Biofertilizer Application by Farmers of Rainfed Agriculture in Karnataka

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Abstract:
The application of biofertilizers is one of the important components of organic farming. Organic farming helps in building up of soil fertility for sustainable production. But despite the efforts to promote organic farming by the department of agriculture and other related government and non-government agencies with various programs, including the promotion of biofertilizer usage, the response of farmers particularly in the rainfed agriculture is not encouraging. This paper intends to draw the attention on the impact of usage of bio-fertilizers by farmers and its limitations in the perspective of agricultural production in Karnataka with emphasis on dryland farming.

Keywords: Biofertilizers, microbiota, organic farming, nitrogen fixers, biomass.

Introduction:

The Green Revolution in India in the early 1960s led to an increase in food production needed to make the country self-sufficient in food grains with the introduction of high-yielding varieties of seeds and the increased use of chemical fertilizers and irrigation. The methods adopted included the use of high-yielding varieties (HYVs) of seeds with modern farming methods. Due to the rise in use of chemical pesticides and fertilizers there were negative effects on the soil and the land such as land degradation and poor soil health.

Bio-fertilizers are an essential component of organic farming. Biofertilizers are the live or latent cells of organisms, that are usually nitrogen fixing microorganisms, solubilizers of phosphates, cellulites microorganisms, growth promoters, that are applied to seeds or plants to increase their growth. Biofertilizers constitute microorganisms that are not a source of nutrients but improve the accessibility of available nutrients in the rhizosphere.

Various institutions both government and non-government agencies have been planning and organizing programs for the promotion of organic farming that includes usage of biofertilizers for sustainable agriculture. Though positive results are seen in adoption of biofertilizers among farmers of irrigated lands, the response is very poor among the farmer of rainfed agriculture land holders. Various factors contribute for such a poor response.

Data and the source of data

The data is based on discussions with farmer self-help groups. The officials of NGOs - AME (Agriculture Man Ecology) at various parts of Karnataka, farmers in Jayamangali sub watershed at Madhugiri of Sujala watershed project. Participating in workshops, farmer field schools (FFS) and participatory technology

development (PTD) programs organized by AME. Discussion with the officials of the department of Agriculture. Secondary data from organizations - AME foundation, LEISA India

Biofertilizers increase the growth and yield of crops by either synergistic or antagonistic interactions with the soil microbiota in the region of rhizosphere. Biofertilizers promote plant growth by enhancing biotic and abiotic plant stress tolerance and supporting its nutrition by fixing atmospheric nitrogen and solubilizing soil nutrients.

The microorganisms present in biofertilizers are available in nature. Initially, these organisms are isolated from various sources such as the root nodule for rhizobium and developed in specific media. Biofertilizers are applied in different methods. The seed treatment is most common that involves preparation of paste or slurry by mixing of biofertilizers water and a binding agent usually jaggery syrup and treating the seed, dusting the biofertilizer or mixing with organic manure and applying to soil.

Organic farming system aims at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes that can be applied in the form of **biofertilizers** to release nutrients to crops for increased sustainable production in an eco-friendly pollution free environment.

Organic farming avoids the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, and biological system of nutrient mobilization and plant protection.

Most of the increase in agricultural output over the years has taken place under irrigated conditions. The focus of research with reference to enhancing the productivity of the farm is also focused on irrigated farming and the rainfed farming is by enlarge neglected for a long period of time. Nearly half of the food grains and oil seeds are grown under rainfed conditions, and large percentage of poor farmers and agriculture labourers depend on rainfed agriculture for their livelihoods.

Commonly used biofertilizers in Karnataka

Name	**Crops**
Rhizobium strains	Legumes like pulses, groundnut, soybean
Azotobacter	Soil treatment for non- legume crops including dry land crops
Azospirillum	Non-legumes like maize, barley, oats, sorghum, millet, Sugarcane, rice etc
Phosphate Solubilizers (Bacterial and fungal)	Soil application usually mixed with organic manure for all crops
Blue-green algae and Azolla	Rice/wet lands
Microhizae (VAM)	Many trees, some crops, and some ornamental plants

As mentioned by the department of Agriculture (government of Karnataka) the main challenge posing the agriculture sector in Karnataka is to mainstream the vast drought prone/rainfed area. In India, out of 142 million ha of arable lands, 60 per cent (5.2 million ha) is rainfed. Karnataka has the second largest area under rainfed agriculture after Rajasthan in the Country with around 120 lakh hectares. Crop yields in rainfed areas are quite low.

Current rainwater use efficiency in rainfed agriculture varies between 35-45 per cent. Rainfed/ dryland areas confront harsh environment and economic hardship. The basic problem of rainfed areas is one of a vicious

cycle that starts with low water availability, degradation of natural resource base because of poor management which ultimately results in low productivity.

