Guide on area specific nutrient management on Cabbage

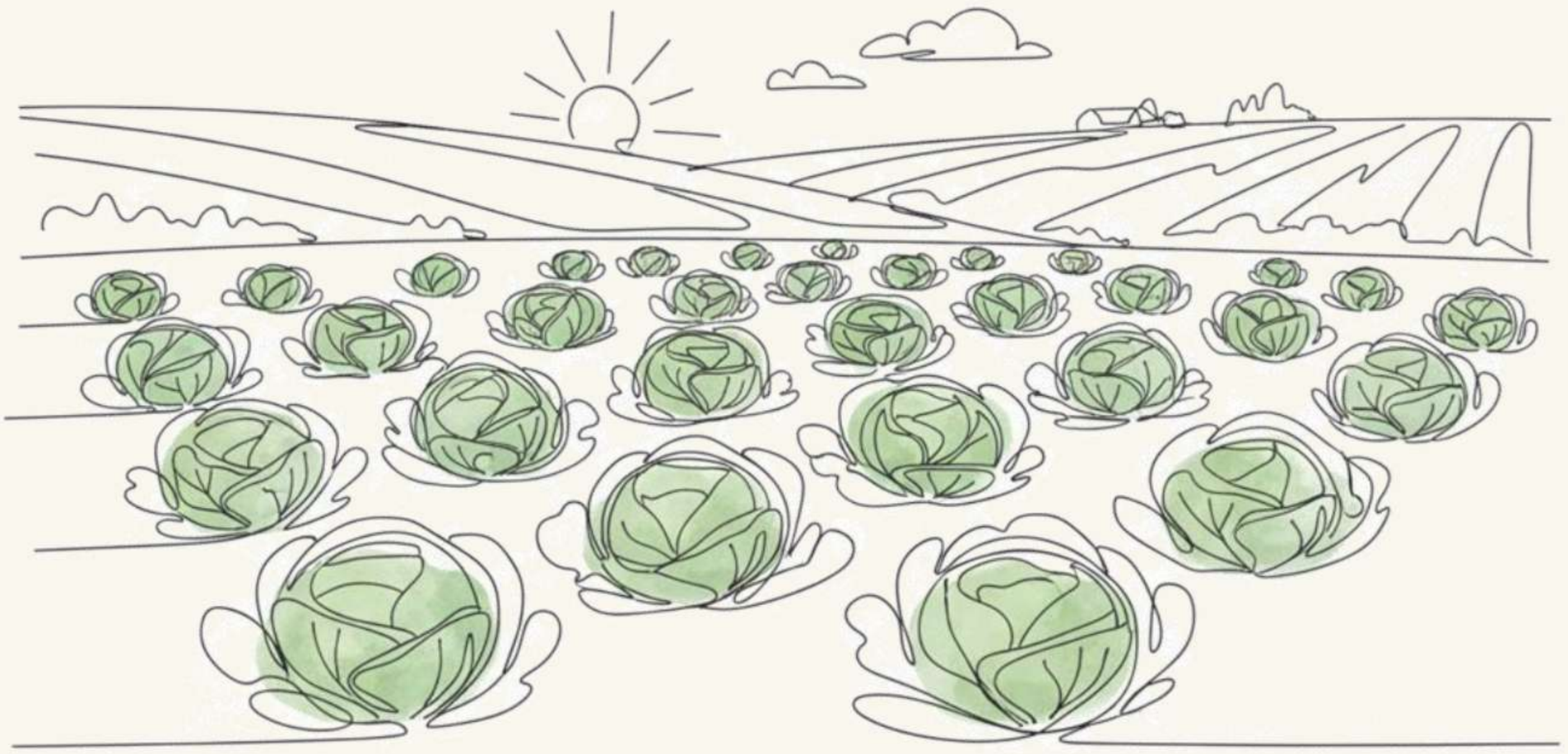
The Project for Promotion of Safe and Appropriate Use of Pesticides and Fertilizers in Sri Lanka (SAFE)

Purpose

The cultivation of vegetables is a vital component of agricultural systems, directly impacting food security and farmers' livelihoods. Among the many vegetables grown, cabbage stand out as major crops in the Badulla and Puttalam (Kalpitiya) regions.

While 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 cabbage in all regions in the country.

To address these limitations, area-specific nutrient management packages for cabbage 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 cabbage cultivation in Badulla and Puttalam based on the testing in farmer's fields at Boralanda and Kalpitiya.



