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Assessment of yield gap in organic cultivation of Lakadong turmeric variety in Meghalaya

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Abstract

The organic cultivation of Lakadong turmeric in Meghalaya, a region renowned for its spice production, shows significant yield gaps despite the crop's potential economic value. This study assesses these yield gaps by comparing potential yields achieved at research stations with actual yields obtained by farmers. The results reveal substantial discrepancies, with yield gaps of 15.78 q/ha at the farmers' level, 6.66 q/ha compared to demonstration yields and 3.74 q/ha against state average yields. These gaps are largely driven by a technological gap of 9.12 q/ha and an extension gap of 6.66 q/ha. While farmers have consistently adopted practices like variety selection, irrigation and harvesting, critical practices such as soil testing, seed treatment, mulching and the application of recommended fertilizer doses remain underutilized. The study highlights that these unadopted practices are essential for optimizing yield, underscoring the need for more focused extension and technology transfer initiatives. To bridge these gaps, the study recommends strengthening extension services, providing targeted training on underutilized practices and improving access to quality inputs such as seeds and organic fertilizers. Overall, addressing these yield gaps through targeted interventions could significantly boost the productivity and economic returns of organic turmeric cultivation in Meghalaya.

Keywords: Lakadong, turmeric, yield gap, Meghalaya

1. Introduction

Spices are low-volume, highly export-oriented commodities that hold significant economic value in India (Sugasini *et al.*, 2018) ^[12]. The North East Hill (NEH) region, often referred to as the green belt of India, is a major hub for spices such as bay leaf, large cardamom, ginger, turmeric, black pepper, and chili, all of which are in high demand and exhibit great potential (Hnamte *et al.*, 2012) ^[7]. The North-eastern region of India accounts for 9.38% of the country's total spice production in 2016–17, covering 6.51% of the nation's cultivated land (Singh *et al.*, 2020) ^[11]. Among the various spice crops, turmeric is a significant cash crop in the NEH region, contributing approximately 8.3% to the country's total turmeric production. Mizoram leads the region with a production of 27.82 thousand metric tons, followed by Meghalaya with 16.63 thousand metric tons, and Manipur with 15.40 thousand metric tons.

In Meghalaya, turmeric is cultivated widely across all districts, with 2,649 hectares under cultivation in 2017-18 (GOM, 2017). The Khasi-Jaintia Hills districts contribute 72% of the state's production, while the Garo Hills district accounts for 28% (GOM, 2020). Common turmeric varieties grown in Meghalaya include Lakadong, Lashien, Ladaw, Lakachain, Yangau, and Megha⁻¹ (Ashraf *et al.*, 2012) ^[1].

Every part of the turmeric plant, including the rhizome, is edible and rich in starch (Bose *et al.*, 2012) ^[3]. The volatile oil content in dry turmeric ranges between 3.6% and 4.8%, and the crop is also high in dietary fiber, making it useful in treating conditions such as obesity, diabetes, cancer, and gastrointestinal disorders (Mukherjee *et al.*, 2016) ^[10].

However, despite strong demand, farmers have yet to realize the full economic potential of turmeric cultivation due to factors such as the predominance of small and marginal farmers, lack of focused research, low individual production volumes, weak post-harvest management and market infrastructure, limited access to information, skills, and technology, unreliable price discovery, the dominance of middlemen and trader cartels, weak agricultural extension services, insufficient irrigation, limited access to finance, and inadequate planting material.

So, in order to overcome the problems, yield gap analysis was done. Yield Gap analysis is a research technique that formally emerged in the early 1980's. It is developed by the International Rice Research Institute (IRRI) which was extensively used to analyze and measure the determinants of gaps in yield in cultivation of different crops in different situations. The yield gap of a crop grown in a certain location and cropping system is defined as the difference

between the yields under optimum management and the average yield achieved by farmers (VanIttersum and Cassman, 2013) [13]. Yield gaps are estimated by the difference between potential yields and average farmers yields over some specified spatial and temporal scale of interest (Lobell *et al.*, 2009) [9]. Potential yield, in turn refers to the yield of an adapted crop variety or hybrid when grown under favorable conditions without growth limitations from water, nutrients, pests, or diseases (Evans, 1993) [4].

Quantification of yield-gaps becomes increasingly important towards impact assessment of climatic conditions, urbanisation, industrialization and other future scenarios that influence the land and natural resource use (Beigh *et al.*, 2015) [2]. Yield-gap analysis has been undertaken for most of the field crops in different regions of India by several researchers in the past using Front Line Demonstrations (FLDs) as base data. Similar studies have been undertaken worldwide using field experiments, yield contests, maximum farmer yields, surveys and simulation-based crop models. Potential yield (yield potential of a particular variety under experimental conditions) and attainable yield (affected by environment and socio-economic factors) can be estimated using on farm experiments, research station experiments and breeder's trials (Licker *et al.*, 2010) [8].