This in turn, leads to over-exploitation of the existing natural resources and causes further degradation. The vast potential of rainfed agriculture could be unlocked by using available scientific technologies including improved cultivars. Crops like jowar, ragi, maize, groundnut, sunflower, pulses, oilseeds and some horticulture crops can be grown by adopting scientific strategy. The vast opportunities existing in dryland areas can be harnessed for improving rural livelihoods.

Ragi is largely grown in southern districts of Karnataka. Red gram is the major pulse crops grown in the Kharif season and Bengal gram is an important rabi crop grown predominantly in the northern districts of the state. Groundnut is an important crop of the State grown in many districts including central Karnataka. Sesamum and safflower are oilseed crop of the State grown in rain fed condition.

According to the department of agriculture, government of Karnataka more than 75 percent of the cultivated area is still under rain-fed condition. The State is encountering drought conditions frequently in the recent times. Hence to address all these problems and to stabilize and increase the agriculture production especially in rain-fed and drought prone areas, Government of Karnataka has brought out State Policy on Organic Farming during March 2004 to promote Organic Farming in the state.

The sustainability of agriculture depends on enhancing the soil fertility and productivity of soils, reduce the cost of production, improve farmers' income through production of quality produce, increase the food security by encouraging the traditional crops, reduce the debt burden of farmers and enable to achieve sustenance and self-reliance, make environment safe and pollution free besides protecting health of human beings and animals, increase rural employment opportunities, facilitate farmers' Self Help Groups for most of their requirements, and equip farmers to effectively mitigate the impact of droughts.

Some of the constraints in adoption of Bio-Fertilizer in rainfed farming are:

The most important challenge of organic farming particularly in dryland farming is the availability of sufficient organic matter for application in the field. The retention of moisture is even more challenging in the dryland farming. It is also affected by the pattern of rainfall distribution within the year, soil characteristics, altitude, temperature and slope and more importantly the soil type, among other things are import factors affecting the dryland agriculture and adoption of organic farming by the rainfed agriculture farmers of Karnataka. High temperatures and low availability of moisture is detrimental to the microbiota and the biofertilizer application in such conditions would not yield evident results**.**

Despite the ability of the biofertilizers to enhance the soil microbiota and improve the soil fertility, bio-fertilizers have not yet gained popularity among farmers for proper adoption.. it becomes difficult to convince the farmers as it takes a certain period to establish, improve the soil fertility and increase the crop yield. Numerous factors affect the sustenance of the soil microorganisms. The non availability of moisture after cropping season and low organic matter may reduce the build up of microorganisms in the soil.

Despite many programs by the department of agriculture and other related government and non-government organizations to promote the use of biofertilizers to adopt organic farming , their still lies the lacuna in knowledge about the concentration, time and method of bio-fertilizer application. The farmers acceptance about the efficacy of bio-fertilizers compared to their familiarity with the use of conventional and tested inorganic fertilizers is a serious constraint of their widescale application. Knowing the different constraints faced by farmers in the use of bio-fertilizers, the extent of adoption of bio-fertilizers can be increased by tackling these issues and problems.

The quality of the biofertilizers and its maintenance is also a challenge**.** Lack of regulatory acts and facilities for testing the samples has led to poor performance and less visible increase in the yield of crops is one of the reasons for non-adoption of this practice by many farmers.

The quality of bio-fertilizers demands not only intensive study of the microbial characteristics, but also explanation of the precautions and limitations of their use at laboratory, at levels of production as and field level as well. Bio-fertilizers offer a wide range of opportunities for the development of better agricultural practices due to the advantages and benefits provided for the soil, crops and farmers. Despite these, there are limitations of these practices that are clearly recognized.

Lack of proper storage facilities and inability of the farmers to procure it in time also impacts the efficacy of the of biofertilizers.

Conclusion

Usage of biofertilizers is one of the important components of organic farming to boost the microbiota of the soil in the farm fields and increase its productivity. Organic farming helps in building up of soil fertility for sustainable production. The main key to successful adoption of organic farming is using local and natural resources and with least external inputs. It is generally considered that organic farming aids in the reduction of the cost of production and helps farmers to get more returns. Though the use of biofertilizers plays an important role in organic farming, its usage by dryland farmers is relatively low. The agencies promoting organic farming need to focus on adopting measures to maintain moisture and organic content in rainfed farm through proper management of soil and moisture conservation through watershed activities, biomass production and application by composting and green manuring, creating awareness among farmers and imparting skill and knowledge required for the proper storage and application of biofertilizers and practices related to the promotion of organic farming.

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