced crop yields - Shift to alternative fertilizers -encourage alternative - Changes in fertilizer distribution	- International trade agreements - Antitrust laws - Contractual obligations	- Less Fertilizer use - Change Farming practices - Increased conservation practices
Capacity building & awareness raising	- Organizational arrangement - Increase skills and knowledge - Make dynamic and capable public sector	- Medium Budget - Training Cost	- Reduced economic costs - Improved competitiveness - Increased investment	- Changes attitudes & behaviors - Improved community engagement - Improved health and well-being	- Improved policies and regulations	- Decreased environmental degradation - Improved environmental stewardship - Increased eco-friendly technologies

4.2.2 Risk Analysis

Policy Option	Risk Factors	Probability	Impacts	Risk Level	Rank
Replace of traditional fertilization methods by Fertigation	Farmers' unacceptance & unwillingness	Medium	Medium	Medium	2nd
	Institutional arrangement	Low	High		
	Technical Complexity	Medium	Medium		
Increase fertilizers price by reducing government subsidy	Coordination with other ministries	High	High	High	3rd
	Corruption	High	Low		
	Veto from fertilizer association	High	High		
Capacity building & awareness raising	Government resources	Low	High	Low	1st
	Understanding	Medium	High		
	Sustainability	Medium	High		

4.2.3 PASTLE Analysis

Options	Political	Economical	Social	Techno -logical	Environ- mental	Legal	Net Point	Rank
Replace of traditional fertilization methods by Fertigation	++	++	+	+	+++	**+**	**10**	**1st**
Increase fertilizers price by reducing government subsidy	--	**++**	**-**	+/-	++	**+**	**2**	**3rd**
Capacity building & awareness raising	**+**	**-**	**+**	++	++	**+**	**6**	**2nd**

4.2.4 Multicriteria Analysis (MCA)

Assessment criteria	Points (-5 to +5)	Weight (0-1)	Impacts (points *weight)	Total score	Position
Policy Options-01	**Replace of traditional fertilization methods by Fertigation**				
Administrative	-2	0.5	-1.0	7.5	**1st**
Economic	4	0.6	2.4		
Fiscal	1	0.2	0.2		
Social	4	0.6	2.4		
Environmental	5	0.7	3.5		
Policy Options-02	**Increase fertilizers price by reducing government subsidy**				
Administrative	-4	0.3	-1.2	3.0	**3rd**
Economic	2	0.5	1.0		
Fiscal	3	0.6	1.8		
Social	-5	0.2	-1.0		
Environmental	4	0.6	2.4		
Policy Options-03	**Capacity building and awareness raising**				
Administrative	4	0.2	0.8	3.4	**2nd**
Economic	-2	0.3	-0.6		
Fiscal	-3	0.3	-0.9		
Social	4	0.4	1.6		
Environmental	5	0.5	2.5		

4.3 Ranking of the Policy Options

Policy Options	PASTLE Analysis		Multicriteria Analysis (MCA)		Risk Analysis		Overall Rank
	Score	Rank	Score	Rank	Level	Rank	
Replace of traditional fertilization methods by Fertigation	10	1st	7.5	1st	Medium	2nd	1st
Increase fertilizers price by reducing government subsidy	2	3rd	3.0	3rd	High	3rd	3rd
Capacity building & awareness raising	6	2nd	3.4	2nd	Low	1st	2nd

4.4 Preferred Policy Option

After conducting a PESTEL and MCA analysis, I determined that all three options play a significant role in reducing the excessive use of chemical fertilizers in Bangladesh. However, the analysis and input from stakeholders indicate that the most effective solution is Option 1, which involves replace of traditional fertilizer application techniques to a more efficient fertigation method. Fertigation, a method of applying fertilizer and water simultaneously through irrigation systems, is widely used in many countries around the world, including Israel, India, China, the United States, South Korea, Japan, Thailand, Vietnam, Malaysia, Indonesia, Philippines, and many others. This method of fertilization has gained popularity in many countries due to its efficiency in delivering nutrients directly to the roots of crops and its ability to reduce waste and leaching.

To implement this option, a detailed action plan must be created, including the creation of new guidelines, hands-on demonstrations, training sessions for capacity building, regular performance evaluations, and enforcement of new policies.

