

Guide on area specific nutrient management on Tomato



The Project for Promotion of Safe and Appropriate Use of Pesticides and Fertilizers in Sri Lanka (SAFE)



Purpose:

The cultivation of vegetables is a vital component of agricultural systems, directly impacting food security and farmers' livelihoods. Among the many vegetables grown, tomatoes stand out as major crops in the Badulla region. While the current fertilizer recommendations of Department of Agriculture provide a foundational guideline for open pollinated vegetable cultivation, they often lack the specificity needed to address the unique challenges and opportunities presented by different agro-ecological zones and soil types. Soils can vary significantly in their nutrient composition, pH levels, moisture retention, and other characteristics that influence plant health and productivity. Therefore, a blanket fertilizer recommendation does not effectively support optimal growth for tomatoes in all regions in the country.

Therefore, area-specific nutrient management packages for tomatoes were investigated. This initiative aims to provide precise nutrient management guidelines, ensuring that farmers have access to the best practices for their region. This manual introduces area specific nutrient management guidelines for tomato cultivation in Badulla based on the testing in HORDI and in farmer's field at Boralanda.



Area specific nutrient management using improved fertilizer package (IDOA):

Badulla

Soil characteristics are crucial for determining the appropriate fertilizer application. Typically, the Department of Agriculture (DOA) advises conducting soil tests before planting to assess the nutrient levels in the soil and identify the most suitable fertilizers for the specific region.

In Badulla, the most common soil type is Red Yellow Podzolic (Ultisol), characterized by low nutrient content and pH levels. Overall, the soil in Badulla tends to be slightly acidic, with a pH range between 5.0 and 6.0.

For tomato cultivation, well-drained, loose, neutral or near-neutral soil that's rich in nutrients are the best. The soil should be able to retain moisture and allow for proper airflow. The ideal soil pH for growing tomatoes is slightly acidic, between 6.2 and 6.8. To improve both nutrient content and soil pH, incorporate fully decomposed poultry manure. Using fully decomposed manure is essential, as fresh poultry manure can introduce pathogens and excess heat from fermentation, which may harm plants and lead to disease or burning. It is recommended to apply the manure one week before transplanting to ensure optimal soil conditions for growth.



As a basal fertilizer, apply TSP (Triple Superphosphate), Urea, and MOP (Muriate of Potash) one day before transplanting to ensure optimal nutrient availability. Applying TSP before planting allows it to integrate into the soil, where it can be readily taken up by plant roots once they begin to grow. Phosphorus plays a crucial role in root development, especially during early plant growth.

Based on the previous research findings, area specific fertilizer management package (IDOA) has developed. The application of nitrogen rate has increased than the general DOA recommendation, due to most of the cultivations use hybrid varieties. The application timing of topdressings of Urea should be based on the growth of tomato (Table 1). Split application is suggested based on the trial in SAFE project. Topdressing of MOP also follows the guidance of Table 1. K^+ is a liquid fertilizer designed to provide plants with an immediate supply of potassium (K) through foliar application. This fertilizer is useful in improving overall plant health during critical growth stages, such as flowering and fruiting and to overcome potassium deficiencies. $Ca(NO_3)_2$ (Calcium nitrate) is a fertilizer that helps plants grow by providing them with nitrogen and calcium. It also strengthens crop cells, prevents physiological disorders caused by calcium deficiency, and strengthens stems and leaves, and increases resistance to pests and diseases. PBRH (Partially Burnt Rice Husks) also improves soil structure, and it contains 20% of Silicate. It makes the cell of plants stronger and improves disease tolerance.

Area specific fertilizer management package (IDOA) in Badulla is shown in the following table 1:



Table 1: Area specific fertilizer application in Badulla

Fertilizer	Before planting	Basal	
	Poultry manure (t/ha)	10	-
TSP (kg/ha)	125		
Urea (kg/ha)	-	215	
MOP (kg/ha)	-	40	
Poultry manure (t/ha)	-	25	
K ⁺ (water soluble potassium) foliar spray - Dilution rate 2g / L : 25 tanks (16L) for one hectare			
Ca(NO ₃) ₂ foliar spray - dilution rate 2g / L : 25 tanks (16L) for one hectare (starting from 50%)			

