

RESEARCH PAPER

# A study on market potential and buying behaviour of micronutrient fertilizers in Vadodara and Bharuch districts of Gujarat

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## ABSTRACT

The agricultural micronutrients market growth has increased progressively because of increased global micronutrient deficiency in soil, shrinkage in the world's agricultural land, intensive cropping pattern, extensive use of chemical fertilizers, mining of micronutrient reserves and extensive irrigation facilities. The micronutrients include iron, manganese, zinc, boron, copper and molybdenum required by most plants in small amounts are not less important in plant growth than the other essential nutrients. In order to understand market potential and buying behaviour of micronutrient fertilizers in different districts, the present study was undertaken during 2016. Data were collected through personal interview from 120 farmers and 50 retailers in two districts of Gujarat *i.e.* Vadodara and Bharuch. Majority of the respondents were medium farmers having land of 4 to 10 acre and were observed growing banana, sugarcane, cotton, castor and chilli. Eighty three per cent of the respondents of Vadodara district and 92 per cent of Bharuch district were found using micronutrient fertilizers. The farmers who were not using the micronutrient fertilizers gave the reasons like they did not need, they were aware but did not use and they knew the importance but did not want to use in any way. Market potential for different categories of micronutrient fertilizers varied from approximately 3 lakhs to 71 crore in both districts. Most of the farmers received information regarding micronutrient fertilizers from retailers (62% in Vadodara and 72% in Bharuch) and were observed purchasing the micronutrient fertilizers from local private dealers/retailers (82% in Vadodara and 75% in Bharuch). Farmers used their past experience for purchase of micronutrient fertilizers. Many of the retailers faced the problems of unawareness of farmers, orthodox mind of farmers, delay in payment of credit and less understanding about micronutrient fertilizers.

**KEY WORDS :** Micronutrient fertilizers, Market potential, Farmer's buying behaviour

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Eight out of 17 essential plant nutrients are classified as micronutrients. These are termed as micronutrients because, in comparison to major nutrients, these are needed by plants in small amounts. Trace elements means elements present at low concentrations (mg/kg or less) in agro ecosystems. The phrase "trace elements" include copper (Cu), zinc (Zn), manganese (Mn), iron (Fe), molybdenum (Mo) and boron (B) called micronutrients. Fe, Mn and Zn are essential

for germination and establishment of seed; Fe, Mn, Cu and B are essential for vegetative growth; Fe and B are essential for flowering and reproduction; Cu, Mo and B are essential for maturity and senescence (Tandon, 1995). If micronutrients are not available sufficiently, plants will suffer from physiological stresses caused by inefficiency of several enzymatic systems and other related metabolic functions (Kobraee *et al.*, 2013). Zinc, iron and manganese are cations that need to be transported from the soil solution into the roots and partitioning in different parts of plant. Distribution of micronutrients into different parts of plant is affected by genotypic characteristic (Moraghan *et al.*, 2002). Micronutrients concentration in different plant organs is related to plant growth stage, availability, and mobility of micronutrient. These can be transferred from the root, stem, leaf and pod walls into developing seeds (Page and Feller, 2005). Fertilizers containing trace elements (such as boron, copper, manganese, zinc and cobalt) - in small quantities are called as micronutrient fertilizers. Micronutrients enable the plants to produce enzymes, hormones and other substances essential for proper growth and development. Micronutrient fertilizer can be broadly grouped into two categories (i) inorganic salts and (ii) chelates. Within each of these, one can have single as well as multi-micronutrient fertilizers. The low use efficiency of major fertilizers, supplying major nutrient, in large proportion can be improved by their modifications to lessen the