CHAPTER V: IMPLEMENTATION PLAN

5.1 Policy Implementation Framework

Agriculture is a vast sector, and the chemical fertilizer is considered as a key input for production, so these fertilizers applications methods would be replace through piloting a project under the ministry of Agriculture. This policy paper, therefore, suggests that " Replace of traditional fertilization methods by Fertigation " will be implemented at upazila level in 50 upazilas under the 7 District of Bangladesh. After the successful completion of a pilot project, the process or technology can be scaled up and widely adopted, often with modifications based on the lessons learned from the pilot phase. It is crucial to keep in mind that plans for implementation should be adaptable to changing situations and new information and should be periodically reviewed and revised to guarantee their ongoing effectiveness. The effective and practical implementation of the preferred policy option studied here has been outlined in the table below, which addresses six questions based on the "6 W's":

What (Initiatives/ Activities)	Who (Players/Actors)	When (Tentative timeline)	Where	Why	How
Inception workshop	DG, DAE	May 2023	BARC Auditorium	-Need Assessment -Understand Context	Administrative Circular
Administrative Approval	Secretery, MoA	June 2023	MoA	-Preparation of Pitol Project	Official Arrangement
DPP Preparation for Pilot Project & Approval	Focal Point Officer, DAE	July to Dec 2023	DAE	To speed up modern fertilizers management approach	Based on feasibility study
Implementation of Pilot Project	Project Director, DAE	Jan 24 to Dec 25	Upazila Level	Ensure judicial use of chemical fertilizer	carrying out the necessary activities, including training, outreach, and data collection.
Monitoring	MoA, DAE and IMED	July to Sep 2025	Project Area	to ensure that a project stays on track and meets its objectives	Meeting, Field visit and Communication with the stakeholders
Midterm Evaluation	Third party (Outsourcing)	Oct to Dec 2025	DAE	To evaluate efficiency and effectiveness for fertigation	Reporting, field visit and stakeholder meeting

5.2 Log Frame of the Pilot Project

Narrative summary	Objectively Verifiable Indicators (OVI)	Means of Verification (MOV)	Important Assumptions (IA)
Pilot Project Goal: To reduce the overuse of chemical fertilizers in Bangladesh and improve the health of the environment and agricultural communities.	-50 upazila will be adopted with modern fertigation technologies. -Contribution to SDG -Upgraded Environment in project Areas -Accelerated soil fertility and productivity.	-Evaluation Report of the National FY Plan. -National environmental report -Base line Survey -Midterm Evaluation -Project monitoring by -Ministry of Agriculture, Planning Commission & DAE HQ.	
Project Purpose: -To raise awareness among farmers about the negative impacts of chemical fertilizers on soil and water quality. -To promote alternative, sustainable agricultural practices that reduce the need for chemical fertilizers. -To provide training and support to farmers on sustainable agricultural practices.	-Reduced health risk and enhanced Livelihood opportunities for the beneficiaries -Direct beneficiaries with access to improved fertilizers use efficient technologies. -Improved Institutional capacity at 50 Upazilas -Improving irrigation channel of project areas	-Field office report -IMED Evaluation report -Report of project office of DAE	-Active participation of the people -Active participation of the respective organizations -No natural disaster
Outputs: -Institutional and farmers capacity will be built. -Improved and efficient water use technologies will be disseminated. -Total crop production & productivity will be improved. -Government Money saved -Improved soil, human, and animal health	-Institutional and farmers capacity built by June 2025. -Arranged National and regional Seminar and workshop by June 2025 -Established modern fertigation technology (fertigation) by June 2025.	-Monitoring Report of DAE -Report of the PMO and field office -IMED Report	-Active participation of the people -Active participation of the respective organizations
<u>Inputs (Activities):</u> -Training for capacity building (Officers, SAAO and farmers) -Develop and distribute training materials - Workshop (Regional & National), Motivational Tour -Provide technical support and resources to farmers -Demonstration, Field Day -Monitor and evaluate the impact of the project	-Arranged National and Regional workshop (4) -Training officers (30 batch), SAAO (60 batch), Farmer (260 batch) -Demonstration (200) -Field Day (20) -Motivational Tour (5) -Foreign Tour (2 batch)	-Office documents -Final Study Report -Designs as per study & field survey -Report of the PMO and field office	-Required budget allocation and placing of fund on time. -Approved designs.

