EM Nature Farming Technology; Research and Extension Activities in Myanmar

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Abstract

Conventional chemical farming methods are generally associated with degradation of environment. Among other things, soil degradation is one of the most serious problems which seriously affect crop production. Increasing prices of agrochemicals often leave farmers with lower profit. Hence attempts were made to formulate a low-input farming system using EM Nature Farming Technology in order to help local farmers to achieve sustainability, not only in agriculture production, but also in soil quality.

Some of the experimental results showing the benefits of EM have been reviewed in this paper. EM when used systematically showed benefits which are greatly magnified when applied in combination with agricultural by-products such as crop residues and farm manures. Results indicated that the combined effect of EM and organic manures showed improvement not only in production of some crops, but also in chemical and physical properties of cultivated soil.

With regard to extension activities of EM nature farming technology in Myanmar, a total of 647 extension employees of Agriculture and Irrigation Ministry have been systematically trained at 12 training-workshops conducted between January, 1994 and July, 1997. The extents under EM nature farming technology have now increased from 900 acres in 1993-94 to 2,000,000 acres in 1997-98 cropping season.

Introduction

The use of conventional chemical farming methods, which substantially increased crop production, was once regarded as a kind of agricultural revolution which would solve all problems related to producing sufficient food for the ever growing world population. However this belief was later over-shadowed by the emergence of numerous environmental and social problems associated with the heavy use of agrochemicals in intensive farming systems.

Conventional chemical farming methods are generally associated with degradation of the environment. Among other things, soil degradation is one of the most serious problems which affect crop production. Increasing prices of agrochemicals often leave farmers with lower net profit. Uncertain availability of those agrochemicals, especially in the developing countries, is often a serious constraint for the farmers in their attempt to increase crop production. Such problems have directed the attention of agriculturists world-wide to seek alternative methods of farming. Although several natural farming systems, using mainly natural products such as animal and crop residues, green manures, composts etc. have very little of those short-comings as stated above, the major constraint usually associated with natural farming is the comparatively low level of crop production per unit area. Several attempts are being made to formulate new natural farming systems which would substantially alleviate crop production without causing any deterioration to the quality of environment.

In attempting to develop productive, profitable and sustainable agricultural systems, several agriculturists turn to farming methods which are based on biotechnologies. One of the several approaches to achieve this goal is using farm manures in combination with EM in order to improve soil fertility and productivity. EM invented by T. Higa of Japan, is mixed culture of micro-organisms such as photosynthetic bacteria, ray fungi, yeast, and filamentous fungi, which, when applied to the cultivated soil, is expected to enhance the availability of soil nutrients, to enhance humus formation, and to control certain plant diseases and pathogens.

Research Activities on EM

The use of EM in agriculture has been considered as one of the safe, environmentally sound and low-input technology. Since EM technology was first introduced to Myanmar in 1990, the following agencies had conducted experiments to assess its effectiveness on crop production and soil management practices.

- Students (undergraduate and postgraduate) and staff of Institute of Agriculture (IOA),
- Staff of Central Agricultural Research Institute (CARI),
- Staff of Central Agricultural Development and Training Center (CASTC),
- Staff of Myanmar Agriculture Service (MAS),
- Staff of Myanmar Sugarcane Enterprise (MSE),
- Staff of Myanmar Cotton and Sericulture Enterprise (MCSE),
- Students and staff of Yangon University (YU),
- Staff of Medical Research Organization (MRO),
- Owners of private farms and orchards

Results of some of the experiments are briefly reviewed in this paper.

Effect of Chemical Fertilizers, Organic Residues and EM on Paddy Rice Cultivation

Researchers reported that when EM alone was applied to paddy rice (*Oryza sativa L.*), the percent yield increase due to EM application varied between 2 percent and 11 percent (Myint, 1994; Myint, 1996a; Myint et al., 1996) (Tables 1, 2 and 3).

When EM was used in combination with natural farm resources such as rice straw, farm yard manure (FYM) etc. in rice production, the increase in yield due to EM application became magnified. For example Myint (1994) reported the percent yield increase due to EM application in paddy experiment to be ranging between 17.0 percent and 41.5 percent over the yield obtained when rice straw alone was applied (Table 2). Myint and Theim (1996) also reported the increase of 23 percent of paddy yield due to EM application over the yield harvested when FYM alone was used (Table 3).