negative aspects as well as trying to combine one or two more nutrients so that with the same application effort, crop benefits with multi-nutrient needs. Therefore, there is a need to promote balanced fertilization for which use of appropriate multi-micronutrient mixture grades would play a big role to improve nutrients use efficiency and enhance crops productivity for food and nutritional security. Most of the soils of Gujarat have been reported to be deficient in Zn and Fe. Therefore, the Zn and Fe deficiency is one of the most frequently encountered micronutrient deficiencies besides hidden hungers of other micronutrients in different crops grown in the state. Table A indicates the multi-micronutrients mixtures prepared based on prevailing deficiencies of Zn and Fe in soils of Gujarat to provide balanced nutrition in different crops. Efficacy of these micronutrients was tested on soils having marginal to deficient status in available Zn / Fe or Zn+Fe (Patel *et al.*, 2008). A projected high increase in global fertilizer consumption, reaching upto 200 to 300 million tones, raises concerns due to low nutrient use efficiency and inappropriate soil management (Osvalde, 2011). To address this issue, farmer friendly proper nutrient management practices along with rational cropping systems can play a key role (Thilakarathna and Raizada, 2015). The global micronutrient market was valued at approximately USD 4.75 billion in 2014 and is expected to reach approximately USD 7.75 billion by 2020, indicating at a CAGR of about 8.0 per cent. In

Sr. No.	Grade	Content (%)				
		Fe	Mn	Zn	Cu	B
<b>For foliar spray</b>						
1.	Grade-I (General)	2.0	0.5	4.0	0.3	0.5
2.	Grade-II (for Zn deficiency)	2.0	0.5	8.0	0.5	0.5
3.	Grade-III (Fe deficiency)	6.0	1.0	4.0	0.3	0.5
4.	Grade-IV (for Zn and Fe deficiency)	4.0	1.0	6.0	0.5	0.5
<b>For soil application</b>						
5.	Grade-V	2.0	0.5	5.0	0.2	0.5

Year	Zinc sulphate	Ferrous sulphate	Copper sulphate	Manganese sulphate	Borax acid	Molybdenum
2010-2011	151162	20254	1388	3942	17466	215
2011-2012	161037	21275	1699	4495	20187	209
2012-2013	160324	22781	1686	5248	17626	107
2013-2014	194406	24633	2921	6064	19567	143
2014-2015	142636	19492	1348	4197	16401	36

Source : Speciality fertilizer statistics 2014-15, The fertilizer association of India

terms of volume, global micronutrient market stood at 1,050 kilo tons in 2014. The micronutrients market is segmented on the basis of major essential micronutrients such as boron, copper, iron, manganese, molybdenum, zinc and others. Among all micronutrients, zinc dominated micronutrient market by type accounting for 35 per cent market share in 2014 followed by boron (25%), iron and manganese (15%), copper (6%) and molybdenum (4%). On the basis of type of crop, cereal segment accounted for the highest share of market in 2014 followed by pulses and oilseeds constituting 29.0 per cent of market share in 2014. On the basis of application, the micronutrient market has been segmented into fertigation, foliar, soil, seed treatment and hydroponics. Soil segment accounted for largest share of overall market in 2014. Foliar was second largest market and accounted for over 23.0 per cent of the micronutrients market in 2014. Asia pacific was the leading regional market for micronutrient and accounted for 55.0 per cent market share followed by North America accounting for 19.0%) in 2014. (Zion Research Analysis, 2016).

At present about 48.1 per cent of Indian soils are deficient in diethylene-triamine penta acetate (DTPA) extractable zinc, 11.2 per cent in iron, 7 per cent in copper and 5.1 per cent in manganese. This apart, deficiencies of boron and molybdenum have also been reported in some areas. In India, foliar application is widely used in potato based cropping system which can be profitable. (Grewal and Sharma, 1993). Foliar spray of zinc sulphate is also very effective for zinc deficiency in guava and other fruit crops (Chaudhary and Natwal, 2005). Areas with multi-micronutrient deficiencies are limited, thus, simple fertilizers are sufficient to exploit the potential of crops and cropping systems. Based on the extent of deficiency, cultivated area and crop removal, the micronutrient fertilizer demand in 2025 as shown in the Table B is projected using sufficiency and maintenance approaches (Gupta, 2005).

### Objectives :

- To analyse market potential of micronutrient fertilizers in Vadodara and Bharuch districts
- To study buying behaviour of farmers with respect to micronutrient fertilizers
- To find market issues of retailers while selling of micronutrient fertilizers.