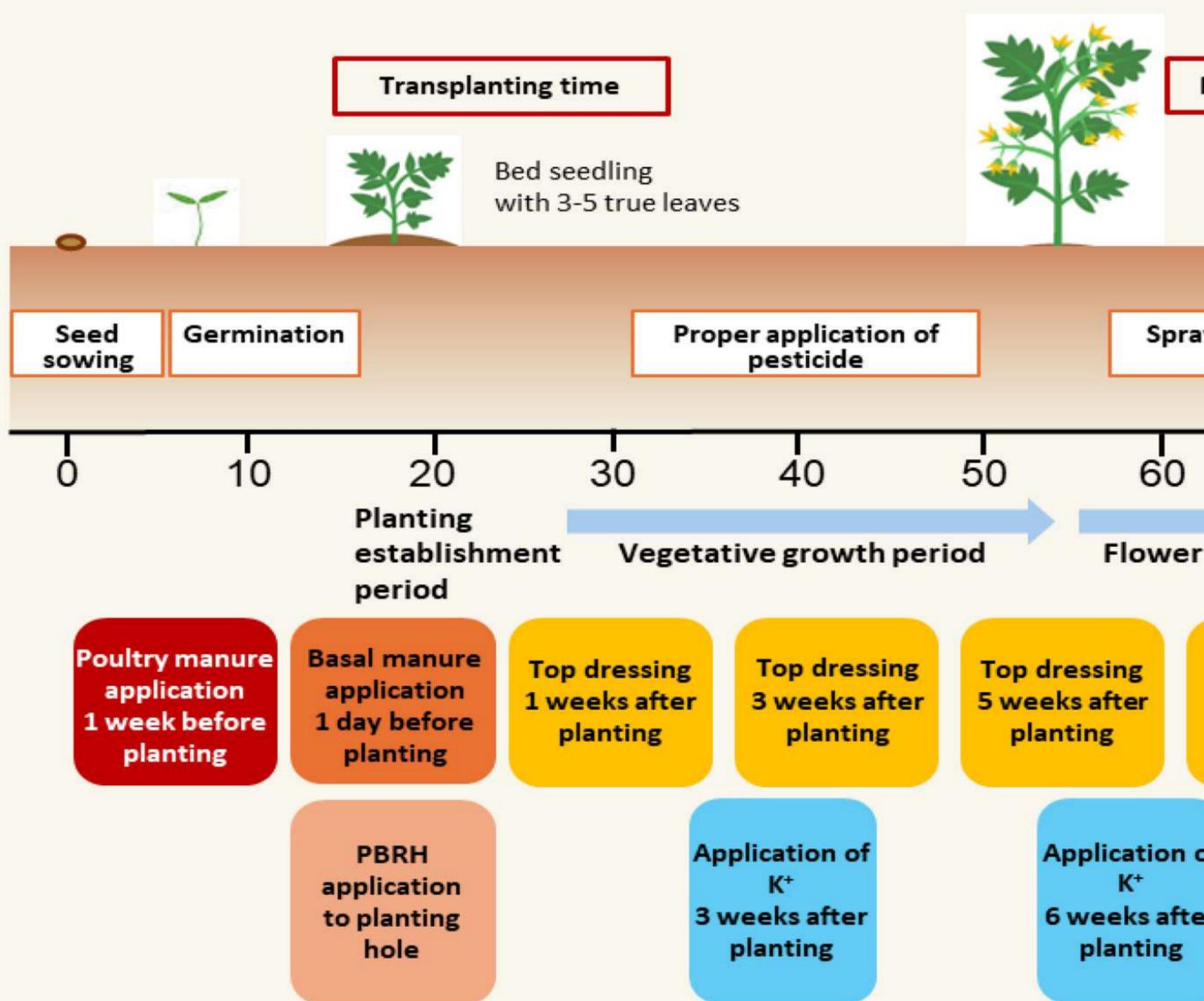