Similar trend of yield increases due to the use of EM in combination with animal and crop residues have been reported in other investigations on various crops such as onion seed production (Myint, 1991b), onion bulb production (Win et. al., 1995) Table 6, radish (Win et.al., 1995) Table 4 and (Hlaing et.al., 1996) (Table 5).

There were some reports of observing comparatively small or in some cases negative effects of EM on crop yields when EM was applied in combination with materials containing high concentration of nitrogen such as chemical fertilizer of certain green manures (Myint, 1994; Myint, 1996b; Myint et. al. , 1996) Tables 1, 2 and 3.

Table 1. Effect of Chemical Fertilizers, Organic Amendments and EM on Rice Grain Yield (g/m^2)

Treatment	With EM	Without EM	Treatment Mean	% increase due to EM
Control	1154	1132	1143.0 b	1.94
Fertilizer	1281	1196	1238.5 a	7.11
Rice Straw	1183	1123	1153.0 b	5.34
Green Manure	1249	1257	1253.0 a	-0.64

In a column, mean followed by a common letter are not significantly different at the 5% level by DMRT(Source – C.C. Myint, 1994)

Table 2.Effect of Chemical Fertilizers, Organic Amendments and EM on Rice Grain Yield (g/hill)

Treatment	With EM	Without EM	Differences	% increase due to EM
Pot Experiment				
Control	19.5	17.5	2.0	11.4
Fertilizer	29.2	26.9	2.3	8.5
Rice Straw	29.3	20.7	8.6	41.5
Green Manure	37.7	35.5	2.4	6.8
Micro Plot Experiment				
Control	19.8	17.9	1.9	10.6
Fertilizer	22.2	23.7	-1.5	-6.3
Rice Straw	20.0	17.1	2.9	17.0
Green Manure	21.4	20.2	1.2	5.9

(Source – C.C. Myint, 1996)

Table 3. Effect of Manure, Fertilizer and EM on Rice Yield (Kg/ha)

Treatment	Grain Yield (kg/ha)		% increase due to EM
	With EM	Without EM	
Check	1872.00	1842.66	1.59
FYM	2310.33	1874.66	23.23
Mean	2091.16	1858.66	12.50
Fertilizer	2859.33	2989.67	-4.35
Fertilizer + FYM	2957.67	3237.33	-8.63
Mean	2908.5	3113.5	-6.58

(Source – K.C. Myint et.al., 1996.)

The results of the initial experiments indicated the following points;

- Comparatively small effect of EM on crop production was observed when EM alone was applied to soil of low fertility possibly due to the competitive interaction between the micro-organisms and the plants for nutrients.
- Comparatively small effect of EM on crop production was observed when EM alone was applied in combination with concentrated chemical fertilizers, possibly due to the fact that nitrogen fixing capacity of micro-organisms might have been suppressed when there was high level of nitrogen in the soil.
- The combined effect of EM and organic residues on crop production became significantly increased over the crop production obtained when either of the soil amendments was used alone. This clearly indicated that the efficacy and the nutrient supplying power of the organic residues were greatly improved by using EM.

Emphasis was therefore placed in later investigations on finding the possibilities of improving crop production and soil fertility through the use of a combination of EM and organic farm residues.

Studies on the Effect of Chemical Fertilizers, Organic Residues and EM on Yield and Yield Components of Selected Crops

Mean values of yield and yield components of selected crops resulting from 6 treatments ; (1) Control, (2) Chemical fertilizer, (3) Farm Yard Manure (FYM) only, (4) FYM + EM, (5) Bokashi + EM, (6) FYM + Bokashi + EM were compared by statistical analysis. Bokashi is a Japanese name meaning EM fermented compost.

Radish Experiment

Experiments were conducted on radish (*Raphanus sativus*) on two successive years 1995 and 1996. (Win et.al., 1995; Hlaing et.al., (1996) (Tables 4 and 5)

EM based treatments such as FYM (30 tons/ha) + EM, Bokashi (20 tons/ha) + EM and FYM (30

tons/ha) + Bokashi (20 tons/ha) + EM were found to give comparable results to those of chemical fertilizers applied at the high rate of 240 kg/ha urea and 360 kg/ha triple superphosphate. (Win et.al., 1995), (Table 4).

EM based treatments such as FYM (30 tons/ha) + EM, Bokashi (20 tons/ha) + EM and FYM (30 tons/ha) + Bokashi (20 tons/ha) + EM were found to give significantly higher yield to those of chemical fertilizer applied at a moderate rate of 70 kg/ha of urea, 70 kg/ha of triple superphosphate and 90 kg/ha of muriate of potash fertilizers, which is the rate commonly used by the local farmers. (Hlaing et. al., 1996) (Table 5).