### METHODOLOGY

The study was carried out in two districts of Gujarat. The sampling method was non-probability sampling under which convenience sampling technique for farmers and Snowball sampling technique for retailers were used. A total of 120 farmers (60 from each district) and 50 retailers (25 from each district) were selected from Vadodara and Bharuch districts of Gujarat. Both primary and secondary data were used in the study. Primary data were collected by personal interview of the respondents with the help of semi-structured schedule. A separate schedule for both farmers and retailers were prepared. Required secondary data were collected from the Department of Micronutrient Project, Indian Council for Agricultural Research, Anand Agricultural University, Anand. Apart from this, district profile and cropping pattern information were collected from Department of Agriculture, District Panchayat Office of Vadodara and Bharuch. Data were analyzed using standard tools like frequency, average, percentage, Garrett ranking method, in MS Excel keeping in view the stipulated objectives of study.

Specifically for calculating market potential following formula was used:

$$\text{Market potential} = \text{Total cultivated area (acre)} * \text{Recommended dosage (kg/acre)} * \text{Average price of product (Rs./kg)}$$

Garrett ranking method was used to rank the preference indicated by the respondents on different factors. As per this method, respondents have been asked to assign the rank for all factors and the outcomes of such ranking have been converted into score value with the help of the following formula:

$$\text{Per cent position} = \frac{100(R_{ij}-0.5)}{N_j}$$

where,

$R_{ij}$  = Rank given for the  $i^{\text{th}}$  variable by  $j^{\text{th}}$  respondents

$N_j$  = Number of variable ranked by  $j^{\text{th}}$  respondents.

### ANALYSIS AND DISCUSSION

The findings of the present study as well as relevant discussion have been summarized under the following heads :

#### Profile of the sampled farmers :

The profile of the sampled farmers is presented in Table 1. The table reveals that most of the farmers belongs

to age group of 31 to 40 years in Vadodara district (40%) and 41 to 50 years in Bharuch district (38%). It was interesting to note that around 26 per cent of the respondents farmers in the study area were graduate.

### Buying behaviour of micronutrient fertilizers by farmers :

Awareness and buying pattern of the farmers on the use of micronutrient fertilizer is presented in Table 2. The analysis of data revealed that majority of the farmers used micronutrient fertilizers (78.67% in Vadodara and 84.33% in Bharuch). The farmers who did not use micronutrient fertilizers gave the following reasons: i.) they knew the importance but did not want to use, may be due to they were late adopters ii.) they aware but did not use as they did not believe that micronutrient has significant importance and iii.) some of them were not aware. Majority of the farmers were observed using multi micronutrient type of grade IV (78%) and grade V (69.6%) in both districts. Most of the farmers used drip as a form of application for micronutrient fertilizers. The study also revealed that majority of the farmers got information about micronutrient fertilizers from dealers/retailers (61.67% in Vadodara and 76.67% in Bharuch) as well as purchased micronutrient from local private dealers (81.67% in Vadodara and 75% in Bharuch). Past

experience was the major factor which influenced the purchase decision of farmers regarding micronutrient fertilizers followed by quality of product, easy availability, price differentiation, credit and brand loyalty.

### Market potential of micronutrient fertilizers in Vadodara and Bharuch districts :

Market potential has been carried out from specific formula which has been discussed in methodology section. The market potential varied from 3 lakhs to 71 crore in Vadodara district (Table 3) and from 3 lakhs to 69 crore in Bharuch district (Table 4). As can be seen from the Table 3 and 4, highest potential was observed in case of Grade-V (Soil application) and lowest in chelated category of micronutrient fertilizers in Vadodara district. Same as, highest potential was observed in case of Grade-V (Soil application) and lowest in chelated category in Bharuch district.