There are ample researches conducted on turmeric to analyse value chain, but very few are available on yield gap analysis of those commonly cultivated turmeric varieties in the state of Meghalaya. It was therefore felt that a study on yield gap analysis of turmeric cultivation would be of paramount importance and the findings of the study would contribute to understand the turmeric farmers about the latent potentials of the crop and addressing the problems pertaining to allocative inefficiency leading to yield gap of the turmeric production. This would be helpful to devise strategies for increased production and productivity and explore opportunities for strengthening the market of turmeric in this region.

2. Methodology

An *Ex-post* facto research design was adopted for the study. The research study will be taken up in West Jaintia Hills district of Meghalaya, which comprises of the highest area under organic turmeric cultivation in the state and contributes more than half of the turmeric production in the state. Two villages are selected purposively from each of the selected blocks (Laskein and Thadlaskein) which comprises of the highest area under organic turmeric cultivation in the district of West Jaintia Hills.

The farmers from each village of selected blocks who are indulged in organic turmeric farming are identified. This selection is done by implying the technique of Probability Proportional to Size Sampling. Thereby, 122 respondents had been determined and pinpointed as sample of the study. The data from the respondents was collected with the help of an interview schedule. The data collected was analysed and interpretations were drawn based on results. The suitable statistical techniques were used for analysis of data.

Yield gap

Yield gap will be calculated on the basis of per hectare

potential farm yield and actual farm yield.

- Yield Gap = Potential Farm Yield - Actual Farm Yield.
- The yield gap is measured in terms of Extension Gap and Technology Gap
- Extension Gap = Demonstrated Yield - Farmers' practice Yield
- Technology Gap = Potential Yield - Demonstration Yield

The yield gap was ascertained both in terms of absolute yield gap (q/ha) and in percent yield gap (%) terms using following formulas separately at state level, demonstration level and farmers' level with respect to potential yield.

Absolute yield gap (with respect to Potential yield)

- State yield gap = potential yield - state yield
- Demonstration yield gap = potential yield - demonstration yield
- Farmer's yield gap = potential yield - farmer's yield

Percentage yield gap (with respect to Potential yield)

- State yield gap = $\frac{\text{Potential yield} - \text{state yield}}{\text{state yield}} \times 100$
- Demonstration yield gap = $\frac{\text{Potential yield} - \text{demonstration yield}}{\text{demonstration yield}} \times 100$
- Farmer's yield gap = $\frac{\text{Potential yield} - \text{farmer's yield}}{\text{farmer's yield}} \times 100$

3. Results and Discussion

The ultimate focus of the present study is to ascertain the yield gap among the organic turmeric cultivation by the farmers. It can be inferred from Table 1. that the yield from the cultivation of the organic turmeric at different levels viz., research station yield (potential yield), KVK station yield (demonstration yield), state average yield and farmers' average yield

Table 1: Yield status at different levels

S. No.	Category	Yield (q/ha)
1.	Potential yield	74.50
2.	Demonstration yield	65.38
3	State yield	62.46
4.	Actual farmers' yield	58.72

Data presented in Table 2. depicts the magnitude of yield gap at farmers' level with respect to potential yield, demonstration yield and state yield were shown along with the extension gap and technology gap.

Table 2: Yield gap status at different levels

S. No.	Parameter	Gap (q/ha)
1.	Yield gap at farmer level	
	a. with respect to potential yield	15.78
	b. with respect to demonstration yield	6.66
	c. with respect to state yield	3.74
2.	Extension gap	6.66
3	Technology gap	9.12

A glance at the table 3. depicts that yield gap both in terms of absolute yield gap (q/ha) and in percentage yield gap (%)

was found to be high with 15.78 q/ha and 26.87% respectively at farmers' level.

Table 3: Yield gap status with respect to the potential yield

S. No	Yield gap	Absolute yield gap (q/ha) (w.r.t. to potential yield)	Percentage yield gap (%) (w.r.t. to potential yield)
1.	State yield gap	12.14	19.43
2.	Demonstration yield gap	9.12	13.94
3.	Farmers' yield gap	15.78	26.87

Extent of technological gap with regard to individual practices of organic turmeric production with impact on yield gap

In the present study, the impact of technological gap on the yield gap was found with regard to the individual practices of organic turmeric cultivation. The practices chosen for the study were selection of variety, soil testing, seed rate, seed treatment, spacing, field preparation, mulching, application

of recommended dose of fertilizer, irrigation, weed management, plant protection measures for control of insect pest and diseases and harvesting.

