

# **Research and Development Activities on Effective Microorganisms (EM) in Myanmar**

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## **Abstract**

Myanmar is an agricultural country with rice as the staple food. The main objective of agricultural sector is to make a surplus in rice production.

The purpose of using EM is to produce more food without deteriorating the environment. Application of EM in Myanmar increased rapidly after the transfer of the Institute of Agriculture and EM Nature Farming project from the Ministry of Education to the Ministry of Agriculture in 1993.

EM workshops and training courses are regularly held for extension workers prior to respective crop growing season. EM tested areas on main crops increase year by year, after farmers have accepted EM technology. The observed effects of using EM are the creation of favorable environment for rice plants, better plant growth, decrease in infestation of insect pests and plant diseases, easier land preparation, and increase in rice yield.

EM concentrated solution is prepared in Myanmar by a technical officer of APNAN, and EM production plant is being built at C.A.D.T.C, Hlegu.

Long term experiment and EM observation plots were set up on C.A.D.T.C. farm and farmers fields where data are collected. Many research and extension works are being planned for using EM in the near future. EM technology has to contribute to environmental protection and food production in Myanmar.

## **Introduction**

Myanmar is an agricultural country with a population of about 43 million people. The goals of the ministry of agriculture are to achieve surplus in rice production, to achieve self-sufficiency in edible oil, and to step up production and export of pulses and industrial crops such as cotton and sugarcane.

Rice was designated as the principal national crop in Myanmar and paddy cultivation was also being designated as a national cause. There are 4.8 mil. hectare of rice in rainy season (May to October), and 0.8 .mil. ha of dry season rice (summer rice) grown as second crop after wet season rice, in places where supplementary irrigation water is available. Water resources are from dam, well, creek, river, ground-water, or from diversion of water from creek and streams.

Effective Microorganism (EM) has induced higher soil fertility, higher yield, suppressed insect pests and plant diseases, and encouraging consecutive planting. These effects have already been observed in Japan after using EM.

Knowing about the effects of EM, Myanmar Agriculture Service (MAS) has decided to test EM on double cropping of rice fields.

### **Objectives**

Application of Effective Microorganism (EM) mainly on rice and other crops, such as corn, vegetables is being conducted on farmers' fields.

The objectives of EM application are:

- To demonstrate the decrease in infestation of insect pests and plant diseases in rice.
- To increase fertilizer efficiency and reduce fertilizer application rate .
- To improve soil aggregation and water holding capacity.
- To develop zymogenic, synthetic and disease-suppressing soil from disease-inducing or low-fertility soil.

### **History of EM Technology in Myanmar**

Effective Microorganism (EM) technology was introduced and presented by Professor Dr. Teruo Higa, of the Ryukyus University, Okinawa, Japan, at the First International Conference on Kyusei Nature Farming held in Thailand in 1989.

Two delegates from Myanmar, Dr. Kyaw Than and Dr. Cho Cho Myint, from the Institute of Agriculture, attended the conference. At that time, Institute of Agriculture was under the Ministry of Education. After returning from the conference, experiments on EM technology was conducted at the Institute of Agriculture, Yezin, Pyinmana Township under laboratory condition.

In September 1993, EM Nature Farming Project, along with the Institute of Agriculture was transferred from the Ministry of Education to the Ministry of Agriculture. In October 1993, EM production unit was established at the Central Agriculture Development Training Centre (C.A.D.T.C.), Hlegu Township, Yangon Division, with the assistance of the Asia Pacific Natural Agriculture Network (APNAN), and the International Nature Farming Research Centre (INFRC).

### **EM Workshop and Training**

Effective Microorganism (EM) technology is a new subject to Myanmar agricultural extension workers and researchers. Myanmar Agricultural Service (MAS) has laid down a plan for using EM on farmers' fields since EM production unit was established at C.A.D.T.C. in October 1993. It became necessary to train extension workers about EM, preparation of EM diluted solution, making EM fermented compost and application methods.

According to training requirements, 27 extension workers from 7 states and divisions attended the First EM Technology Training Course at C.A.D.T.C., Hlegu in January 1994. Resource persons were Professor. Dr. Cho Cho Myint, The Soil Chemistry Department, Institute of Agriculture and Mr. T. Hayakawa, technical officer from APNAN.

During the second EM training course, some old trainees were invited to attend to present their experiences on using EM and effects of EM on farmers' fields. At all EM workshop and

training courses, some old participants were invited. Three hundred and twenty seven trainees from 9 states and divisions have attended the EM courses.

### **EM Observation Plots on Farmers Fields**

Researchers and extension officers from MAS who were involved in EM technology discussed on EM tests on crops at different localities. These proposals were submitted to Managing Director (MD) and General Manager (Extension) (GM-ext) of MAS for approval.

With the approval and encouragement from MD and GM Ext, 360 ha of summer rice were tested in 1994 at 7 states and divisions in Myanmar. Seeing the effects of EM on rice, 6,000 ha of rainy season rice and 6,000 ha of summer rice were applied with EM in 1994-95, in 9 States and Divisions. In addition to rice, some other crops such as vegetables, maize, sugarcane and cotton were included for testing in 1995-96. Fourteen thousand hectares of rice and maize were applied with EM in 1995-96 rainy season. Again in summer, 10,080 ha of rice, vegetables, sugarcane and cotton were treated with EM.

