Ascertaining of Farmers' Perception Regarding Soil Quality Management Using Participatory Method

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ABSTRACT

A village level survey was conducted with the small and marginal farmers of three blocks namely Balurghat, Kumarganj and Tapan in Dakshin Dinajpur district of West Bengal to ascertain farmers' perception regarding soil quality management by participatory mode. The outcome of the survey revealed the inadequate doses of organic matter application among small and marginal farmers were more common in Balurghat and Kumarganj blocks compared to Tapan block. When asked about the usefulness of organic matter in soil, 90 per cent of the farmers agreed upon the beneficial effects in soil. Regarding the advisory service, almost 49.3 per cent farmers of the three blocks received no advice while the rest of the portion (mostly small farmers of the blocks) gets advice from dealers and Krishi Prajukti Sahayaks. Interestingly the small farmers and some marginal farmers of Kumarganj and Balurghat blocks had some idea about the importance of soil testing but 63.2 per cent of the small and marginal farmers of Tapan block were totally ignorant about the importance of the same. Another important aspect, micronutrient application was neglected by the farmers in all the three blocks as they were ignorant about micronutrient use in crops. Regarding the use of fertilizer, broadcasting was usually practiced along with partially or decomposed organic matter application in open field. The farmers who got the advice from the KPS only, applied lime in soils. Some farmers experienced the nutrient deficiency symptom as reddening of crops. According to the farmers' perception, gradual increase of inorganic fertilizer is inevitable in order to keep pace with the production. Keeping all these facts in view it may be concluded that awareness generation of farmers though extension activities is of vital importance for soil quality management by the small and marginal farmers of this district.

Key words: *Farmers' perception; Soil quality management; Participatory mode; Organic matter application ;*

Intensive agriculture, while increasing food production, has given rise to second generation problems in respect of nutrient imbalance including greater mining of soil nutrients to the extent of about 10 million tons every year depleting soil fertility, emerging deficiencies of secondary and micronutrients, decline in water table and its quality of water, decreasing organic carbon content and overall deterioration in soil quality and health. Soil quality is related to soil functions and soil health concepts, views soil as a finite and dynamic living resource (*Kinyangi 2007; Laishram et al., 2012; Sinha et al., 2014*).

Indian soils more specifically West Bengal soils not only show deficiency of primary nutrients (Nitrogen, Phosphorous and Potassium) but also of secondary nutrients (Sulphur, Calcium and Magnesium) and micro nutrients (mainly Boron, Zinc, Copper and Iron etc.) in most parts of the country (*Compendium on Soil Health, 2012*). Under micronutrient deficient situations, the application of major nutrients alone does not give expected results. Inadequate fertilization with macro and micro nutrients, low soil pH, less irrigation facility, small land holding and low economic status and finally lack of knowledge about balanced fertilization vis-à-vis soil

quality maintenance of the farmers are the major constraints in raising productivity levels in this district in spite of moderate fertilizer use. The imbalanced use of fertilization (especially macronutrients) by this studied population had already been studied by *Das et al., 2009*. Thus information on the present level of consumption of organic manure and soil amendments is of prime importance in order to derive facts in the micro farming level. As almost 98.23 per cent of land holders of this district belong to marginal (having less than 1.0 ha land) and small (having 1-2 ha land) category of farmers, the present study is restricted within these categories of farmers where the fertilizer consumption and other fact findings would be assessed.

Knowledge is a component of the behaviour of an individual. To improve the adoption of techniques of use of organic manures, micronutrients and soil testing under village condition it is necessary to know the knowledge level of farmers so that it could be used effectively with an appropriate economic viability.

Keeping these facts in view the present study was designed with the following objectives :

i. To determine the current status of organic manure & micronutrient use in the villages by the small and marginal farmers.
ii. To ascertain the knowledge level of farmers about soil quality management
iii. To identify farmers' perception regarding different components of balanced fertilization and to analyze the knowledge gap through questionnaire survey.