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

(1) 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 successful cabbage cultivation, well-drained loamy soil rich in organic matter are ideal. The optimal pH range for cabbage is between 6 and 6.5. To improve soil fertility, incorporate fully decomposed poultry manure as a soil conditioner which has an additional advantage in increasing soil pH. Using 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.

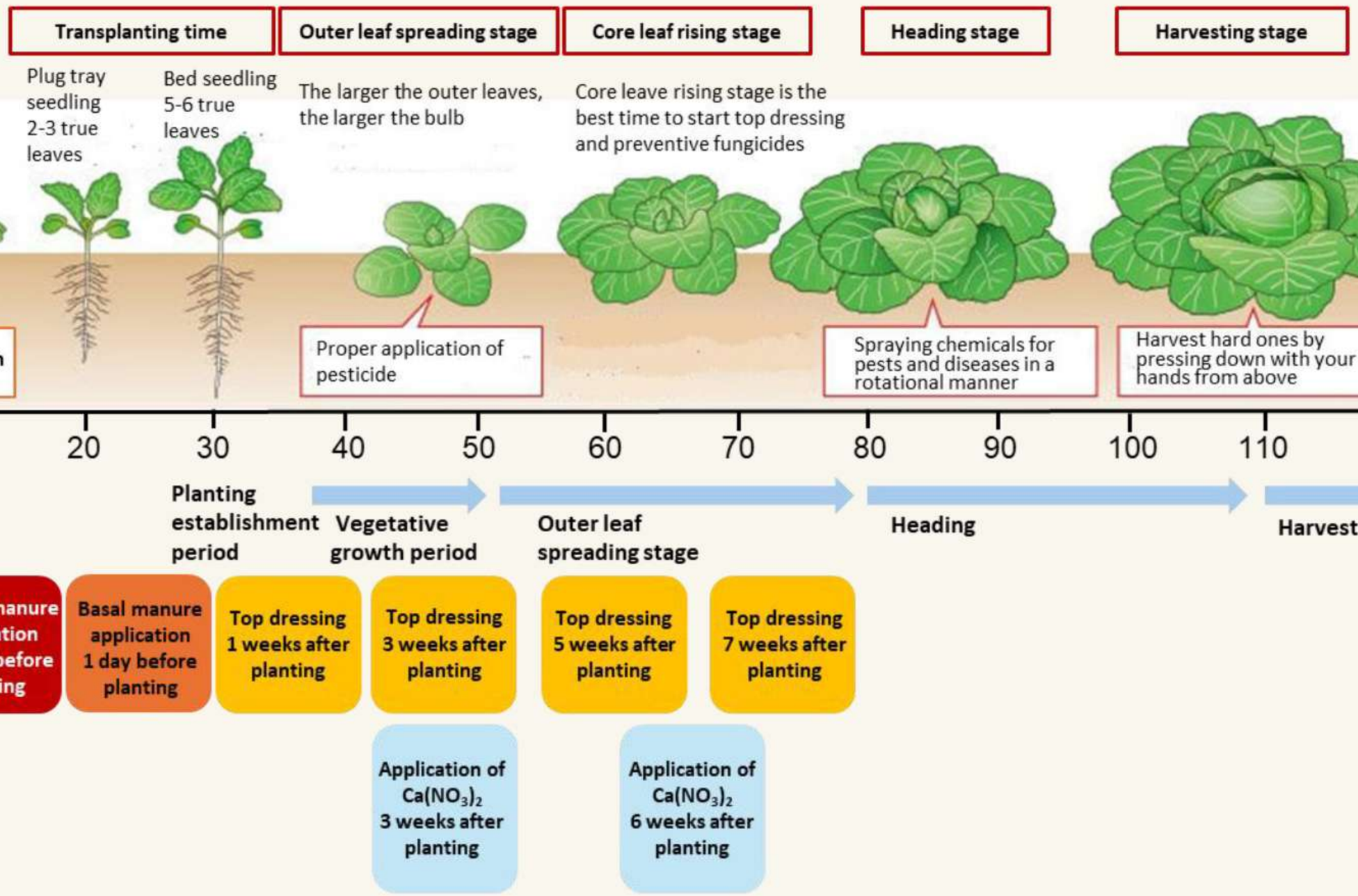
Apply TSP (Triple Superphosphate), Urea, and MOP (Muriate of Potash) one day before transplanting to ensure optimal nutrient availability. Applying TSP before planting allows it to integrate into the soil, where it can be readily taken up by plant roots once they begin to grow. Phosphorus plays a crucial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

The application of nitrogen rate has slight increase 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 cabbage (Table 1). Split application is suggested based on the trial in SAFE project. Topdressing of MOP also follows the guidance of Table 1. Ca $(NO_3)_2$ (Calcium nitrate) provides both nitrogen and calcium, which are essential for plant growth. It strengthens plant cell walls, helps prevent calcium deficiency-related disorders, promotes healthier stems and leaves, and enhances resistance to pests and diseases.