Application of chemical fertilizers were much more expensive than that of natural farming systems using EM. Hence using a combination of EM and organic residues may be taken as one of the low input, cost effective and sustainable farming systems for radish production.

It was also interesting to note that FYM + EM treatments produced several comparatively superior results than those of FYM treatments alone, clearly indicating strong and positive interaction between FYM and EM, which in turn contributed towards higher production of radish

Table 4. Summary of the Effects of EM and Other Soil Amendments on Yield and Yield Components of Radish

Treatment	Number of Leaves (No.)	Fresh Weight of Whole Plant (Kg/ha)	Fresh Weight of Leaves (kg/ha)	Dry Weight of Leaves (kg/ha)	Fresh Weight of Root (kg/ha)	Dry Weight of Root (kg/ha)	Length of Root (cm)	Diameter of Root (cm)
Control (T_1)	9.67 b*	375.93 b	138.52 c	12.28 c	233.15 c	14.44 b	10.45 c	2.18 b
Fertilizer Only (T_2)	11.67 a	966.17 a	403.09 a	26.73 a	651.54 a	19.32 b	15.70 ab	3.25 a
Farm Yard Manure Only (T_3)	10.00 b	386.30 b	194.14 bc	14.51 c	251.42 c	19.01 b	10.50 c	2.50 b
Farm Yard Manure + EM (T_4)	10.67 ab	569.88 b	227.96 bc	18.33 bc	298.64 bc	23.21 ab	12.96 bc	2.83 ab
Bokashi + EM (T_5)	10.67 ab	903.27 a	301.54 ab	19.44 b	463.40 ab	20.74 b	16.50 a	3.03 a
Farm Yard Manure + Bokashi + EM (T_6)	11.00 a	914.20 a	308.95 a	23.02 ab	550.62 a	27.65 a	17.17 a	3.47 a

*Data followed by the same letter do not differ significantly at $P<0.05$ (Source – K.K. Win et. al., 1995)

Table 5. Summary of the Effects of Chemical Fertilizers, Organic Amendments and EM on Yield and Yield Components of Radish

Treatment	Number of Leaves (No.)	Plant Height of Shoot (cm)	Fresh Weight of Shoot (g/plt)	Dry Weight of Shoot (g/Plt)	Fresh Weight of Root (g/plt)	Dry Weight of Root (g/plt)	Length of Root (cm)	Diameter of Root (cm)
Control (T_1)	7.93 c*	12.64 b	8.16 d	1.513 c	3.60 c	1.213 c	3.11 d	0.925 b
Fertilizer Only (T_2)	9.87 ab	16.66 ab	19.40 bc	2.687 ab	14.30 bc	2.667 abc	5.75 bcd	3.220 a
Farm Yard Manure Only (T_3)	8.43 b	16.71 ab	14.80 cd	2.047 bc	11.23 c	2.354 abc	5.70 cd	2.004 ab
Farm Yard Manure + EM (T_4)	9.47 abc	15.45 ab	15.67 b	2.063 bc	16.40 bc	2.453 abc	6.48 bcd	2.003 ab
Bokashi + EM (T_5)	10.33 a	19.34 ab	24.23 ab	2.966 ab	30.12 ab	4.016 ab	8.88 ab	2.622 a
Farm Yard Manure + Bokashi + EM (T_6)	10.37 a	20.29 a	30.38 a	3.253 a	41.61 a	4.517 a	9.75 a	2.790 a

*Data followed by the same letter do not differ significantly at P<0.05 (Source – Hlaing et. al., 1996.)

Onion Experiment

Similar trends of yield improvements were observed in onion (*Allium cepa*) experiment (Win et. al., 1995). Experimental results indicated that FYM (30 tons/ha.) + EM, Bokashi (20 tons/ha) + EM and FYM (30 tons/ha) + Bokashi (20 tons/ha) + EM generally gave comparable results to treatment with chemical fertilizer (240 kg/ha urea and 240 kg/ha triple super phosphate) (Table 6). Therefore, moderate amount of FYM + EM and/or Bokashi may be employed as a low-input, environmentally sound farming system producing comparable yield as that of chemical farming system.