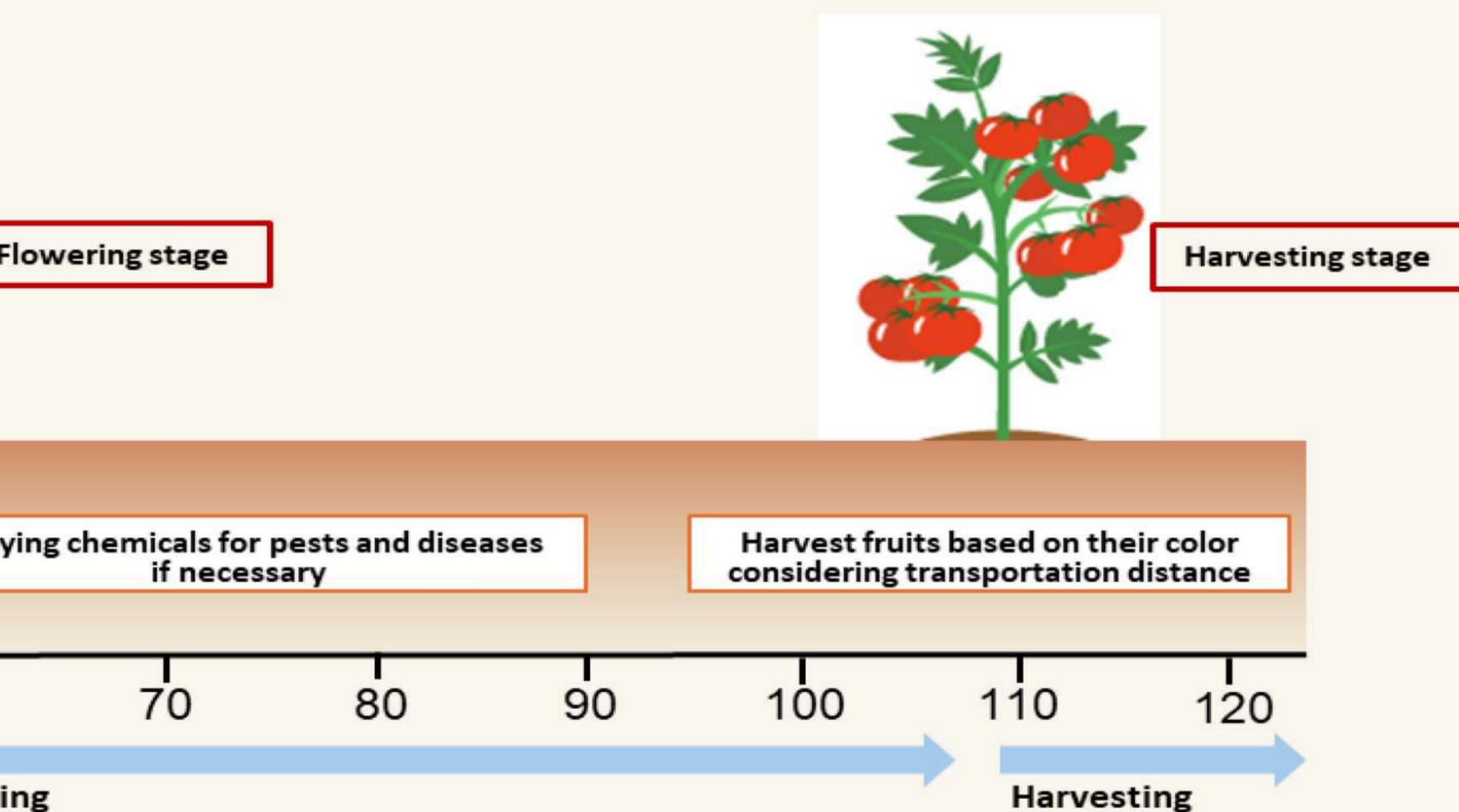