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

Table 1: Area specific fertilizer application in Badulla

Fertilizer	**Time of application**						Total
	Before planting	Basal	1 WAP	3 WAP	5 WAP	7 WAP	
Poultry manure (t/ha)	10	-	-	-	-	-	10
TSP (kg/ha)	-	270	-	-	-	-	270
Urea (kg/ha)	-	50	75	70	70	70	335
MOP (kg/ha)	-	75	-	-	-	75	150
$Ca(NO_3)_2$ foliar spray - dilution rate 2g / L : 25 tanks (16L) for one hectare (3 WAP* and 6 WAP) *WAP (week after planting)							



Growth of cabbage and timing of fertilizer application in Badullla

(2) Kalpitiya

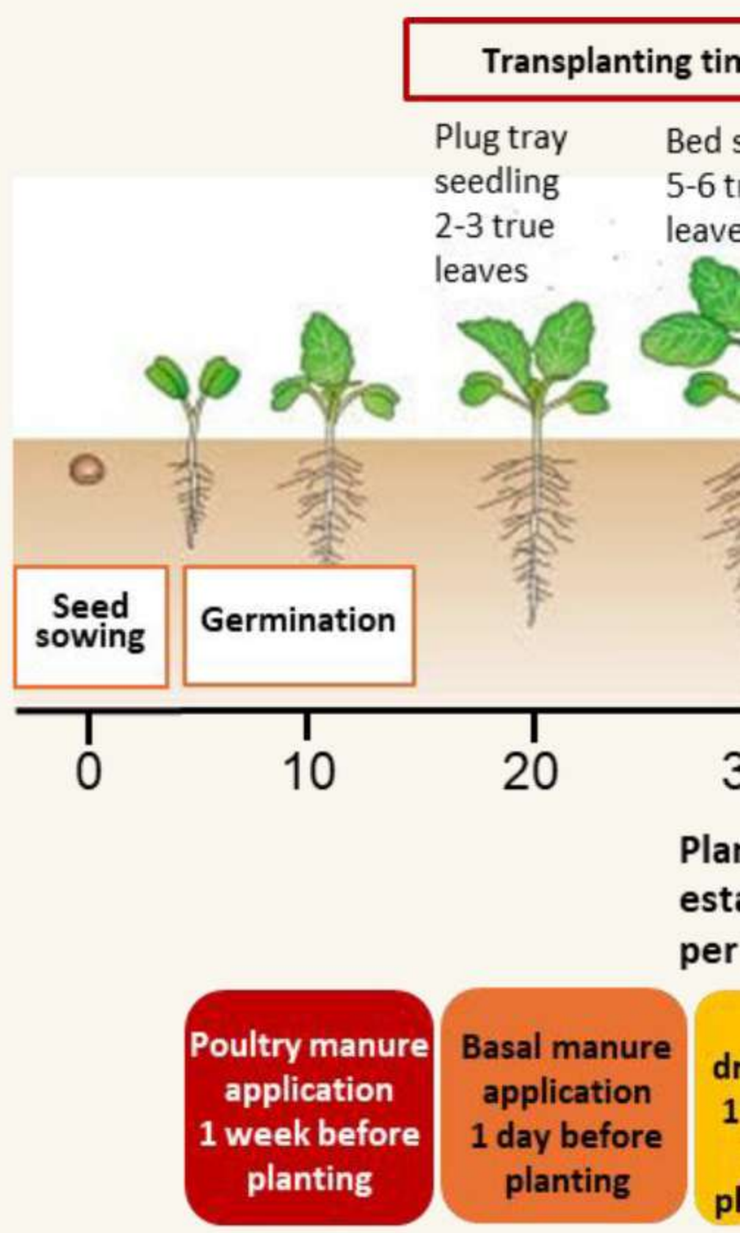
In Kalpitiya, the predominant soil type is Regosol (Entisol), characterized by low organic matter content and rapid drainage. The soil pH in Kalpitiya generally falls within the neutral to alkaline range, between 6.8 and 8.5. However, it is often noted that the soils in Kalpitiya are sandy and lack a fine-textured fraction, which can lead to rapid nutrient leaching and reduced fertility.