The observations from the Table 3. indicates the frequency and percentage of the total respondents with different levels of technology gap ('full gap', 'partial gap', 'no gap') for each practice.

Table 3: Technological gap with regard to recommended package of practices of organic turmeric production (n=122)

S. No	Package of practices	Extent of technological gap		
		Full gap	Partial gap	No gap
1.	Selection of variety	-	-	122 (100.00)
2.	Soil testing	114 (93.44)	-	8 (6.56)
3.	Seed rate	-	98 (80.32)	24 (19.67)
4.	Seed treatment	81 (66.40)	30 (24.60)	10 (8.20)
5.	Spacing	-	93 (73.22)	29 (23.78)
6.	Field preparation	-	76 (62.30)	46 (37.70)
7.	Mulching	109 (89.34)	13 (10.65)	-
8.	Application of recommended dose of fertilizer	77 (63.11)	55 (45.08)	-
9.	Irrigation	-	-	122 (100.00)
10.	Weed management	-	107 (87.70)	15 (12.30)
11.	Plant protection measures for control of insect pest and diseases	116 (95.08)	5 (4.10)	-
12.	Harvesting	-	-	122 (100.00)

Note: The figures within parentheses indicate per cent of the total farmers

3.1 Selection of variety

The data manifested in table 3. revealed that the total share (100.00%) of the respondents were under no gap category in adopting the selection of variety. This is due to the reason that all the respondents are maintaining their ancestral heritage through securing the local variety. This practice may thus have the minimal effect on the yield of the organic turmeric since no new variety was being grown.

3.2 Soil testing

The data displayed in table 3. indicated that majority (93.44%) of the respondents were under full gap category followed by respondents under no gap (6.56%) category for this practice. The possible reason may be that the respondents have meagre knowledge about soil testing of rhizomes. As most of the respondents belongs to full gap group this practice thus has negative impact on the yield and would result in higher yield gap.

3.3 Seed rate

From Table 3., it was clearly revealed that majority of the respondents were under partial gap category which was followed by no gap category and none was in full gap category. The major reason might be that most of the respondents were negligent and gave less priority for the quantity of seed material. Since most of the respondents were of partial gap category seed rate has no significant

impact on the yield gap.

3.4 Seed treatment

From the data displayed in Table 3., highlighted that majority (93.44%) of the respondents were under full gap category followed by respondents under partial gap (6.56%) and no gap category. It could be possible as most of the respondents were reluctant in changing their practices to scientific methods. Since full gap category tops the list, non-adoption of seed treatment would lead to higher yield gap.

3.5 Spacing

A glance at Table 3., depicted that majority of the respondents were under partial gap category followed by no gap category. This may be due to the fact that for most of the respondents spacing was not give much priority. Since most of the respondents were of partial gap category seed rate has negligible impact on the yield gap.

3.6 Field preparation

An overview of Table 3., pointed out that that majority of the respondents were under partial gap category followed by no gap category. The reason for partial adoption might be that the respondents do not have time to prepare seed beds with required dimensions. Yield gap is least affected since majority of the respondents were of partial gap category.

3.7 Mulching

Figures in Table 3., revealed that majority (93.44%) of the respondents were under full gap category followed by respondents under partial gap (6.56%) category for mulching practices. The main reason for full gap might be due to lack of awareness among the respondents regarding the significance of this practice. There is significant impact on the yield gap as majority of the respondents were under full gap category.

3.8 Application of recommended dose of fertilizer

From the data revealed in Table 3., it was observed that majority (93.44%) of the respondents were under full gap category followed by respondents under partial gap (6.56%) category for application of recommended dose of fertilizers. The feasible reason behind this could be due to the fact the respondents had no knowledge about the importance of this practice. There is significant impact on the yield gap as majority of the respondents were under full gap category.

3.9 Irrigation

The data manifested in Table 3., revealed that the total share (100.00%) of the respondents were under no gap category for irrigation application. This is due to the reason that all the respondents were not providing artificial irrigation to their field as they completely depend on rainfall. This practice may thus have the minimal effect on the yield of the organic turmeric.

3.10 Weed management

Results furnished in Table 3., revealed that majority of the respondents were under partial gap category which was followed by no gap category and none was in full gap category. The major reason might be that most of the respondents were negligent and gave less priority for the weed management practices. Since most of the respondents were of partial gap category seed rate has no significant impact on the yield gap.