Figure 1: Area Specific Fertilizer Application in Badulla

Time of application				Total
1 WAP	3 WAP	5 WAP	7 WAP	
-	-	-	-	10
-	-	-	-	215
75	58	58	58	289
40	45	45	45	200
e (3 WAP and 6 WAP)				
6 flowering 2 week interval)				



**Top dressing
7 weeks after
planting**

- Application of $\text{Ca}(\text{NO}_3)_2$ after 50% flowering
- Application of $\text{Ca}(\text{NO}_3)_2$ 2 weeks after 1st application
- Application of $\text{Ca}(\text{NO}_3)_2$ 4 weeks after 1st application
- Application of $\text{Ca}(\text{NO}_3)_2$ 6 weeks after 1st application

Demonstration summary:

The experiments were conducted at farmers' fields in the Boralanda Agrarian Service Region, located in the Badulla district. Three farmer's fields were selected for the study, focusing on the popular "Padma 108 F1" tomato variety. Four different treatments were tested in Boralanda. The results were shown in Figure 3 and income to cost ratio (Calculated based on fertilizer cost only) was shown in Figure 4.

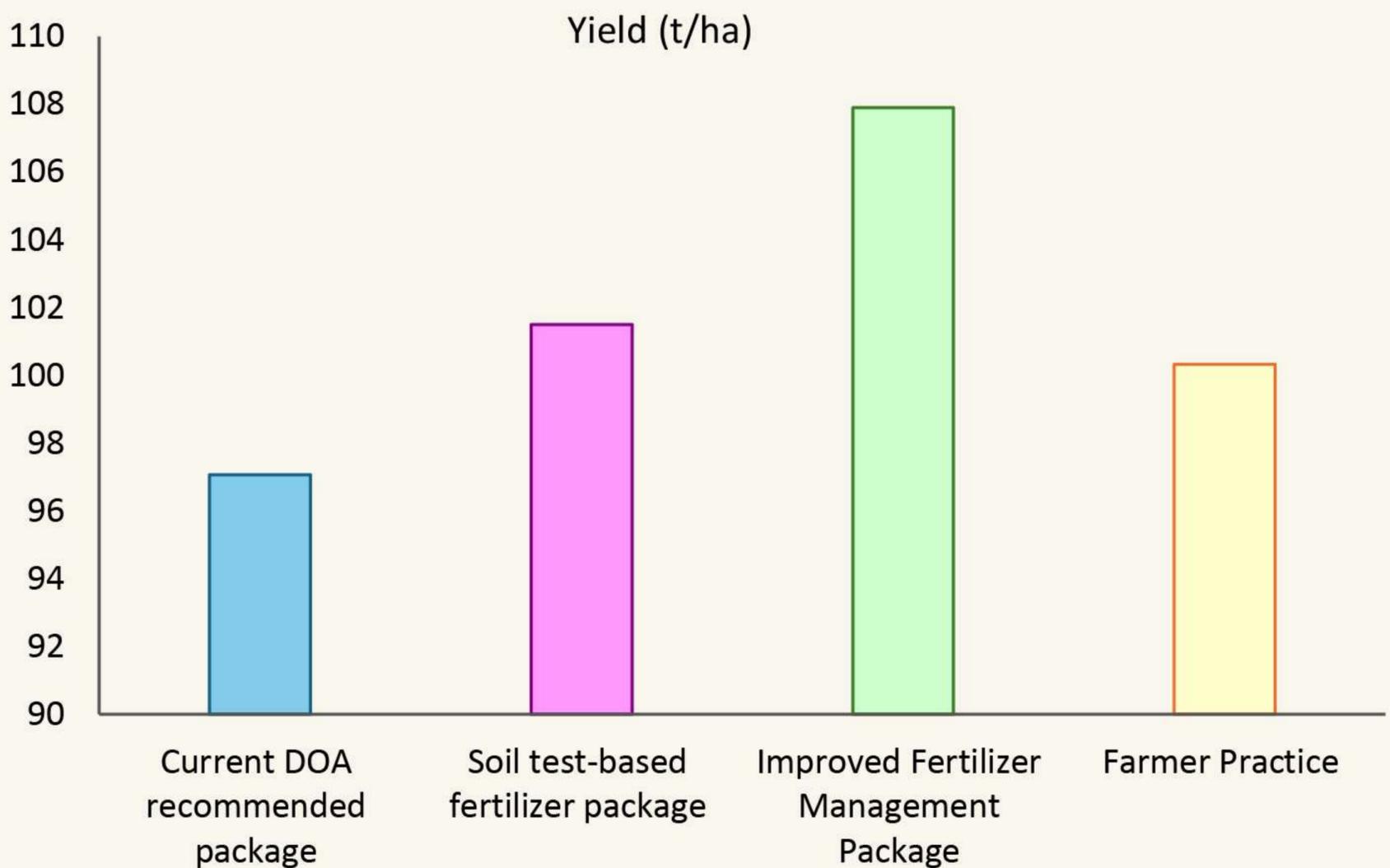


Figure 3: Result of Field Trial in the Boralanda



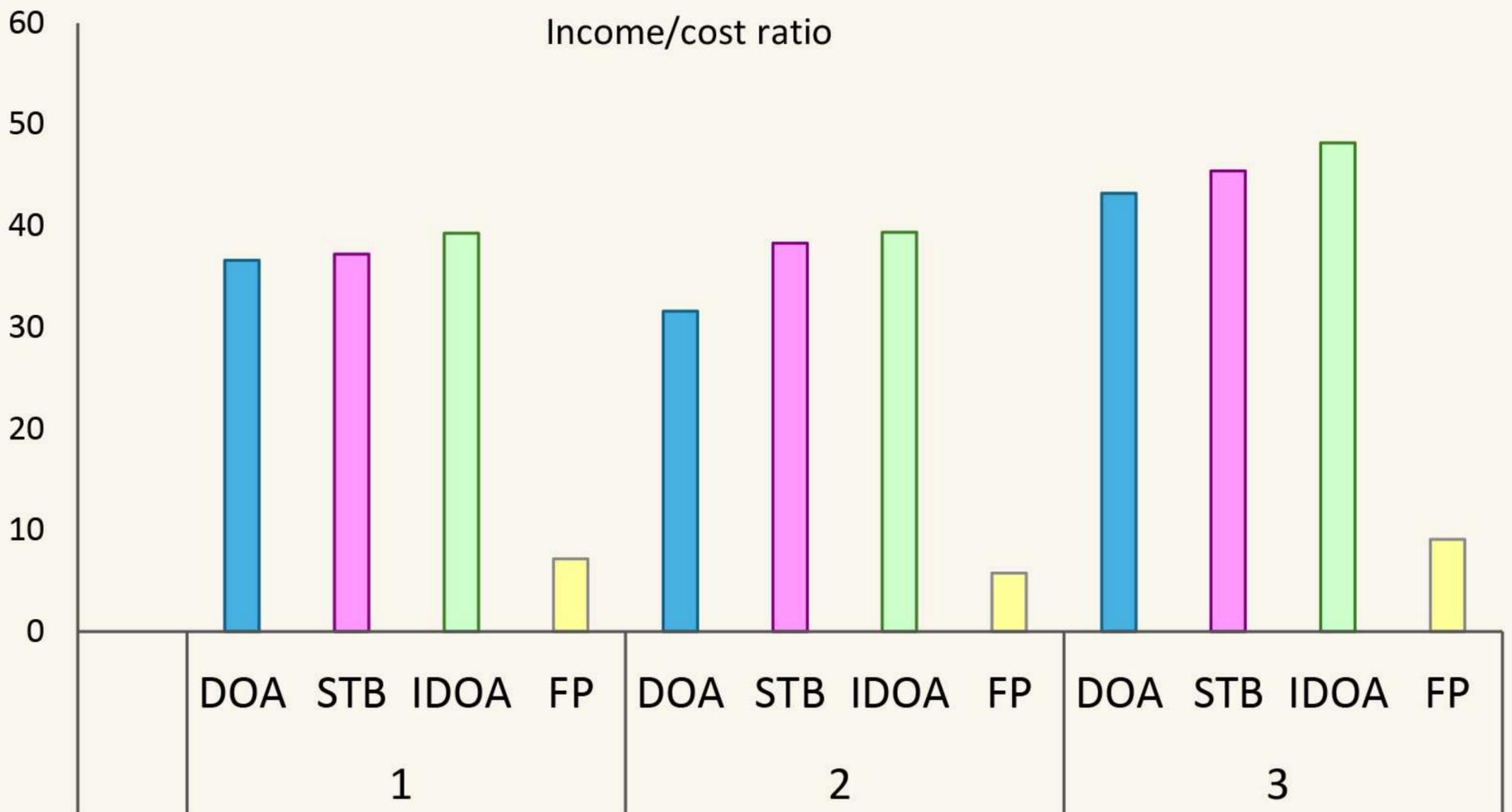


Figure 4: Income to cost ratio tomato cultivation in Boralanda

*DOA-Current department of recommendation, STB- Soil test based fertilizer recommendation, IDOA - Improved package, FP-farmer practice

As shown in Figure 3, IDOA treatment showed significantly higher yields. The highest income-to-cost ratio is also achieved with IDOA (Figure 4). Therefore, IDOA appears to be the most profitable option for tomato.



Tomato field in Boralanda

Points to note when to introduce the Improved DOA nutrient package:

(1) On-time applications of balanced nutrients