As mentioned in Badulla region, cabbage grows best in well-drained soil with a good amount of organic matter. Therefore, it is needed to add organic matter to Kalpitiya soil. That is the reason for application of cattle manure (decomposted cow dung) since it has long-term effects on soil improvement. Cattle manure can improve soil structure, enhances moisture retention, and promotes beneficial microbial activity in the soil. 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 as well as retains the moisture. Because of soil type, nutrients are leaching rapidly. Therefore, the application of fertilizers Urea and MOP should be split and applied repeatedly within a short period. $Ca(NO_3)_2$ (Calcium nitrate) provides both nitrogen and calcium, which are essential for plant growth. It strengthens plant cell walls, helps prevent calcium deficiency-related disorders, promotes healthier stems and leaves, and enhances resistance to pests and diseases. Additionally, moisture retention is low with the sandy nature of the soil which can restrict the Ca absorption by plant roots. Therefore, young leaves of the cabbage can be scorching. By providing foliar spray of Ca this situation can be prevented.

Improved fertilizer package (IDOA) in Kalpitiya (Nawakkaduwa & Eththalai) is shown in the following table:

Table 2: Area specific fertilizer applicati

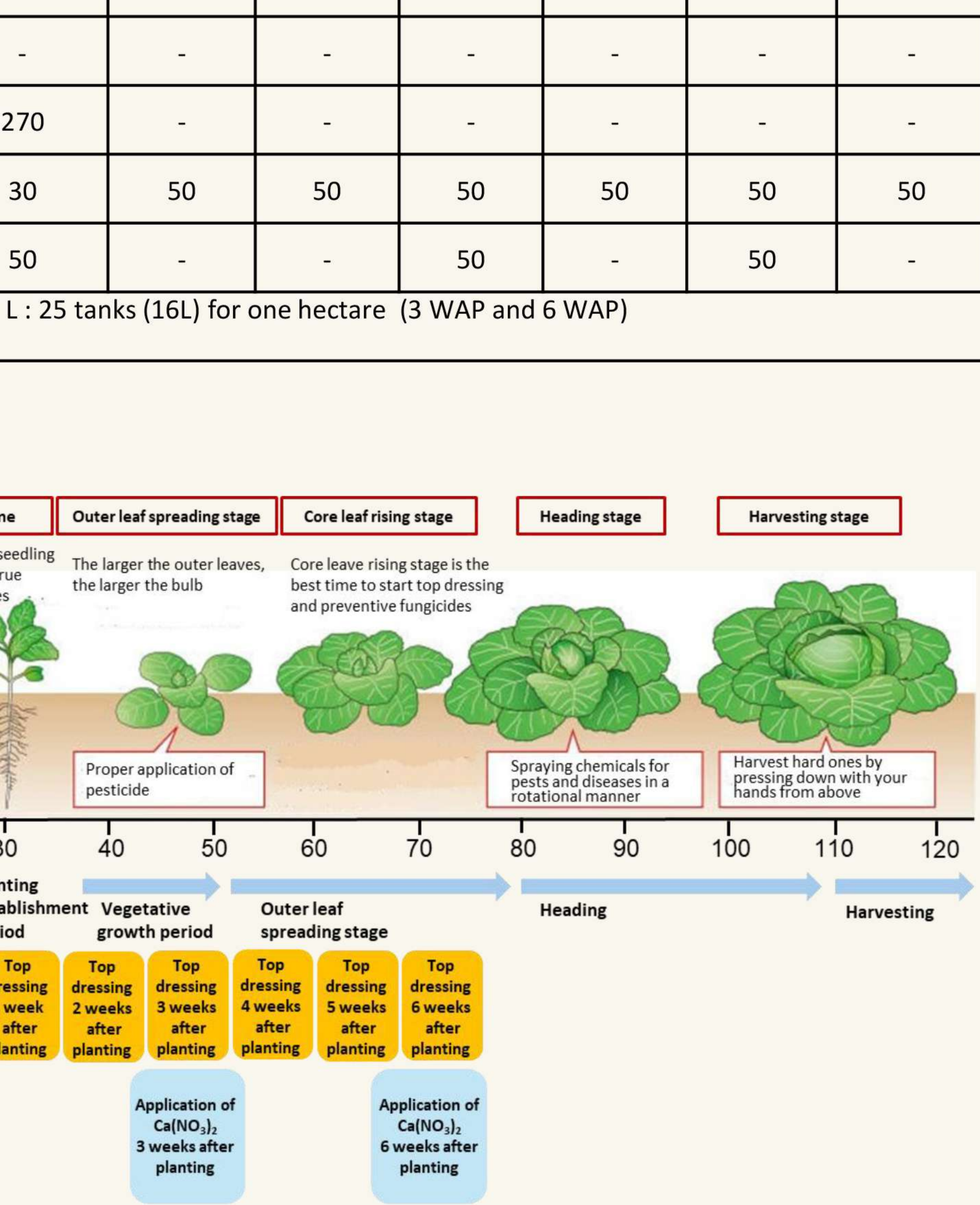
Fertilizer		
	Before planting	
Cattle manure (t/ha)	10	
PBRH(g/plant)	125	
TSP (kg/ha)	-	
Urea (kg/ha)	-	
MOP (kg/ha)	-	
$Ca(NO_3)_2$ foliar spray - dilution rate 2g /		