3.11 Plant protection measures for control of insect pest and diseases

It is apparent from the Table 3., that majority (93.44%) of the respondents were under full gap category followed by respondents under partial gap (6.56%) category for plant protection measures. The reason for the partial adoption may be due to lack of technical assistance, high cost and non-availability of the bio chemicals. There is significant impact on the yield gap as majority of the respondents were under full gap category.

3.12 Harvesting

The observations from Table 3., indicated that the total share (100.00%) of the respondents were under no gap category for harvesting of turmeric. This is due to the reason that all the respondents were harvesting their produce manually. This practice may thus have the minimal effect on the yield of the organic turmeric since all the respondents were under no gap category.

4. Conclusion

The study reveals significant yield gaps in organic turmeric cultivation, particularly between the potential yield at

research stations and the actual yields achieved by farmers. The yield gaps at the farmers' level compared to the potential, demonstration, and state average yields were 15.78 q/ha, 6.66 q/ha, and 3.74 q/ha, respectively. These gaps are primarily attributed to a technological gap of 9.12 q/ha and an extension gap of 6.66 q/ha. To bridge these gaps, it is essential to strengthen extension services and provide targeted training that emphasizes the adoption of underutilized practices. Enhanced access to quality inputs, such as seeds and organic fertilizers, along with regular soil testing, can significantly reduce the technological gap. Additionally, establishing Farmer Field Schools (FFS) specifically for organic turmeric cultivation would provide farmers with hands-on experience and encourage the adoption of best practices. A robust monitoring and feedback system is also crucial to track progress and make necessary adjustments in extension strategies, ensuring that farmers receive the support needed to improve their yields and profitability.

References

1. Ashraf K, Mujeeb M, Ahmad A, Amir M, Mallick MN, Sharma D. Validated HPTLC analysis method for quantification of variability in content of curcumin in turmeric (*Curcuma longa* L.) collected from different geographical regions of India. *Asian Pacific Journal of Tropical Biomedicine*. 2012;2(2):5384-5588.
2. Beigh MA, Sibat FK, Matoo JM, Shah ZA, Mir R. Quantification of yield gaps of important field crops in North-Western temperate region of India. *International Journal of Agricultural Sciences*. 2015;7(8):626-633.
3. Bose TK, Kabir J, Maity TK, Parthasarathy VA, Som MG. Vegetable crops. Vol 2. Kolkata: Naya Udyog Publishers; 2012. p. 413-442.
4. Evans LT. Adapting and improving crops: The endless task. *Philosophical Transactions of the Royal Society B*. 1997;352:901-906.
5. Government of Meghalaya. Directorate of Agriculture and Farmers' Welfare – Organic agriculture. 2017.
6. Government of Meghalaya. Directorate of Agriculture and Farmers' Welfare – Organic agriculture. 2020.
7. Hnamte V, Chatterjee R, Chattopadhyay PK, Pariari A. Spices scenario in the North Eastern states of India with special reference to production and marketing. *Journal of Crop and Weed*. 2012;8(2):109-112.
8. Licker R, Johnston M, Foley JA, Barford C, Kucharik CJ, Monfreda C, *et al*. Mind the gap: How do climate and agricultural management explain the yield gap of croplands around the world? *Global Ecology and Biogeography*. 2010;19(6):769-782.
9. Lobell DB, Cassman KG, Field CB. Crop yield gaps: Their importance, magnitudes, and causes. *Annual Review of Environment and Resources*. 2009;34:179-204.
10. Mukherjee D, Roquib MA, Das ND, Mukherjee S. A study on genetic variability, character association and path coefficient analysis on morphological and yield attributing characters (*Cassia esculenta* var. *antiquorum* L. Scott). *American Journal of Plant Sciences*. 2016;7:479-488.
11. Singh R, Dympep A, Passah S, Feroze SM, Choudhury A, Kumar S, *et al*. Value chain analysis of Lakadong

- turmeric in Meghalaya: A micro-level study. *Agricultural Economics Research Review*. 2020;33(2):239-249.
12. Sugasini D, Yalagala PC, Kavitha B, Kasturi T, Vijayalakshmi Y, Kumar PK, *et al*. Indian culinary ethnic spices uses in foods are palate of paradise. *Acta Scientific Nutritional Health*. 2018;2(8):22-28.
 13. Van Ittersum MK, Cassman KG. Yield gap analysis—Rationale, methods and applications—Introduction to the special issue. *Field Crops Research*. 2013;143:1-3.