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Technological interventions for enhancing the availability of vegetables in the market of Kashmir valley

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Abstract
A substantial increase in the area and production of vegetables has been observed in relation with technology mission, extent and determinants of marketed surplus and price spread of vegetables in the Kashmir valley. Vegetables are high nutrient demanding crops. Repeated applications of fertilizers in vegetable growing fields without knowing its fertility status may create severe imbalance of nutrients. All essential plant nutrients are present in soil system either in available or in complex forms. Number of soil factors like pH, salinity/alkalinity, calcareousness, clay colloids, organic matter and its rate of mineralization and immobilization affect their availability to plants. Therefore, before conversion of traditional food grain growing fields in to vegetable fields, one should ensure the soil fertility analysis with particular emphasis on micronutrients. Some of the vegetables need specific nutrient in higher quantity for example, cole crops need more K, B, Mo & Ca whereas fruit vegetables B & S and leguminous vegetables Ca & P. The nutrients required by plants may come from various sources, such as the atmosphere, soil, irrigation water, mineral fertilizers, manures and biofertilizers. The combinations, quantities and integration of nutrients to be supplied from various sources (integrated plant nutrient supply) depend on various factors including the type of crop, soils, availability of various resources, and ultimately on economic considerations, such as the level of production and the costs of inputs and outputs. Integrated nutrient management (INM) is a well-accepted approach for the sustainable management of soil productivity and increased crop production.

Keywords: vegetables, fertility, manures, nutrient, productivity

Introduction
Vegetables play a vital role in the nutrient security of human beings, in addition to improve the economy of the people of the country. India is the second largest producer of vegetables next to china in the world. The local area under vegetables in India is 6.2 million hectares with a production of 72 million tons. The area under vegetables in Kashmir is 17.70 thousand hectares with a production of 4.42 lakh tones (Nayeem & Khan 2003) [7]. Vegetables growing per unit area is quite profitable as the production and net returns is higher than cereals. In country like India were vegetarian is way of life science early times, vegetable production has tremendous scope to meet the needs of growing population. So it is required to intensify our efforts to increase the vegetable production to meet the needs as well as ensuring the nutritional security of fast growing population. Under present situation it is not possible to increase the area; increasing productivity is only option left. Amongst various factors responsible for production of higher yields of quality vegetables balanced nutrition is one of the effective ways to enhance the productivity of vegetables and to maintain soil health. The growth and production of vegetables depletes the soil of its macro and micro nutrient reserves resulting reduction in native fertility. reported that one tone of cabbage, cauliflower and onion removes 5, 2, 7, 5.2, 1.1, 6.8 and 3.4, 1.4 and 4.5kg/ha of N, P & K. These nutrients therefore must be returned to the soil to maintain fertility and to sustain productivity.

Nutrient management
Nutrient refers to all those compounds which are required by plant as a source of body building material and for energy without which it fails to complete its life cycle. The application of these nutrients to maintain fertility and nutrient supply to an optimum level for

sustaining desired level of production is nutrient management. The various essential nutrients required for plant growth are N, P, K, Ca, Mg, S, Zn, Cu, Mn, Fe, B and Mo, Na, Cl. The first six are categorized as macro and the last eight as micronutrients on the basis of requirement of plants. In addition to these there are other elements which have been found to beneficial are called beneficial elements. These are Co, Si which are specific for crops.

Nutrient requirement of vegetable crops

The various approaches that are used to make fertilizer recommendation based on soil tests are:

Maintenance concept

When the soil test is at or above the critical level it can be maintained by fertilizer rates that replace loses by crops removal. This approach is useful when the capital is limited and the land is being rented. This approach is used for immobile elements like P, K and Zn. The soil test must be monitored periodically to determine whether the fertility level is decreasing or increasing. If the soil fertility level is decreasing than the application will be removal + quantity for maintenance. This approach is not practicable for mobile nutrients like No3, So4 and Cl because these nutrients readily leach below the root zone in many soils.

Build up concept

When soil test value is below critical limits it is desired to apply rates of nutrients to increase the soil test value to the critical limits or above. Generally application of 30kg/ha application P2O5 are required to increase the test P level to 2.24 kg/ha. Similarly to increase the soil test K level to 2.24 kg/ha 10 kg/ha of K2O is needed. If the soil test value is above the critical level not to fertilize the crop with that nutrient.

