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Scientific *Badi* /kitchen garden for nutritional security and additional income source opportunity

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Abstract
The improved model involves many crops that can be repeatedly harvested to meet a family's vegetable needs throughout the year. The crops and their varieties are scientifically selected to be highly nutritious with few pest and disease problems. The underlying cause for malnutrition may be the unawareness, illiteracy, inadequate availability of vegetables and fruits and low purchasing power of the households. The traditional *Badi* system provides only some vegetable but the scientific *Badi* system provides diverse vegetable in the same piece of land; offers intake of more nutrition to the rural families. As per Recommended Dietary Allowances, daily intake of vegetables should be 300 gm/person including roots and tubers, green leafy and other vegetables. Keeping into consideration the high prevalence of malnutrition especially micronutrient deficiencies and inadequate availability of vegetables, Krishi Vigyan Kendra, Pahanda (A) has conducted 29 demonstrations having 300 m^2 area per demonstration during the year 2019-2020 on scientific Badi development at the backyard/kitchen garden of rural farm family. Five trainings and a *Poshan Pakhwada* were organized to create awareness on nutrition amongst the rural's. The major objective was to provide the nutrition required in daily diet, to provide additional income from the *Badi* and to utilize *Badi's* scientifically. The results of the demonstration showed an improvement in availability of vegetables for consumption at both household and individual level. The average per capita availability of vegetables increased from 178 gm/day to 280 gm/day. The awareness on nutrition and technical knowledge on scientific utilization of *Badi* were also increased through demonstration and training programme.

Keywords: Scientific badi, nutritional security, front line demonstration and trainings

Introduction
Food security is multidimensional and is presumed exists when is adequate and continuous food availability, access, and utilization in a sustainable manner. Vegetables help combat malnutrition and diversify diets. Dietary diversification balances the diet by enhancing the supply of essential micro-nutrients leading to improved health, such as improving functions of the whole body, disease prevention, and delayed disease progression. "A menu filled with seasonal fruits and vegetables could provide a big nutritional boost" and vegetables were packed with fiber and water and were low in fat, they decreased the calorie density of diet, while boosting overall nutrition. It was evident from the literature that home gardens are a part of agriculture and food production systems in many developing countries and are widely used as a remedy to alleviate hunger and malnutrition in the face of a global food crisis.
The nutritional home garden or kitchen garden is generally located close to the house and is used for growing vegetables, fruits and other food crops for the family (Jana, 2015). It not only saves our money and time but also can provide a healthy, useful and environment friendly hobby for whole family. Improved vegetable nutrition garden is better than traditional homestead vegetable garden. The improved model involves many crops that can be repeatedly harvested to meet a family's vegetable needs throughout the year. The crops and their varieties are scientifically selected to be highly nutritious with few pest and disease problems. The suggested model can produce 300 kg of vegetables annually, sufficient to meet vitamins and minerals requirement of a family comprising four members.

Material and Methods
A front line demonstration on development of scientific *Badi* was carried out by Krishi Vigyan Kendra, Pahanda (A), Durg, IGKV, C.G. during the year 2019-20 at the villages namely Pahanda (A) and Batang. Firstly, beneficiaries were selected having a *Badi* of 300 m^2 than training given to selected beneficiaries on development of scientific *Badi* with the objective to upgrade the knowledge of rural people regarding the importance of *Badi*/kitchen garden and

technical details of its establishment. Pre and post evaluation of trainees was conducted which includes the information regarding caste, education level, income, previous grown crop in the *Badi etc*. Data on the major constraints for kitchen gardening were also collected. To find out the major constraints in vegetable production in *Badi*, Participatory Rural Appraisal (PRA) technique was used. Preferential ranking technique was utilized to identify the constraints faced by the rural people in kitchen gardening. A total of 29 households were selected through purposive sampling technique by screening households based on their willingness and interest to establish kitchen garden in their backyard to ensure nutrition security. Each household consists of 4-6 members. For individual household, an area of 300 m^2 was taken for the establishment of scientific *Badi*/ kitchen garden. The study was conducted in both the *kharif* and *rabi* seasons. Krishi Vigyan Kendra, Pahanda (A) has provided the seed and planting material of improved varieties of fruits and vegetables for the selected *Badi's*. Improved varieties of fruits *i.e.* Mango *var.* Dashehari, Lime *var.* Kagzi lime, papaya *var.* Red lady, guava *var.* Allahabad safeda and Jackfruit local were planted at North-West direction of the *Badi*, to reduce the shadding effect on vegetables grown at *Badi*. Improved varieties of vegetables included Cowpea, okra, bottle gourd, sponge gourd, bitter gourd, brinjal and tomato and planting material of sweet potato, Ivy-gourd and drumstick were demonstrated during *Kharif* 2019; whereas during *Rabi* seeds/planting material of coriander, fenugreek, spinach, radish, carrot, cauliflower, cabbage, tomato, brinjal, chilli and garden pea were demonstrated. A schematic diagram of scientific *Badi* development presented in Fig-1. To assess the impact of established scientific *Badi*/kitchen garden in the rural households, average yield per unit were obtained. Nutrient availability was compared with the recommended dietary allowances given by ICMR for Indians.