Moreover the fact that FYM treatment alone produced only 92.28 kg/ha of dry weight of onion whereas FYM + EM produced 124.57 kg/ha clearly indicated that addition of EM increased the yield of onion by about 34.8 per cent (Table 6). This indicated once again a strong positive interaction between FYM and EM which contributed to produce a significantly higher yield.

Table 6. Summary of Effects of Chemical Fertilizers, Organic Amendments and EM on Yield and Yield Components of Onion

Treatments	Dry Weight of Onion (Kg/ha)	Diameter of Onion Bulb (cm)
Control (T1)	90.49 b*	2.95 b
Fertilizer Only (T2)	152.53 a	3.80 a
FYM Only (T3)	92.28 b	3.07 b
FYM + EM (T4)	124.57 a	3.32 ab
Bokashi + EM (T5)	139.69 a	3.68 a
Bokashi + FYM + EM (T6)	147.65 a	3.81 a

* Data followed by the same letter do not differ significantly at p< 0.05 (Source – Win et. al., 1995)

Sugarcane Experiment

Hlaing et. al. (1996) reported that Bokashi (20 tons/ha) + EM or FYM (30 tons/ha) + EM produced comparable yield and yield components to those of chemical fertilizer treatment and Bokashi (20 tons/ha) + FYM (30 tons/ha) + EM was found to produce significantly superior yield to that of chemical fertilizer treatments applied at the rate of 250 kg/ha of urea and 95 kg/ha of triple super phosphate and 75 kg/ha of muriate of potash. (Table 7).

Table 7. Summary of the Effects of Chemical Fertilizers, Organic Amendments and EM on Yield and Yield Components of Sugarcane at Two Months after Sowing

Treatments	Plant Height (cm)	Fresh Weight of Plant (g)	Dry Weight of Plant (g)
Control (T1)	57.90 b*	10.40 d	1.80 b
Fertilizer Only (T2)	83.18 a	19.45 abc	3.95 ab
FYM Only (T3)	62.10 b	15.86 cd	3.59 ab
FYM + EM (T4)	70.13 ab	17.60 bcd	3.61 ab
Bokashi + EM (T5)	84.98 a	23.21 ab	3.96 an
Bokashi + FYM + EM (T6)	85.12 a	24.13 a	4.31 a

* Data followed by the same letter do not differ significantly at $p<0.05$ level. (Source – Hlaing, 1996)

Effect of Chemical Fertilizers, EM and Organic Residues on Nitrogen Content of Soil

It was reported that the application of EM and organic residues to onion and radish cultivation on a sandy loam soil increased the total soil nitrogen content by 8 percent to 11 percent at the time of harvest. (Win et. al., 1995; Hlaing et. al., 1996) (Table 8)

Table 8. Summary of Effects of EM and Other Soil Amendments on Properties of Cultivated Soils in Radish Experiment

Treatments	Total Nitrogen (%)	Bulk Density (g/cm^3)	Maximum Water Holding Capacity (%)
Control (T1)	0.025	1.793	23.12
Fertilizer Only (T2)	0.025	1.787	22.09
FYM Only (T3)	0.025	1.755	28.95
FYM + EM (T4)	0.026	1.740	29.18
Bokashi + EM (T5)	0.026	1.658	30.11
Bokashi + FYM + EM (T6)	0.029	1.655	31.44

(Source – Win et. al., 1995)

Effect of Chemical Fertilizers, Organic Residues and EM on Bulk Density and Water Holding Capacity of Soil

Win et. al. (1995) reported that the use of a combination of EM and organic residues improved the soil physical properties such as maximum water holding capacity and bulk density while the use of chemical fertilizer resulted in degradation of soil structure. (Table 8).

Myint, et. al. (1996) reported that application of EM and organic residues increased the maximum water holding capacity by about 36 percent over that of control treatment plot, and in contrast, the use of chemical fertilizer was found to reduce the maximum water holding capacity by 4.5 per cent over that of control treatment in radish.

Hlaing et. al. (1996) reported similar effects of EM and organic residues on physical properties of soil (Table 9).

Table 9. Effects of Chemical Fertilizers, Organic Amendments, and EM on Soil Physical Properties in Radish Experiment

Treatment	Bulk Density of Soil (g/cm^3)	Maximum Water Holding Capacity of Soil (%)
Control (T1)	1.259	35.185
Fertilizer Only (T2)	1.267	34.933
FYM Only (T3)	1.247	35.317
FYM + EM (T4)	1.243	35.440
Bokashi + EM (T5)	1.224	38.282
Bokashi + FYM + EM (T6)	1.190	38.609

(Source – Hlaing, 1996)

Extension Activities on EM

Agriculture is one of the most important sectors in the development of Myanmar's economy, and over 65 per cent of Myanmar's foreign exchange comes from agriculture. Future economic development of the nation will also be based on the agriculture sector. Ministry of Agriculture and Irrigation therefore laid down policies and objectives for agricultural development and committed continuous efforts for its achievements.