5.3 Timeframe for Implementation, Monitoring & Evaluation

Activities Quarter (3 Months)	Actual Duration (Month)	Timeframe for Implementation, Monitoring & Evaluation											
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Inception workshop	2												
Administrative Approval	1												
DPP Preparation for Pilot Project	6												
Implementation of Pilot Project	24												
Monitoring	3												
Midterm Evaluation	2												

5.4 Tentative Budget (Piloting Project)

Sl. No	Action Plan	Amount (Lakh)	Source of Fund
01	Training for capacity building (Officers, SAAO and farmers)	300	**Government of Bangladesh**
02	Training Manual and Guidelines Preparation	40	
03	Equipment procurements	1500	
04	Demonstration	200	
05	Field Day	60	
06	Workshop (Regional & National)	30	
07	Farmer Motivational Tour	10	
08	Advertisement and Publication	25	
09	Foreign Tour (Officers)	120	
10	Miscellaneous Expanses	15	
	Total	**2300**	

RECOMMENDATION & CONCLUSION

Recommendation

The prevention of overuse of chemical fertilizers in Bangladesh can be done taking various measures like reducing government subsidies, promoting alternative fertilization methods, and building capacity and awareness. This policy paper recommends alternative fertilization methods called Fertigation. It is the process of applying fertilizers through an irrigation system, and is seen as a best way to reduce the overuse of chemical fertilizers in Bangladesh for several reasons:

- ✓ Precision application: Fertigation allows for precise application of fertilizers, reducing the amount of fertilizer that is wasted or leached into the environment.
- ✓ Cost-effectiveness: Fertigation can be more cost-effective compared to traditional fertilizer application methods, as it reduces the amount of fertilizer needed and ensures that it is used in the most efficient manner.
- ✓ Reduced environmental impact: Reducing the amount of fertilizer used and ensuring that it is applied in a precise manner, fertigation reduces the environmental negative impact.
- ✓ Increased crop yields: By ensuring that plants receive the correct amount of nutrients at the right time, fertigation can result in increased crop yields and improved crop quality.
- ✓ Integrating organic fertilizers: Fertigation can also be used to integrate organic fertilizers, such as compost and vermicompost, into the irrigation system, further reducing the dependence on chemical fertilizers.

Therefore, the use of fertigation can play a key role in reducing the overuse of chemical fertilizers in Bangladesh.

Conclusion

This study was conducted to identify best policy for preventing overuse of chemical fertilizers in Bangladesh. The overdose of chemical fertilizers in Bangladesh is a complex issue with far-reaching consequences. While chemical fertilizers have helped to increase agricultural productivity, they have also resulted in negative impacts on the environment, human health, and long-term soil fertility. To address this issue, it is important to adopt a multi-faceted approach that includes measures to prevent overuse, such as reducing government subsidies, promoting alternative fertilization methods, and building capacity and awareness. Effective implementation of these measures will require close collaboration between the government, the private sector, and farmers. It is clear that prevention of overuse of chemical fertilizers in Bangladesh requires a multi-pronged approach that engages all stakeholders, including the government, farmers, and the general public. By working together, it is possible to create a more sustainable and resilient agricultural sector in Bangladesh and ensure the long-term health and productivity of the country's agricultural lands.

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APPENDIX

Break Up of Tentative Budget (Piloting Project)

Sl. No	Items	Unit Cost (Lakh)	Unit	Total Number	Total Cost (In Lakh)
01	Training for capacity building (farmers)	0.5	Batch	260	130
02	Training for capacity building (SAAOs)	1.47	Batch	60	88.2
03	Training for capacity building (Officers)	2.723	Batch	30	81.69
04	Training Manual and Guidelines	40	Lump sum	LS	40
05	Procurements	1500	Lump sum	LS	1500
06	Demonstration	1	No	200	200
07	Field Day	0.11	No	20	2.2
08	Workshop (Regional & National)	8	No	4	32
09	Farmer Motivational Tour	2	No	5	10
10	Advertisement and Publication	25	Lump sum	LS	25
11	Foreign Tour (Officers)	6	Person	20	120
12	Miscellaneous Expanses	15	Lump sum	LS	15
Total: In word Twenty-Two Crore Forty-Four Lakh Nine Thousand					**2244.09**