Sufficiency level concept

This is based on nutrient use efficiency or crop response to applied doses of nutrient. Presently this concept is popularly adopted while making recommendation of fertilizer.

Crop response level

Crop response to fertilizer doses is quadratic means yield increases with increase in the rate of fertilizer application up to certain level beyond which the rate of increase in the yield with every additional dose of fertilizer is reduced. Thus the yield reaches to a peak or plateau at a particular level of fertilizer further increase in fertilizer dose results in reduced yield which is considered to be toxic level.

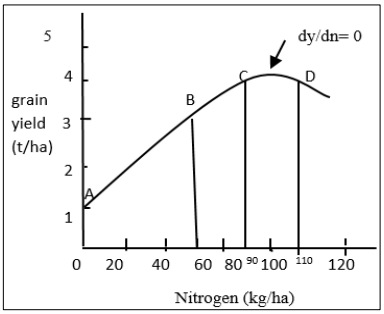

Fig 1: Nitrogen (kg/ha)

It is clear from figure that one tone yield of wheat is obtained with inherent soil fertility. There is linear response up to 60kg (from A to B). Thereafter the response becomes curvilinear (B to C) which indicates that wheat yield is in decreasing trend with every increase in fertilizer dose. Beyond 90kg the yield dose not increase plateau (C to D) with further increase in dose of nutrient is considered to be toxic. Mathematically:

$$Y = a + bN + cN^2$$

Where

Y= grain yield kg/ha, N= dose of nutrient kg/ha a, b, c are constants. Of these a is intercept that's yield without N application, b slope indicates response rate (kg grain/kg N applied/ha) and whereas c represents curvature of response line showing adverse effects of excess N which has – sign.

Sources of nutrients

The various sources of these nutrients are:

(i) Organic manures (ii) inorganic fertilizers (iii) biofertilizers

These sources have their own merits and demerits.

Organic materials

Merits

1. Organic manures improve soil structure, water holding capacity, permeability, prevent leaching of nutrients.
2. They are the sources of almost all nutrients.
3. They also provide growth principle substances like enzymes and growth regulators.
4. They not only improve physical but also chemical and biological properties of soil.
5. Maximization of organic matter.
6. They have no pollution effect.

Demerits

1. Non availability of quality organic manures.
2. No package of practice for organic manures.
3. Divergent nutrient values of some organic manures.
4. Since they contain less amount of nutrients than chemical fertilizers, large quantities are needed which is difficult to store.
5. The total potential of organic sources in the country is 17mt and the nutrient value is 12mt.

Inorganic fertilizers

Merits

1. The nutrients from this source are available just after application.
2. They contain high contents of nutrients so small quantities are required.
3. They are easily available.

Demerits

1. Their application results in acidity or alkalinity.
2. Environmental pollution occurs due to their application.
3. Nutrient imbalances due to excessive use of straight nutrient fertilizers.
4. Serve as source of heavy metals from phosphatic fertilizers.

Heavy metal contents in fertilizers (mg/kg) on dry wt basis

	As	Cd	Cr	pb
Urea	<0.04	0.2	-	0.4
DAP	0.9-16.2	4.6-35.5	5.5	2.1-3.7
MOP	0.4	0.2	1.0	0.4-10
SSP	10.3	15.0	13.3	11.0

***Source*:** Singaram P (2007) [9].

Biofertilizers

These are microbial inoculants which are capable of nitrogen fixation, phosphorus solublization and decomposing organic matter at a faster rate thereby help in improving the soil fertility and boosting crop production.

Merits

1. They are ecofriendly, renewable and pollution free.
2. They act as biopesticides. Azotobacter strain found to inhabit seed borne pathogens in some cereals.
3. Economical with high cost, benefit ratio without risk.

Demerits

1. Lifespan is short, their availability is low.
2. Their efficiency is affected by soil acidity.
3. For production of quality product, use of high-tech instrument and equipment is desirable.
4. Presence of antagonistic strains in bioinoculant masses affects the efficiency of microbes.

Conclusion

Based on number of experiments it is concluded that balanced fertilization i.e. rational use of organic and inorganic fertilizers is the only option of returning these nutrients to the soil in such a manner that would have least adverse effects on environment maintain soil productivity and sustain high yield. The addition of organic manures would not only provide the needed nutrients including micronutrients but it would also reduce the need of chemicals supplying specific micronutrient and minimize the risk of inducing deficiency of other micronutrients.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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