Growth of

ion in Kalpitiya

Time of application							Total
Basal	1 WAP	2 WAP	3 WAP	4 WAP	5 WAP	6 WAP	
-	-	-	-	-	-	-	10
-	-	-	-	-	-	-	125
270	-	-	-	-	-	-	270
30	50	50	50	50	50	50	330
50	-	-	50	-	50	-	150
L : 25 tanks (16L) for one hectare (3 WAP and 6 WAP)							



cabbage and timing of fertilizer application in Kalpitiya

Demonstration summary:

Badulla

The experiments were conducted at farmer's fields in the Badulla district and Kalpitiya. Three farmer fields were selected in each location for the study, focusing on the popular "Sisiro" cabbage variety in Badulla and varieties "Oxillus" and "Omphalos" in Kalpitiya. Four different treatments were tested.

The test results in Badulla were shown in Figure 3 and income to cost ratio (Calculated based on fertilizer cost only) was shown in Figure 4.

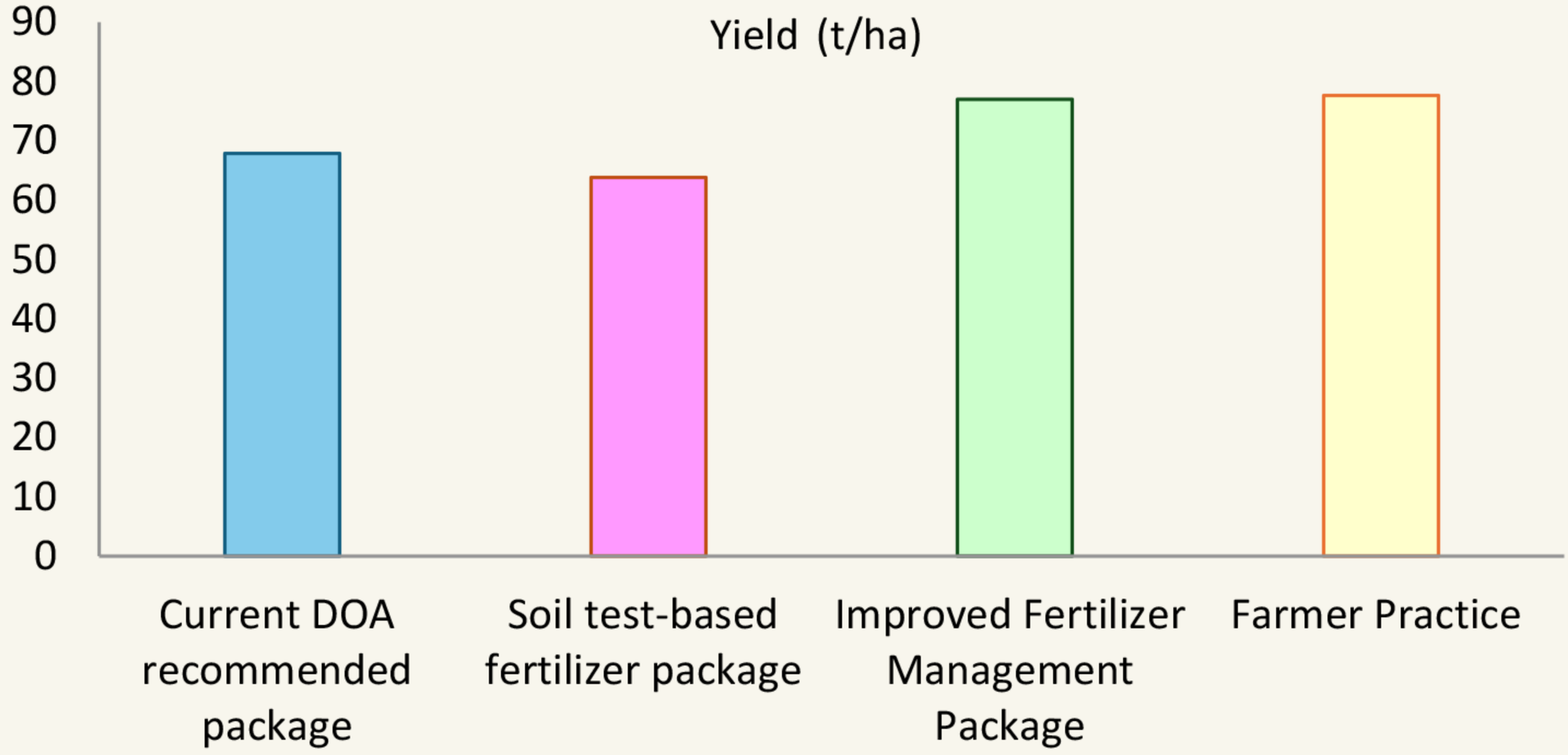