METHODOLOGY

The study was conducted in Dakshin Dinajpur district (latitude 250 10/55 // N and longitude 88047/00 / / E) of West Bengal. Three Blocks namely Balurghat, Kumarganj and Tapan were selected purposefully for the study. From each of these blocks two to four villages were selected by random sampling without replacement techniques. The landholding wise distribution of farmers depicts that, marginal and small farmers of the district comprises 98.23 per cent of the total land holders. Population of farmers in different study blocks showed concentration of more numbers of marginal farmers than small farmers in Tapan block as compared to Balurghat and Kumarganj block. Accordingly number of respondents were taken from Tapan and rest equally from the other two blocks making the total respondents' population to 140. The data were derived through structured interview schedule and PRA exercise. Participatory rural appraisal (PRA) techniques have been employed to assess farmers' perception on organic matter use, use of lime, soil testing and use of micronutrient, etc.

To measure the knowledge level of farmers they were asked to reply different questions about the use of organic matter, liming materials, micro nutrient, use of chemical fertilizers and soil testing. The respondents were grouped under three categories viz., farmers 'with full knowledge', 'with partial knowledge' and having 'no knowledge' and were assigned the score 2, 1 and 0, respectively (*Naik et al. 2009*). The scores so obtained under various questions were summed up. On the basis of the total score obtained, respondents were categorized into three classes' i.e. low, medium and high level of knowledge. The activity wise knowledge percentage was also calculated on the basis of following formula.

$$KI = \frac{\text{Summation of obtained Knowledge Scores}}{\text{Max. possible obtainable Knowledge Scores}} \times 100$$

KI= Knowledge Inde

The independent variables represented socio-personal, socio-economic, communicational and psychological variables of the respondents and were empirically measured by procedures evolved for the purpose, and also by using scales and scoring procedures developed by earlier research study (*Goswami et al. 2010 ; Goswami 2012*).

RESULTS AND DISCUSSION

Farmers' perception about soil quality management was judged through general response, perception of farmers and knowledge level attained by the farmers about their farming strategy. The detailed findings and discussions are described hereunder.

Response of farmers about liming **:** Use of lime has not been popularized in all the survey blocks as 88.9 per cent, 88 per cent and 73.9 per cent of small farmers of Tapan, Balurghat and Kumarganj block respectively and 95.2 per cent, 100 per cent and 100 per cent of marginal farmers respectively from these blocks didn't use lime in their fields. The probable causes are lack of advice regarding use, less purchasing capacity of lime due to poor economic back-up of farmers etc. Regarding the advisory service almost 87.3 per cent farmers of these blocks received no advice. However, progressive

Table 1: Average use (q/ha) of different organic manures in different crops (N = 140)

Name of Crops	Category of Farmers	Tapan Block				Balurghat Block			KumarganJ Block		
		FYM	Oil cake	Pond silt	Other	FYM	Oil cake	Pond silt	FYM	Oil cake	Pond silt
Aman Rice/	S*	32.5(15)	10(1)	10(1)	4 (1)	5.88(10)	0.13(5)	0	12.9(11)	5.62(8)	0
Boro rice	M*	24.3(10)	0	0	0	5.43 (8)	0	1.25(3)	11.0(15)	12.6 (8)	0
Vegetables	S	0	0	0	0	4.13(10)	0.29 (8)	1.15(3)	0	0	0
	M	20 (1)	0	0	0	6.61(8)	0.91(5)	1.25(3)	0	0	0
Mustard	S	7.5 (6)	0	10 (1)	0	3.00(5)	0	0	6.50(8)	0.50 (2)	0
	M	5.22 (10)	0	0	0	4.00 (3)	0	0	8.50 (4)	0	0.42(2)
Wheat	S	6 (6)	0	0	0	0	0	0	0	0	0
	M	13.3(4)	0	0	0	0	0	0	0	0	0
Winter	S	0	0	0	0	14.5(8)	0.40(8)	0	4.02(13)	0	0.84(2)
vegetables / Potato	M	20(1)	0	0	0	15.3 (5)	0.40 (3)	0	1.50 (11)	0	0.42 (4)
Jute	S	0	0	0	0	0	0	0	6.75 (8)	0	0.42 (4)
	M	0	0	0	0	0	0	0	6.00 (8)	0	0.42 (6)

*S = Small & M= Marginal farmers (Numbers in parentheses indicates number of respondents)

Table 2: Farmers' perception about use of organic manure, soil testing and micronutrient use

