

*(Translation of main points and outline from original Chinese paper)*

Prof. GE Cheng. 2006. Issues related to development of bio-fertilizers in China. Presentation at the Sixth Symposium on Environment Friendly New Fertilizer Products and Technology. Soil and Fertilizer Institute, Chinese Academy of Agricultural Sciences, Beijing 100081

1. Historical aspects of bio-fertilizer development in China

Bio-fertilizer production started in China in the 1950s, and has been 70 years by now. It went through several PERIOD or STEPS or PHASES:

1.1 First Phase: Early 1950s: Mainly working on legume crop Rhizobium inoculations and very small production mainly by several research labs.

1.2 2<sup>nd</sup> Phase: Late 1950s: Some quick expansion in production without good research bases and good management, no standardized quality criteria.

1.3 3<sup>rd</sup> Phase: 1960s-1970s: During the Cultural Revolution time. Affected by the cultural crop Rhizobium inoculation, many local low level productions, but low quality, did not really help much.

1.4 4<sup>th</sup> Phase: from 1980s till now. It can be split into 3 periods:

1.4.1 1980s-mid 1990s: Some development, but no regulations, no good management, no standardized criteria. Some companies produce fake bio-fertilizers to cheat farmers.

1.4.2 1996-2006: More controlled development period: In 1996, Ministry of Agriculture (MOA) started working on the management of bio-fertilizers and its registration. In 1997, first group with total 8 bio-fertilizer products registered. By now (2006) total of 511 products received temporary registration and about half of them received permanent registration. In 1994, first Bio-fertilizer standard was released, and by now (2006) total of 17 bio-fertilizer standard criteria being released including 3 national standards and 14 industrial standards. In 2000, MOA released "The Management Methods for Bio-fertilizers. During this period, there are some good development, and some products being used in crop production and adopted by farmers. But there are still great differences in terms of product quality among the various companies.

2. Problems and Trends:

2.1 Problems:

- 1) Bacteria type bio-fertilizer developed faster than fungus and actinomycetes;
- 2) A lot of bio-fertilizer companies pay more attention to production quantity, but less attention to improve product quality;

- 3) Production facilities and related technology need to be improved;
- 4) Selection of carries and additives need to be improved;
- 5) Stability of liquid products;
- 6) bagging materials, etc.

#### 2.2 Problem in application:

- 1) Special products that mean products specifically fit the situation for different crops and different soil conditions are not well developed;
- 2) lack of suitable application methods including application rate, time, placement and application techniques for different products;
- 3) Need more field research for validation; 4) some misleading propaganda exists at different levels, etc.

#### 2.3 Future trends and needs:

- 1) Further improvement of product quality
- 2) Development of specific product suitable for different crops and soils;
- 3) Improvement of product quality;
- 4) Selections of different micro-organisms for mixed products;
- 5) Improvement of production technologies;
- 6) Innovation of product and technology;
- 7) Improvement of production facilities and its adoption.

#### 3. Problems need to be solved in bio-fertilizer application:

- 1) The role of bio-fertilizers in agricultural development need to be clarified, avoid over stated and under estimated. Must be true and scientific;
- 2) Strengthen training before application;
- 3) Strengthen research, demonstration and extension;
- 4) To be worked together with current soil testing and fertilizer recommendation work;
- 5) pay more attention to farmers responses and farmers needs;
- 6) Take necessary actions on the fake bio-fertilizer products.

#### 4. Issues associated to bio-fertilizer industrialization and innovation:

- 1) Strengthen long term and strategic detailed research on important aspects, such as soil bio-fertility, sustainability, N bio-fixation, etc.
- 2) Issues related to production and application: such as technology innovation, introduction of new technology and products, training, adoptability of microbial in the bio-fertilizers when applied to soils, etc.
- 3) Other problems need to be solved for industrialization of the bio-fertilizers: Bio-fertilizer association need to be formed for better management and services for the bio-fertilizer sector; standardization of the products, technology improvement, and services after selling to farmers, etc.