Figure 3: Result of Field Trial in cabbage in Boralanda

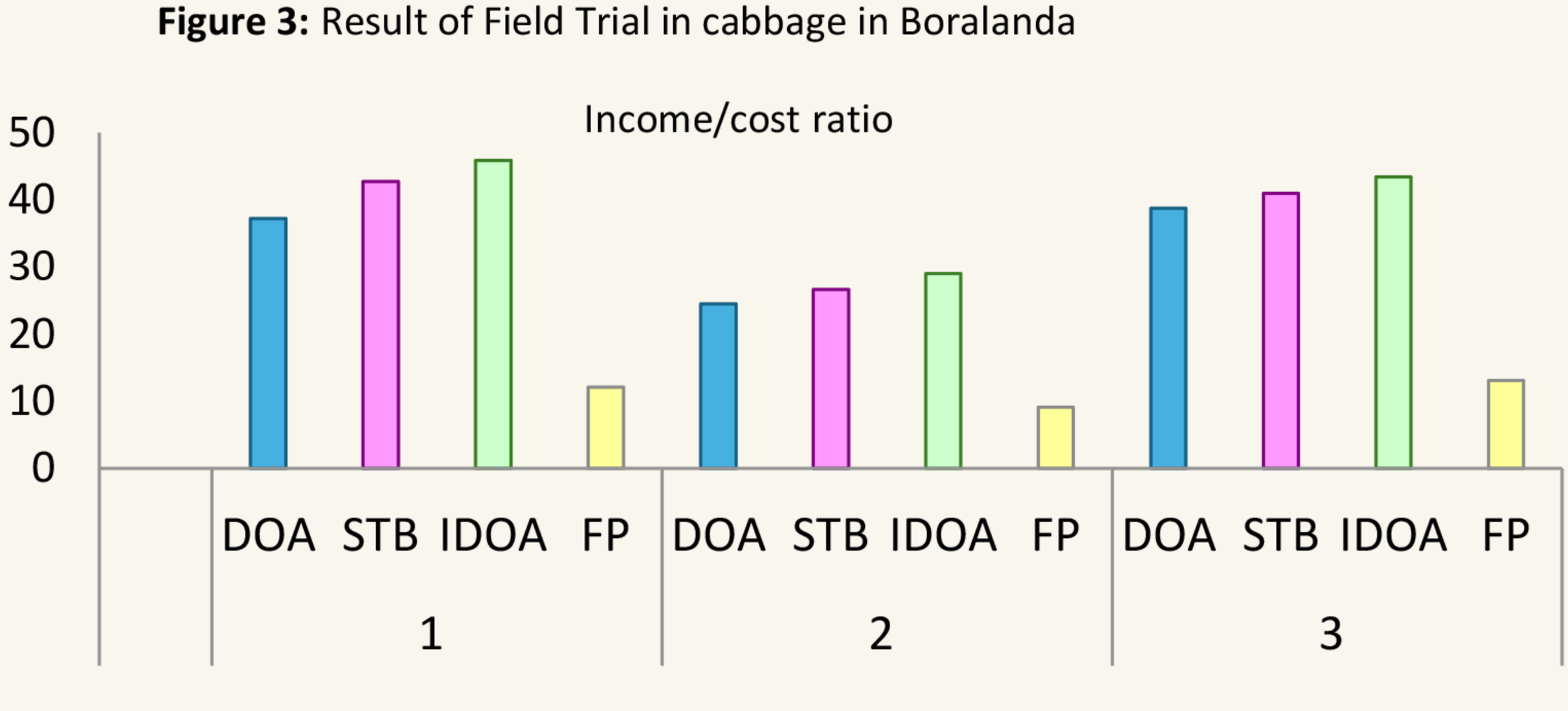


Figure 4: Income to cost ratio for cabbage cultivation in Boralanda

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

As shown in Figure 3, FP and IDOA treatments showed comparatively similar yields. The highest income-to-cost ratio is achieved with IDOA (Figure 4). However, FP shows the lowest income-to-cost ratios across all farmers. Overall, IDOA appears to be the most profitable option for cabbage.

2) Kalpitiya

The two farmer fields were selected in each location for study , focusing on popular ‘’Oxillus’’ and “Omphalos” in Kalpitiya. Five different treatments were tested. The Harvesting results in Kalpitiya were shown in figure 5 and income to cost ratio (calculated based on fertilizer cost only) was shown in figure 6.