Farmers' perception	Perception No. of respondants																	
	Tapan Block						Balurghat Block						Kumarganj block					
	Small			Marginal			Small			Marginal			Small			Marginal		
	Yes	No	NP*	Yes	No	NP	Yes	No	NP	Yes	No	NP	Yes	No	NP	Yes	No	NP
Use of organic manure																		
Improves soil fertility	16	0	2	39	1	2	23	1	1	13	1	1	21	1	1	15	1	1
Improves soil structure	14	2	2	37	3	2	19	3	3	11	2	2	17	0	6	14	1	2
Improves WHC and aeration	14	1	3	38	2	2	19	4	2	12	1	2	17	2	4	15	1	1
Improves other benefits	15	1	39	1	2	21	1	3	13	0	2	18	1	4	15	0	2	
Increases average yield	17	0	1	38	1	3	23	1	1	13	1	1	21	1	1	16	0	1
About soil testing																		
Gives idea of soil fertility	12	5	1	12	13	17	25	0	0	13	1	1	19	0	4	15	0	2
Guides proper doses of fert. in	12	3	3	11	12	19	18	3	4	11	1	3	17	0	6	15	0	2
Gives idea about disease/pest	10	4	4	9	14	19	19	3	3	12	0	3	13	6	4	11	2	4
Gives idea of proper lime dose	13	2	3	10	12	20	15	0	10	11	3	1	15	4	4	10	0	7
Identifying other problems	12	4	2	11	12	19	22	0	3	12	0	3	19	2	2	13	2	2
About micronutrient use																		
What is micronutrient	4	5	9	7	20	15	12	8	5	0	5	10	11	6	6	7	6	4
Got advice about its use	3	6	9	4	25	13	17	3	5	3	7	5	15	2	6	4	4	9
Know how to use	2	7	9	4	25	13	12	5	8	0	10	5	11	4	8	4	7	6
Know how it works in plant	1	7	10	4	23	15	12	5	8	0	10	5	8	11	4	4	6	7
Know how it helps in increase yield	5	6	7	9	23	10	22	0	3	3	10	2	17	2	4	8	7	2

*NP – Not properly known

farmers and to some extent fertilizer dealers (2.38% of marginal farmers of Tapan block) and Krishi Prajukti Sahayak (KPS) (14.3% and 13.3 per cent of marginal farmers of Tapan and Balurghat block respectively and 10.7 per cent and 17.4 per cent of small farmers of Balurghat and Kumarganj block respectively rendered some advice to the small farmers. The advices from KVK reached to the 20% and 11.8 per cent marginal farmers of the Balurghat and Kumarganj block respectively.

Use of different manures on different crops along with farmer's perception : Generally, organic manure is more used by the small farmers compared to the marginal farmers irrespective of the blocks. However, more numbers (38 and 56% respectively) of marginal farmers of Balurghat and Kumarganj used average organic matter (especially FYM, irrespective of crops) than small farmers (33 and 43% respectively) compared to Tapan Blocks (29 and 13% respectively for small and marginal farmers) (Table 1). Inadequate amount (much less than state government recommended doses of FYM is 5t/ha) of organic matter use by small and marginal farmers was more common in Balurghat and Kumarganj Blocks compared to Tapan block which would certainly contribute less towards fertility or in broader sense soil quality. Irrespective of the category of farmers in all the three blocks, FYM was preferred followed by oilcake and tank silt where no uses of vermicompost or compost were observed.

When asked about the usefulness of organic matter in soil, 90 per cent of the farmers agreed on the beneficial effects in soil (Table 2). Only a few marginal and small farmers of the three blocks hadn't any definite idea of benefit. Though they did not have any idea about the mechanism of action of organic manure, they had a general idea of its role for overall increase of soil quality which ultimately leads to increase in yield of crops.

Response of farmers about soil testing and perception of the farmers : In Tapan Block 100 per cent of small and 95.3 per cent of marginal farmers under study didn't test their soil while in Balurghat Block about 88 per cent and 100 per cent and in Kumarganj Block 82.6 per cent and 76.5 per cent, respectively did not test their samples which might be attributed to the scarcity of soil testing laboratory at the time of this survey, lack of awareness for seeking advisory service from KPS and Assistant Director of Agriculture of the concerned blocks. Interestingly, some farmers of the Kumarganj Block and Balurghat Block had some idea about the importance of soil testing but 63.2 per cent of the small and marginal farmers of Tapan Block were totally ignorant about the importance of the same (Table 2). Regarding perception of soil testing among the farmers most of the farmers agreed that soil testing gave an idea of soil fertility, helped in applying proper doses of fertilizer & liming materials. The reluctance nature of farmers about soil testing was one of the important barriers to implement balanced fertilization which affects soil quality.