### Problems faced by retailers :

Table 5 shows the major problems faced by retailers while selling of micronutrient fertilizers in the study area. The major problem in Vadodara district was unawareness of farmers (32%) towards the micronutrient fertilizer followed by orthodox thought of farmers (28%) and interestingly, 28 per cent of retailers studied did not face any problem in selling of micronutrient fertilizers. In

Table 1 : Profile of the sampled famers		(n =120)	
Particulars	Vadodara (%)	Bharuch (%)	
<b>Age (years)</b>			
21-30	10.00	8.00	
31-40	40.00	26.67	
41-50	35.00	38.33	
51-60	13.33	21.67	
<b>Education (%)</b>			
Illiterate	3.33	0.00	
Primary	6.67	16.67	
S.S.C /H.S.C.	61.67	60.00	
Graduate	26.67	20.00	
Post Graduate	1.67	3.33	
<b>Land holding (acres)</b>			
<1 Marginal	1.67	3.33	
1-2 Small	11.67	10.00	
2-4 Semi-medium	20.00	23.33	
4-10 Medium	53.33	46.67	
>=10 Large	13.33	16.67	

Table 2 : Buying pattern on micronutrient fertilizer used by farmers		(n = 120)			
		Vadodara (%)		Bharuch (%)	
Users of micronutrient fertilizers		78.67		84.33	
Nonusers of micronutrient fertilizers		21.33		15.67	
Reasons for not using micronutrient fertilizers					
Not aware		4.33		1.67	
They aware but don't use		6.00		2.33	
They know the importance, don't want to use		11.00		1.67	
Not needed		0.00		10.00	
Type of micronutrient		For both districts			
Single micronutrient type	Chelated Zn	8.40			
	Chelated Fe	6.00			
	Chelated Mn	2.40			
	B	2.40			
	Chelated Cu	1.20			
Multi-micronutrient type	Grade I	22.80			
	Grade IV	78.00			
	Grade V	69.60			
Since how long using micronutrient fertilizer (years)					
3-5		43.33		20.00	
6-8		21.67		45.00	
Form of application					
Broadcasting		5.67		33.67	
Drip		41.33		21.00	
Foliar		2.00		3.00	
Broadcasting + drip		27.67		23.33	
Broadcasting + foliar		2.00		3.33	
Sources of information of micronutrient fertilizers (each out of 100%)					
Friends/relatives		1.67		31.67	
Dealers of fertilizers		61.67		76.67	
Local co-operative soc.		1.67		5.00	
Krishi mahotsav		36.67		28.33	
Farmers' meeting		31.67		23.33	
Self-knowledge		8.33		0.00	
Point of purchase (each out of 100%)					
Local Pvt dealer/retailer		81.67		75.00	
Direct from company depot		0.00		10.00	
Agro service centre		3.33		5.00	
Factors considering while purchasing micronutrient fertilizers (using garrett ranking method)					
		Garrett score	Vadodara (Rank)	Garrett score	Bharuch (Rank)
Price differentiation		44.12	4	37.38	5
Quality of product		58.64	2	59.80	2
Easily available		46.98	3	47.13	3
Brand loyalty		32.22	6	29.47	6
Credit		38.12	5	46.64	4
Past experience		69.32	1	69.18	1

**Table 3 : Market potential of micronutrient fertilizer in Vadodara district**

Grade name	Total cultivated land holding (acre) (I)•	Recommended dosage (kg / acre) (II) ••	Average price of product (Rs./ kg) (III)	Market potential (In crore) [IV= (I•II••III)/10000000]
<b>Non-chelated single micronutrient</b>				
<b>For soil application</b>				
ZnSO <sub>4</sub> (Zn-21%)	674856	3	60	12.15
FeSO <sub>4</sub> (Fe-12%)	674856	6	50	20.25
MnSO <sub>4</sub> (Mn-30.5%)	674856	4	100	26.99
Borax (B-10.5%)	674856	0.705	190	9.04
CuSO <sub>4</sub> (Cu-24%)	674856	Not required	Not required	0.00
<b>Chelated single micronutrient</b>				
<b>For fertigation application</b>				
Chelated Zn-EDTA	674856	0.003	175	0.035
Chelated Fe-DTPA	674856	0.004	156	0.042
Chelated Mn	674856	0.0025	313	0.053
B	674856	0.003	165	0.033
Chelated Cu	674856	0.002	300	0.040
<b>Multi micronutrient</b>				
<b>For foliar spray</b>				
Grade I (General)	674856	1	286	19.30
Grade II (For Zn deficiency)	674856	1	248	16.74
Grade III (For Fe deficiency)	674856	1	208	14.04
Grade IV (For Zn and Fe deficiency)	674856	1	105	7.09
<b>For soil application</b>				
Grade V (Soil application)	674856	8	131	70.72