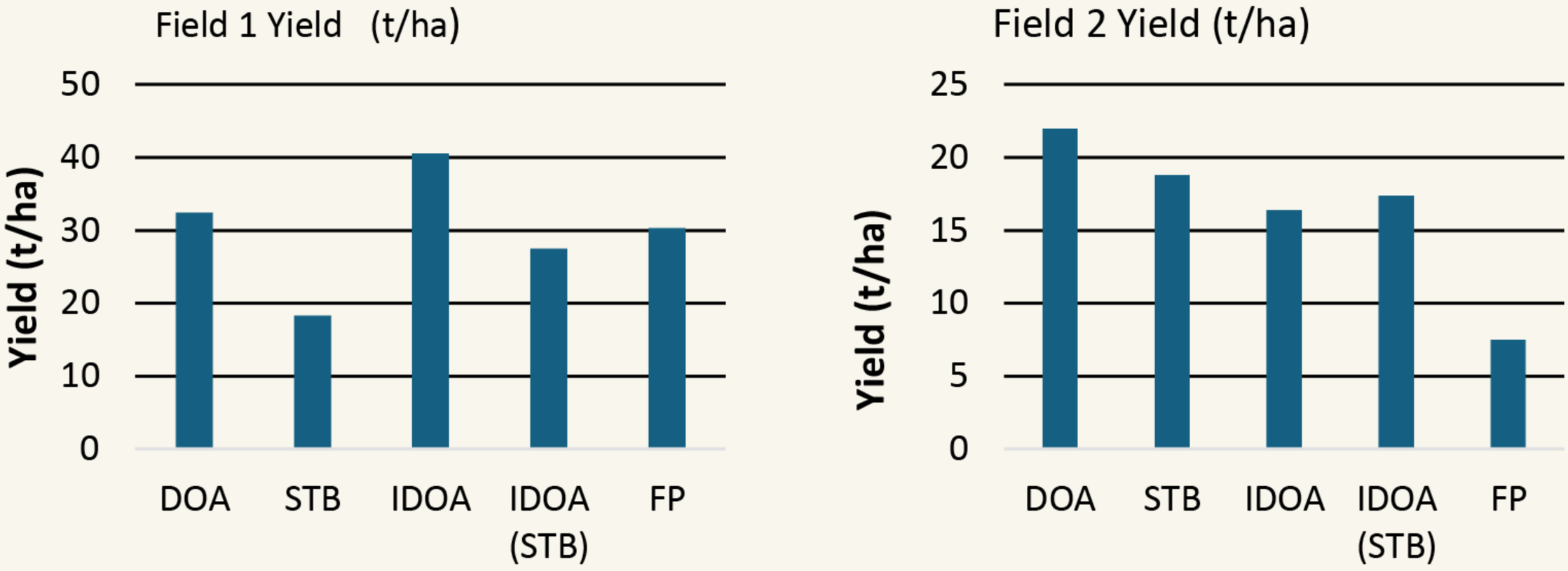


Figure 5 : Result of Field Trial in cabbage in Kalpitiya

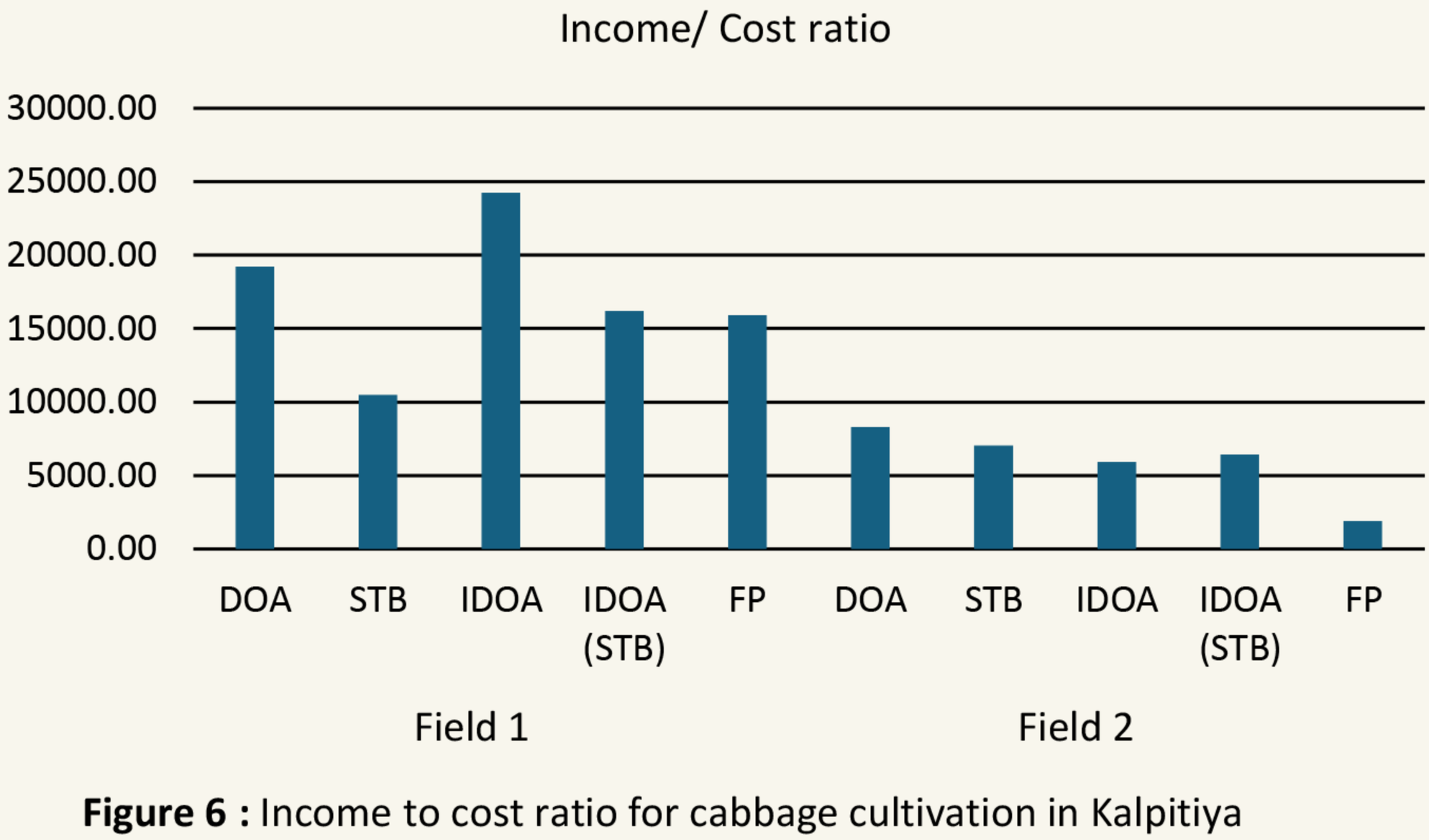


Figure 6 : Income to cost ratio for cabbage cultivation in Kalpitiya

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

As shown in Figure 5, IDOA treatments showed comparatively similar yields. The highest income-to-cost ratio is achieved with IDOA (Figure 6). However, FP shows the lowest income-to-cost ratios across all farmers. Overall, IDOA appears to be the most profitable option for cabbage.

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. Applying nutrients at the correct growth stages ensures that plants have access to the necessary nutrients when they need them most.

(2) Split application of N and K fertilizers

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.

(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. 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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