In addition to this cultivated area in summer, another 8,000 ha under summer rice was extended to be tested with EM in 2 townships in Yangon division, namely Hlegu and Taikgyi with 4,000 ha each. Summary of these tests are shown in Tables 1 and 2.

**Table 1. EM Observation Plots on Rice, (1993-94, 1994-95)**

SR. No.	State & division	1993-94, 1994-95			Total
		Summer rice	Rainy season rice	Summer rice	
1	Yangon	100	2000	2000	4000
2	Pago	300	2000	2000	4000
3	Mandalay	100	2000	2000	4000
4	Sagaing	100	1000	1000	2000
5	Magwe	100	1000	1000	2000
6	Ayeyawady	100	3000	3000	6000
7	Mon	100	2500	2500	5000
8	Kayar	-	500	500	1000
9	Shan	-	1000	1000	2000
Total		900	15,000	15,000	30,000

**Table 2. EM Observation Plots on Main Crops (1995-96)**

SR. No.	State & division	Rainy season , Winter & Summer						Total
		Rice	Maize	Vegetable	Sugarcane	Rice	Cotton	
1	Yangon	5000	-	4000	20	2000	-	11020
2	Pago	5000	-	1000	40	4000	-	10000
3	Mandalay	4000	5000	-	20	4000	100	13120
4	Sagaing	2500	-	-	-	-	-	2500
5	Magwe	2000	-	-	-	-	-	2000
6	Ayeyawady	5000	-	-	-	4000	-	9000
7	Mon	5000	-	-	-	4000	-	9000
8	Shan	1000	-	-	20	-	-	1020
9	Kayar	500	-	-	-	-	-	500
Total		30,000	5,000	5,000	100	18,000	100	58,160

**Effects of EM on Rice**

Distinct improvement in rice plants and changes in soil properties were observed with EM application since 1993-94. These are as follows :

- Easier land preparation
- Early plant recovery after transplanting
- The leaves are green throughout the growing season
- Early panicle initiation and early maturing
- Healthy plant growth
- Suppression of plant diseases and insect pests, such as bacteria leaf blight, gall midge-formation insect
- Having drought resistance, attributed to increase in water holding capacity of soil.

**Production of EM in Myanmar**

EM Production Unit was established in October 1993 at C.A.D.T.C. A technical officer from APNAN is assigned to Myanmar to produce EM concentrated solution. This EM solution can be stored for 6 months under air-tight condition. Recommended rate for EM application is 1.5 liter of EM conc solution per ha.

**Long Term Experiments**

Treatments of long term observation plots on C.A.D.T.C. farm are as follows:

1. Control
2. Fertilizer alone (Urea 125kg/ha + TSP 62.5 + MOP 31.25)
3. Cattle dung manure alone (5t/ha)
4. EM + Cattle dung manure (5t/ha)

Wet season rice as a first crop has been harvested and no significant difference was observed. This can be due to residual effect of chemical fertilizers. Three crops will be grown every year. All agricultural research departments are invited to conduct insect pest and plant disease

experiments on these plots.

Long term experiments on the effects of EM on consecutive planting of rice were also conducted on the C.A.D.T.C farm on a plot of 0.20 ha. No significant differences were recorded due to the residual effect of chemical fertilizers, except for brown leaf spot where it occurred the least on EM treated plots and the most on control plots.

This experiment consisted of 8 treatments with 3 replications, arranged in a randomized complete block design. Three rice crops will be grown in a year. The treatments were as follows:

Control

Fertilizer alone (Urea 125kg/ha+TSP 62.5+MOP 31.25)

Cattle dung manure alone (5t/ha)

Fertilizer + Cattle dung manure (5t/ha)

EM + Fertilizer

EM + Fertilizer + Cow dung manure (5t/ha)

Cow dung manure alone (25t/ha)

EM + Cow dung manure (25t/ha)

### **Future Trend in EM Technology**

Infestation of insect pests and plant diseases occurred even on resistant varieties of rice in Asian rice production countries practicing conventional farming which requires chemical fertilizer and agricultural chemicals. Some areas of rice fields in Myanmar are no exception. On the other hand, organic rice (Basmati) is being exported to Germany at a higher price. Therefore, researchers and agriculture extension workers like to use EM technology widely in Myanmar. Future plan of using EM in Myanmar includes:

Expanding usage of EM on main crops.

Development of EM technique on split application, time, rate, and dilution ratio with water.

Encourage farmers to make EM fermented compost (Bokashi).

Establishment of EM dominated soils and production of organic farm products.

Conduct training for researcher, extension workers, and farmers.

### **Conclusion**

EM technology is based on the power of nature, strengthens the intrinsic power of agricultural soil, minimizes the loss of energy in recycling on farm products, suppresses the incidence of insect pests and plant diseases, and produces more food that enhance human health. Thus, EM technology can solve agricultural problems and contribute to food production and environmental protection in Myanmar.