Among the strategies, which are being adopted to achieve the objectives of the Agriculture Ministry, application of modern technologies has become an important tool in boosting agricultural production in Myanmar.

Research

Due to the increasing prices and uncertain availabilities of agro-chemicals at the time when they are badly needed, attention was directed to testing the effectiveness of EM technology on crop production at first in 1990 on a small scale under laboratory and screen house conditions and later in 1993 on a larger scale, covering 900 acres in various agroecological zones of Myanmar (Fig. 1).

Although the degree of combined effect of EM and organic residues on crop production and on properties of soils varies depending upon a number of factors, results from the majority of investigations consistantly indicated positive effect of EM.

Reports from the farmers and township managers which have indicated the positive effects of EM not only on productions of crops, but also on properties of cultivated soils, and the increasing demand for EM by the local farmers, had led the authorities to increase the cropping area under EM rather rapidly.

Since 1993-94 crop year the increasing use of EM has been gaining momentum with a target plan for 2 million acres for the 1997-98 crop year.

Education

As an essential component of implementing the EM Nature Farming Project in Myanmar, EM technology training workshops have been conducted at Central Agriculture Development Training Centre (CADTC) at Hlegu township with the following objectives:

- To train the selected extension workers for the implementation of the EM Nature Farming Project in their respective zones.
- To share, among the workshop participants, the regional experiences on the application of EM technology in crop production, and
- To disseminate latest information and developments of EM technology to the extension workers.

A total of twelve EM technology training workshops have been conducted between January 1994 and July 1997 and all together 648 participants from 9 States and Divisions in Myanmar and also from various organizations have been trained at those workshops (Table 10 and 11).

Those participants of the workshops, when they return to their headquarters, are expected to carry out the following responsibilities;

- To conduct further training on EM technology at farmers' level,
- To guide and oversee the farmers so that EM technology be systematically employed in crop production, and
- To conduct research on the effectiveness of EM under their local conditions.

Table 10. Duration and Number of Participants of EM Technology Workshops Held Between January, 1994 and July. 1997

Duration		EM Technology	Number of Participants		
From	To	Workshop Number	Male	Female	Total
10-01-94	14-01-94	I	17	10	27
09-05-94	14-05-94	II	51	21	72
03-10-94	08-10-94	III	35	22	57
20-02-95	25-02-95	IV	39	26	65
08-05-95	12-05-95	V	47	19	66
02-10-95	06-10-95	VI	55	23	78
20-11-95	24-11-95	VII	28	16	44
19-02-96	23-02-96	VIII	39	19	58
06-05-96	10-05-96	IX	37	20	57
21-10-96	25-10-96	X	32	05	37
03-02-97	07-02-97	XI	34	18	52
13-07-97	18-07-97	XII	24	11	35
	TOTAL		438	210	648

Table 11. Participants of EM Technology Workshops Held Between January, 1994 and July, 1997

Rank of Participants	EM technology Workshop Number												Total Number
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Township-Manager	1	9	-	1	-	-	-	-	-	-	-	-	11
Deputy-Supervisor	7	6	3	10	10	26	8	8	11	-	2	2	93
Assistant-Supervisor	9	41	31	22	33	36	19	41	26	25	23	17	323
Dy. Assistant-Supervisor	10	15	23	25	23	16	17	9	20	12	20	16	206
Assistant-Lecturer	-	1	-	-	-	-	-	-	-	-	-	-	1
Demonstrator	-	-	-	1	-	-	-	-	-	-	-	-	1
Students	-	-	-	6	-	-	-	-	-	-	7	-	13
Total	27	72	57	65	66	78	44	58	57	37	52	35	648

Expansion of Cultivated Area Under EM Technology

EM Technology was first introduced into Myanmar in 1990-91. Testing the effectiveness of EM on crop production began in 1991-92 on a small scale. The area of testing gradually increased, in 1993-94, to 900 acres in farmers field, spreading over 7 States and Divisions. (Fig. 1).