On-time applications of balanced nutrients are crucial for maximizing crop growth, optimizing yields, and maintaining soil health. It ensures that crops receive consistent nutrients throughout their growth cycle. Applying nutrients at the correct growth stages ensures that plants have access to the necessary nutrients when they need them most. This promotes efficient nutrient uptake, leading to healthy growth and high yields.

(2) Split application of N and K fertilizers

Split application of fertilizers involves dividing the total amount of fertilizer into multiple doses, applied at different stages of plant growth. Split application reduces the risk of nutrient leaching and volatilization, which can occur with a single large dose of fertilizer. It can improve fertilizer use efficiency, reducing waste and the overall cost of fertilizer inputs. Further it minimizes the environmental impact of fertilizers by reducing the amount of excess nutrients that may runoff into waterways, preventing water pollution.



(3) Area specific nutrient application

This is the practice of applying fertilizers and nutrients tailored to the specific needs of different areas, rather than using a uniform application across the country. By applying nutrients where they are most needed, farmers can avoid over-application in areas that don't require them, leading to better resource utilization. This practice helps in reducing nutrient runoff or leaching, which can be harmful to the environment, especially in water bodies.



(4) Consideration of surroundings

When applying poultry manure, it's crucial to consider its condition. It is highly recommended to use well-decomposed poultry manure for application. Fresh manure, on the other hand, can produce strong odors, attract houseflies, and cause discomfort for nearby residents. To mitigate these issues, fresh manure should be avoided. Additionally, after application, the manure should be covered to reduce odor and prevent nutrient loss, ensuring a more effective and neighbor-friendly application.

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