Farmers' perception about micronutrients use : Regarding micronutrient application most of the farmers except few in all the three blocks were reluctant as they had no idea about the beneficial effects of micronutrient in crops (Table 2). Regarding knowledge of micronutrients and its use, 48 per cent of small farmers of Kumarganj & Balurghat Blocks knew better as compared to the small farmers of Tapan Block (22.2%). However, 16 per cent of marginal farmers of Tapan Block and 41.2 per cent of the same category from Kumarganj Blocks had some idea about micronutrient. These farmers knew less about the role of micronutrient in plants but they knew better about its use, helped in increase in yield etc.

General perception about the nutrient use : Through questionnaire survey the farmers were asked to choose options against the questions and according to their response the interpretations were made in terms of no. of respondents (Table 3).

Advice regarding the use of chemical fertilizer : About 40-45 per cent of small and marginal farmers of Tapan Block, 60 per cent and 100 per cent small and marginal farmers respectively from Balurghat Block and 43 per cent and 25 per cent of the same from Kumarganj Block didn't receive any advice (Table 3). However, the rest of the farmers got advice mainly from local people in Tapan Block, KPS in Balurghat Block and fertilizer dealers in Kumarganj Block. Except KPS, the other advisors didn't have much scientific knowledge about cultivation; hence the chemical fertilization became arbitrary without any scientific back up.

Method of Use of fertilizer : Regarding the use of fertilizer, broadcasting was usually practised along with partially or decomposed organic matter application in open field. It was the usual practice by the farmers of this area (Table 3).

Farmers' perception on the impact of excessive fertilizer use on the fertility of soil : Assessment was made on what farmers believe in the impact of long term use of inorganic fertilizer on the fertility of the soil. Most of the interviewed farmers (48% to 86%) believed that excessive use of inorganic fertilizer reduces the fertility of the soil (Table 3). However, a considerable proportion (32% and 40% respectively) of marginal farmers of

Table 3: Farmers' perception about different aspects of use of fertilizer and organic manure, nutrient deficiency symptoms, involvement of KVK and soil testing laboratory

AttributesAttributesAttributes	No. of respondents					
	Tapan Block		Balurghat Block		Kumarganj block	
	Small	Marginal	Small	Marginal	Small	Marginal
Advice regarding chemical fertilizer use						
Did you get advice :Yes	7	19	15	15	10	4
No	11	23	10	0	13	13
If yes from whom : a) KVK	0	3	4	3	3	0
b) Agril. Workers	0	1	0	0	0	0
c) KPS	1	3	8	12	4	0
d) ADA	0	0	0	0	0	0
e) Fert. Dealer	2	2	3	0	3	4
f) Local people	4	10	0	0	0	0
Methods of Fertilizer Use						
Broadcasting	14	38	18	13	19	17
Band Placement	0	0	0	0	0	0
Only Topdressing	0	0	0	0	0	0
Mainfield broadcasting & topdressing	3	3	6	2	4	1
Foliar spray	1	1	1	0	0	0
Farmers' perception about excessive fertilizer use						
Field deteriorates	14	24	18	13	17	8
Yield will increase	0	3	0	0	0	2
No idea	2	13	4	1	4	7
Yield will decrease	1	1	3	0	2	0
Environmental pollution	1	1	0	1	0	0
Use of organic manure in field						
Raw	0	0	3	0	0	0
After decomposition	3	10	10	10	13	8
Partially decomposed	11	4	7	2	6	6
Mix when become dried	4	28	5	3	4	3
Farmers' perception about soil fertility						
Good yielding	3	18	8	5	4	11
Plants become green with small fert	1	12	8	10	2	1
Good yield even if no/less fert applied	4	1	3	0	4	0
less yield if no/less fert applied	7	10	8	0	8	4
No idea	1	1	0	0	4	0
Knowledge about nutrient deficiency symptoms						
yellowing/reddening of plant with stunted growth	11	7	8	0	4	2
yellowing of crop I patches	3	10	5	0	4	0
plants infested by disease pest before topdressing	0	1	3	0	0	0
No idea	3	12	4	12	11	13
stunted growth	1	2	2	0	2	0
less yield	0	10	3	3	2	2
Idea about using same doses of fertilizer years after years						
yield increases	1	1	0	0	0	0
yield decreases	9	22	4	3	10	8
yield remains same	0	3	3	0	2	0
fertilizer doses have to be increased	8	15	15	10	11	9
No idea	0	1	3	2	0	0
Any improvement due to KVK intervention						
Yes	4	6	16	10	6	4
No	12	29	7	5	15	13
No clear idea	2	7	2	0	2	0
How : a) Not known	3	3	8	2	2	2
b) Advisory Services	0	3	10	7	4	0
Use of Soil Testing laboratory						
Yes	13	24	18	12	19	15
No	3	18	3	3	2	2
No Idea/ Not properly known	2	0	4	0	2	0