Fig 1: Schematic Diagram of Scientific Badi

Results and Discussion

1. Impact of training

A total of 87 rural's were participated in the training program. They were of 21 to 61 years of age group. Most of the trainees were educated up to primary level (48.27%) followed by upper primary level (27.58%) and 24.13% were found illiterate. Majority of participants (90.8%) belonged to other backward class followed by schedule caste (5.75%) and schedule Tribes (3.44%). Their per capita income ranged between Rs. 1060.0 to Rs. 5290.0 per month. Training helps in improving knowledge and skill and changes the attitude of the trainees. The knowledge of the participant was assessed through collection of data through an interview schedule before and after training programs. Data obtained is presented in Table-1 and Fig-2 showed an increase in the knowledge of participants after their participation in training on various aspects of Scientific *Badi*/kitchen gardening. Least (0.00%) rural's had knowledge on layout of scientific *Badi* whereas highest knowledge was observed on intercultural operations (65.0%) before the training. After training, their knowledge

has been increased in all the aspects of vegetable production under *Badi*/kitchen gardening. A total of 71.26% trainees trained on layout of scientific *Badi* which was 0.0% before training. Malabasari and Hiremath (2016), also reported an increase in the knowledge of rural women after providing them training on various aspects of agricultural and home sciences

Data presented in Table-2 showed that lack of technical knowledge on layout of Scientific *Badi* (100%) is the major constraint followed by lack of knowledge on vegetable requirement on daily diet (93.1%) for production and consumption of vegetables in these areas. Lack of knowledge on establishment of Scientific *Badi* /kitchen garden *i.e.* improved varieties, seed rate, sowing time, major insect pest diseases and their management, fertilizer and manure application, irrigation etc. ranked third constraint in this regard. Other constraints found included unavailability of quality planting material and seeds of HYV vegetables, adoption of traditional practices for growing vegetable, lack of interest in kitchen gardening and lesser priority is given to kitchen gardening than other farm activities. In a similar study conducted at Burdwan district of West Bengal, it was found that input constraint was most important constraint as it was ranked in 1st position (Sethy *et al.* 2010) [5]. Another study reported the unavailability of quality planting material and seeds of HYVs of vegetable, less availability of water for irrigation, lack of knowledge about improved varieties, seed rate and sowing time, lack of knowledge about seed treatment, high soil pH and EC, lack of knowledge regarding major pests and diseases identification and their management and lack of interest among rural youth were reported major bottlenecks in successful adoption of kitchen gardening (Sharma *et al.* 2011) [6]. Similar results are also reported by Biswas and Jamir (2015) [2] and Singh *et al.* (2018) [7].

2. Front Line Demonstration

A total of 29 demonstrations on scientific *Badi* development have been conducted in the adopted villages. Each *Badi's* were established in 300 m^2 area. The result presented in Table-3 showed that the average yield of the vegetables increased from 410 kg/unit in farmers practice to 765 kg/unit under demonstration, which was 86.58% over the farmers practice. Increase in yield of vegetable might be due to proper land utilization, use of improved varieties, field preparation, adaptation of IPM technique, balance nutrition of crops, proper intercultural operation, irrigation at critical stages of crops and proper marketing of vegetable crops. Result shows that the average per capita consumption of vegetables increased 57.3%. Before demonstration of scientific *Badi* /kitchen garden, average per capita availability and consumption of vegetables was 59.33% of Recommended Dietary Allowances (RDA) which was increased up to 93.33% by establishment of scientific *Badi*. Increase in vegetable consumption in daily diet might be due to creation of awareness amongst trainees on importance of balance nutrition on human health. It was also observed that the consumption of green leafy vegetables increased after training and demonstration of scientific *Badi*. Awasthi, *et al.* 2016, also reported increased per capita vegetable consumption after plantation of kitchen garden in Kanpur dehat and Kushinagar districts of Uttar Pradesh.

Impact of technology demonstrated

The demonstrated technology not only fulfil the daily requirement of vegetables but also provide additional income opportunity to the rural's. The neighbouring farm families also willing to adopt the technology. Availability of vegetables for per capita consumption increased by this technology may also increases per capita availability of nutrients/day.