Reports which indicated the results of positive effects of EM led the authorities of the Ministry of Agriculture and Irrigation to expand the cropping area to be treated with EM to 30,000 acres in 1993 – 95 spread over 9 States and Divisions 60,200 acres in 1995-96 and 350,000 acres in 1996-97. The projected area of crops to be treated with EM in 1997-98 crop year is 2 million acres spreading over States and Divisions (Tables 12 and 13) and (Fig. 2).

Table 12. Yearly Expansion of Total Sown Acerage Under EM Technology

Year	Area under EM Treatment (Acres)		
	Monsoon	Winter + Summer	Total
1993-94	-	900	900
1994-95	15000	15000	30000
1995-96	35000	25200	60200
1996-97	200000	150000	350000
1997-98	2000000	--	2000000
Total	2250000	191100	2441100

Table 13. State and Divisional Allotments of Acreage for Implementing EM Technology in Myanmar

State/Division	SOWN ACREAGE				Projected Acreage	Total Acres
	1993-94	1994-95	1995-96	1996-97	1997-98	
Ayeyarwady Division	100	6000	9020	100000	720000	835100
Bago Division	300	4000	10040	205000	540600	759940
Yangon Division	100	4000	13020	45000	220000	282120
Sagaing Division	100	2000	2500	--	191000	195600
Mon State	100	5000	9000	--	110000	124100
Mandalay Division	100	4000	13120	--	106000	123220
Magway Division	100	2000	2000	--	68000	72100
Shan State	--	2000	1020	--	21600	24620
Kayin State	--	-	--	--	22800	22800
Kayah State	--	1000	500	--	--	1500
Total (Acre)	900	30000	60200	350000	2000000	2441100

Constraints in Implementation

Introducing the EM technology into Myanmar Agriculture and increasing of cropping area dramatically within a short span of time, had not been an easy task and has been confronted by a number of constraints. Some of the examples are as follows;

- Like the introduction of any other biotechnology, the effect of the EM technology on the performance of crops is not quick enough to draw the attention and interest of the farmers. It's impact on the soil quality improvement is not easily visible.
- Training the farmers the systematic method of EM application becomes a essential component for the successful implementation of the project.
- Failure to activate and to multiply the EM before applying to the soil often results in showing little or no effect of EM.
- The number of training workshops and the number of trained personnel mismatch the dramatic increase of cultivated area under EM technology. Only 648 employees have been trained at the twelve training workshops. The projected acreage to be treated with EM for the 1997 – 98 crop year is two million, with a result that each trained employee is required to supervise more than 3000 acres of crop land.
- Transportation and distribution of large quantities of EM, and mollasses from the factory to its users (farmers) necessitate the purchase or the loan of the following items;
  (a) suitable containers for storing EM and mollasses which are in liquid form, and
  (b) suitable vehicles for the transportation of the EM and mollasses containers from the factory to the remote areas.

Conclusion

It has been about eight years now since EM technology was first introduced into the Union of Myanmar in 1990-91 crop year. The first four years were spent mainly concentrating on doing research and investigations on the suitability of the new EM technology in agriculture under the local conditions and the latter four years were spent concentrating on practical application of EM technology in the agricultural systems of Myanmar.

Research work conducted during those years, indicated that EM can be employed systematically and profitably in the agricultural systems of Myanmar. Results of the investigations indicated that the efficacy or the degree of effectiveness of EM varied depending on the method and conditions under which EM was applied.

Results also indicated that EM and organic farm manures when applied together could complement each other in producing significantly higher yield than those yields obtained when either of these soil amendments were used alone.

This combination of EM and organic farm manures could significantly improve not only crop yields but also chemical and physical properties of the cultivated soil.

Bearing these beneficial effects of EM technology in mind, It is not surprising that the cropping area under EM technology has been rapidly increasing in Myanmar with a target of 2 million acres for the 1997-98 cropping year.

Although there are several areas where success has been achieved and significant progress has been made regarding the application of EM technology in crop production in Myanmar, there are still some areas which are facing setbacks and constraints in implementing the EM technology due to some unfavourable and unavoidable circumstances. In those areas, it is hoped that the combined efforts of the farmers, extension workers and higher authorities of the agriculture sector will be able to identify the specific constraints and formulate solutions to overcome the problems. Based on the facts, which have been accumulating over the last eight years, it is believed that this EM technology, with time, will have better and long lasting effects not only on crop production, but also on soil conservation, soil fertility development and improvement, and also in maintaining environmental quality in the Union of Myanmar.

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