Tapan and Balurghat Block respectively didn't have any idea of the impact of excessive use of fertilizer. Very few farmers believed that excessive chemical fertilizer use can cause environmental pollution. According to the farmers' perception gradual increase of inorganic fertilizer was of utmost necessity in order to keep pace with the production demand (Table 3).

Use of organic manure in the field : Most of the farmers of Tapan Block used organic manure by mixing it in soil in dried form. Besides many of the famers irrespective of blocks used partially decomposed manure and kept them for longtime in soil. This drying of manure and keeping partially decomposed manure in open field for long time caused losses of nutrient content in manures. This was essentially detrimental towards soil quality in this area. However, significant number of farmers used manures in the decomposed form (Table 3).

Nutrient deficiency symptoms : Most of the respondents did not have any idea about the nutrient deficiency symptoms. Only they felt that nutrient deficiency might cause poor yield. Some farmers belonging to small category of both the blocks had knowledge on yellowing or reddening of plant with stunted growth. Some farmers experienced the nutrient deficiency as reddening of crops.

Idea about use of same doses of fertilizer year after year **:** A considerable fraction of the farmers of the study blocks believed that yield of crops may decrease with the use of same dose of fertilizer year after year and to keep pace with the increase in production and increase in fertilizer level was inevitable. This was because of the fact that they didn't have the access to soil testing (Table 3).

Improvement due to KVK intervention : As Kumarganj and Balurghat Blocks were adopted earlier than Tapan Block by the KVK, more number of farmers got benefit from KVK. Increased positive perception of the people of these two blocks about soil quality maintenance may be attributed to different KVK interventions (Table 3).

Knowledge level of farmers about soil quality management: Knowledge is pre-requisite to the adoption of an innovation. The final decision of farmers to use a new practice is usually the result of their knowledge of the practice and attitude. Knowledge level of farmers refers to the information they possess in respect of soil quality management practices. Knowledge of soil quality management practices would lead to adoption or rejection. Once acquired and accumulated, knowledge produces change in the thinking process. Its result is seen in behavioral change of the farmers. i.e. adoption about soil quality management practices. Therefore, an effort was made to ascertain the knowledge level possessed by the farmers regarding soil quality management practices.

Table 4. Overall knowledge level of farmers about soil quality management (N =140)

Category of knowledge	Score range	No.	%
Low	25-40	41	29.2
Medium	41-60	67	47.9
High	61-80	32	22.9

Overall knowledge level of farmers : It is evident from the data in Table 4 that there was not much difference between number of farmers in low and high level categories with regard to overall knowledge level of soil quality management. The study shows that 67 farmers (47.9%) had medium level of knowledge about soil quality management while 41 farmers (29.2%) had low knowledge level. Only 32 farmers (22.9%) were having high knowledge level about overall knowledge of soil quality management. The findings were in agreement with the findings by *Naik et al., (2009); Demirbas et al., (2009); Reddy (2013); Hothongcum et al., (2014)* who reported that majority of farmers had medium level of knowledge. Majority of respondents belonged to medium to low level of overall knowledge regarding soil quality management.