Table 1: Pre and post training knowledge of trainees regarding establishment of scientific *Badi*/ kitchen garden

S.N.	Participants	Knowledge of selected trainees (n=87)			
		Pre-training evaluation		Post-training evaluation	
		n	%	n	%
1.	Field preparation	56	64.36	81	93.1
2.	Layout of scientific *Badi*	0	0.00	62	71.26
3.	Improved varieties and planting material	12	13.79	77	88.50
4.	Sowing time and seed rate of vegetable crops	21	24.1	73	83.90
5.	Nutrient management	39	44.82	64	73.56
6.	Critical stages for irrigation	35	40.22	69	79.31
7.	Intercultural operations	65	74.71	85	97.70
8.	Use of IPM techniques	5	5.74	55	63.21
9.	Marketing	56	64.36	85	97.70
10.	Post-harvest management	32	36.78	62	71.26

Table 2: Major constraints perceived in the establishment of scientific *Badi*/ kitchen garden

S.N.	particulars	Participants (n=87)		Rank
		n	%	
1.	Unavailability of quality planting material and seeds of HYV vegetables	54	62.06	IV
2.	Lack of technical knowledge on layout of Scientific *Badi*	87	100	I
3.	Lack of knowledge on establishment of Scientific *Badi* /kitchen garden *i.e.* improved varieties, seed rate, sowing time, major insect pest diseases and their management, fertilizer and manure application, irrigation etc.	61	70.11	III
4.	Lack of interest in kitchen gardening	22	25.28	VI
5.	Adoption of traditional practices for growing vegetable	51	58.62	V
6.	Lesser priority is given to kitchen gardening than other farm activities	15	17.24	VII
7.	Lack of knowledge on vegetable requirement on daily diet	81	93.10	II

Table 3: Per unit production and availability of vegetables before and after establishing nutrition kitchen garden

Treatments	Production kg/unit area	% change in Yield	Parameter (Per capita consumption g/day)	% change in Parameter	%RDA*
Farmers practice	410	-	178	-	59.33
Demonstration of scientific *Badi*	765	86.58	280	57.3	93.33

(*RDA-Recommended Dietary Allowances)

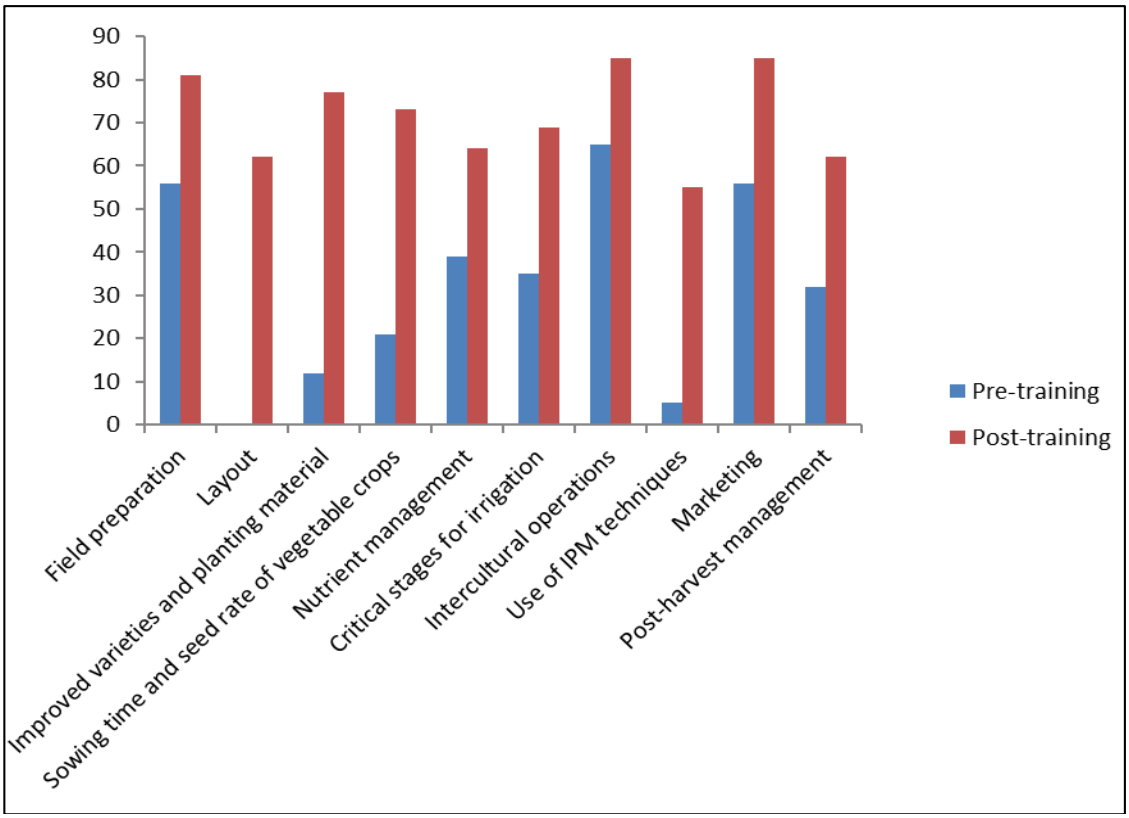

Fig 2: Pre and post training knowledge of trainees regarding establishment of scientific *Badi*/ kitchen garden

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