Source: • - Agriculture Department, District Panchayat Office of Vadodara district

•• - Micronutrient Project, ICAR, AAU, Anand, Gujarat

**Table 4 : Market potential of micronutrient fertilizer in Bharuch district**

Grade name	Total cultivated land holding (acre) (I) •	Recommended dosage (kg / acre) (II) ••	Average price of product (Rs./ kg) (III)	Market potential (In crore) [IV= (I•II••III)/ 10000000]
<b>Non-chelated single micronutrient</b>				
<b>For soil application</b>				
ZnSO <sub>4</sub> (Zn-21%)	626923	3	60	11.28
FeSO <sub>4</sub> (Fe-12%)	626923	6	50	18.81
MnSO <sub>4</sub> (Mn-30.5%)	626923	4	100	25.08
Borax (B-10.5%)	626923	0.705	190	8.40
CuSO <sub>4</sub> (Cu-24%)	626923	Not required	Not required	0.00
<b>Chelated single micronutrient</b>				
<b>For fertigation application</b>				
Chelated Zn-EDTA	626923	0.003	148	0.028
Chelated Fe-DTPA	626923	0.004	163	0.041
Chelated Mn	626923	0.0025	300	0.047
B	626923	0.003	152	0.029
Chelated Cu	626923	0.002	300	0.038
<b>Multi-micronutrient</b>				
<b>For foliar spray</b>				
Grade I (General)	626923	1	270	16.93
Grade II (For Zn deficiency)	626923	1	248	15.55
Grade III (For Fe deficiency)	626923	1	208	13.04
Grade IV (For Zn and Fe deficiency)	626923	1	120	7.52
<b>For soil application</b>				
Grade V (Soil application)	626923	8	138	69.21

Source: • - Agriculture Department, District Panchayat Office of Bharuch district

•• - Micronutrient Project, ICAR, AAU, Anand, Gujarat

Table 5 : Problem faced by retailers while selling of micronutrient fertilizers	(n=50)	
	Vadodara (%)	Bharuch (%)
Orthodox thought of farmers/hard to explain	28.00	20.00
Unawareness of farmers	32.00	24.00
Delay in payment of credit by farmers	12.00	20.00
Less understanding about micronutrient fertilizer	0.00	16.00
No problem	28.00	20.00

Bharuch, major was again unawareness of farmers (24%) followed by orthodox mind and delay in payment of credit by farmers (20%) and 20 per cent of the farmers of did not face problem in selling of micronutrient fertilizer.

### Conclusion :

This paper makes an attempt to study the market potential and buying behaviour of micronutrient fertilizers in selected district of Gujarat *i.e.*, Vadodara and Bharuch. Eighty three per cent of the respondents of Vadodara district and 92 per cent of Bharuch district were found using micronutrient fertilizers. Market potential for different categories of micronutrient fertilizers varied from approximately 3 lakhs to 71 crore in both districts. Farmers used their past experience for purchase of the micronutrient fertilizers yet the role of retailer/dealers in information sharing was commendable and it has a great impact on selling of the particular categories of fertilizers in the study area. Many of the retailers faced the problems of unawareness of farmers, orthodox mind of farmers, delay in payment of credit and less understanding about micronutrient fertilizers. The findings of the study can go a long way for organization to take appropriate strategic decisions pertaining to the customers and dealers apart from understanding the dynamic market environment as well as for expanding the business and evaluating the current situation regarding micronutrients. Farmers and retailer level analysis was carried out to know issues faced by retailers.

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