Distribution of farmers on the basis of the knowledge score : To ascertain the level of knowledge possessed by the respondents in different soil quality management practices, they were categorized into low, medium and high knowledge groups. On the basis of knowledge percentage, the practices were accorded ranks (Table 5). The study brought out that knowledge of respondents about use of chemical fertilizer (80.3%) was maximum with mean knowledge score of 10.4 among all the five major practices of soil quality management. The table further shows that majority of respondents (83.0%) had high level of knowledge regarding use of organic matter. While only 12.0 per cent showed low level of knowledge and 5 per cent had medium level of knowledge about it. The Table 8 also shows that knowledge percentage of the farmers about

Table 5. Distribution of farmers on the basis of the knowledge score on soil quality management (N= 140)

Soil quality management practices	Category	Score range	No.	%	MS	Knowledge%	Rank
use of organic matter	Low	0-3	17	12	7.8	75.4	II
	Medium	4-10	7	5			
	High	11-15	116	83			
Use of liming in the field	Low	0-3	21	15	7.3	56.6	III
	Medium	4-8	42	30			
	High	9-11	77	55			
Soil testing	Low	0-1	56	40	3.1	45.8	V
	Medium	2-4	57	41			
	High	5-6	27	19			
Use of micro nutrient	Low	0-2	45	32	4.6	50.3	IV
	Medium	3-6	63	45			
	High	6-9	32	23			
Use of chemical fertilizer	Low	0-9	14	10	10.4	80.3	I
	Medium	10-18	21	15			
	High	19-26	105	75			

use of organic matter was found to be 75.4 per cent and accorded second position in ranking order.

The study revealed that the knowledge percentage about the use of liming was also quite high (56.6%). More than half of the respondents (55%) were found to have high level of knowledge followed by medium level (30.00%). However, only (15.00%) respondents belonged to low level of knowledge regarding use of lime. So far as the use of micronutrient was concerned, the knowledge was 50.3 per cent. Moreover, 45.00 per cent of the respondents had medium level of knowledge; those who had low level of knowledge were 32.00 per cent. There were 23.00 per cent respondents who had low level of knowledge about micronutrient. While the study showed that the knowledge percentage of soil testing was 45.8 per cent and accorded last rank out of five soil quality management factors. So the extension functionaries should make concerted efforts to disseminate the knowledge of this aspect among the farmers by continuous extension activities. This low level of knowledge may be attributed to complexity of some of the above technologies and lack of government support to the soil quality management. Appropriate knowledge gathering by the famers may help in better management of soil. This is in agreement with the findings of *Lima et al*. 2011.

Relationship between independent variables and knowledge level : To establish association between the background variables of the respondents and their knowledge regarding soil quality management, the correlation coefficient was computed. In general knowledge level of farmers had positive correlation with age (r=0.171), land holding (r = 0.121), risk orientation (r = 0.132) and economic motivation (r=0.190). Education had positive and significant correlation at 0.05 level of probability with knowledge of the respondents about the soil quality management (r=0.445*). Accordingly, higher the level of education higher would be the knowledge of soil quality management of the respondents. These results are in agreement with *Naik et al., (2009*) and *Bisen and Sharma (2013)* who also observed that education had positive and significant relationship with the knowledge of the respondents. It implies that education leads to gain in the knowledge of the respondents. The study also shows positively and significant correlation at 0.05 level of probability between knowledge of the respondents and their social participation (r=0.245*). The mass media exposure of the respondents is observed to be positive and significantly correlated at 0.05 level of probability with the knowledge of soil quality management (r=0.557*). These results are in consonance with the observations of *Naik et al., (2009); Singha and Devi (2013).* The study shows that innovativeness had positive and significant correlation at 0.05 level of probability with the knowledge of respondents (r=0.357*). Keeping all these facts in view, it may be inferred that as in social sciences, farmers' perception changes due to the change in the technology as well as methodology. Further it can also be interpreted from the above findings that soil quality maintenance for the small and marginal farmers can be

achieved through awareness generation programmes and implementation of FLDs, training and field days through KVKs, government agencies and non-government organizations through proper utilization of natural resources and balanced use of external inputs. Panchayati Raj Institutions may play an important role in motivating the farmers.

CONCLUSION

From the above mentioned interpretation of the study it can be concluded that in case of both small and marginal farmers there is indeed a knowledge gap about the use of appropriate nutrients and soil amendments.

To increase food production and to meet the growing food demand of developing countries, soil fertility management practices, mainly the use of balanced fertilization, liming use of organic manures through various strategies and policy consideration needed to be given due attention. For promotion of organic manures, farmers have to be encouraged for vermi composting, crop residue management through mulching/ recycling, green manuring, encouraging cattle rearing for enhancing use of dung and urine for composting, encouraging ITKs preparation etc. Further soil quality maintenance for the small and marginal farmers can be successfully implemented through awareness generation programmes and training and field days and other extension activities through KVKs, government agencies and non-government organizations and even Panchayati Raj Institutions.

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