

# Impact of Farming System for Nutrition model on nutritional & livelihood security of rural household in Aurangabad district

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## Abstract:

Nutritional security of Indian rural community is a big issue and remains a big challenge for developing countries. In a context where a significant section of the population is malnourished and the majority of the Indian population are dependent on agriculture for their livelihoods and nutrition security. Hence, Krishi Vigyan Kendra, Aurangabad has focused to overcome the nutritional as well as economical insecurity through Farming System for Nutrition (FSN) model. FSN model is an interventional approach that includes a combination of sustainable agricultural remedies involving advanced crop production practices, bio fortification for rendering higher income and better nutrition output. This study was conducted with 30 rural household on an area of 0.20 ha each at village Lakhegaon and revealed that 518.1gm food stuff (cereals, pulses and vegetables) available per capita per day as against RDA recommendation 625 gm (75.16%). It was also recorded that FSN model provided 36.43 gm protein, 955 kcal energy, 23.1mg iron, 326.7 mg calcium, 88.9 mg vitamin C and 204.0 µg folic acid per day to each adult in the family and also earned Rs.94210. It was recommended that replication of this type of FSN model may be very useful to enhance the nutritional security through staple foods and also increased the economical status.

**Key word:** Farming System for Nutrition, Model, Nutritional security, Livelihood, Bio fortified

## I INTRODUCTION

Malnutrition continues to be a major concern across the world. World Health Organization has estimate that about 2 billion people are undernourished, including with Micronutrient deficiency. As per the National Family Health Survey (NFHS- 4), in 2015-16, 38.4 per cent of India's children, below the age of five years they were stunted and 35.7 per cent underweight; one fifth of women in the reproductive age group, were estimated to be suffering from chronic energy deficiency while another one fifth were obese. Further, more than 50 per cent of children and women suffer from anemia (IIPS-ICF, 2017). In Aurangabad district 21.5 per cent of women below normal BMI, 38.3 per cent children under the age 6-59 months they are anemic and 45 per cent of women are anemic. (National Family Health Survey - 4, 2015-16). In a context where a significant section of the population is malnourished and majority of the Indian population are dependent on agriculture for their livelihoods and nutrition security. Nutritional security is a global issue and remains a big challenge for developing countries. Nutritional security is multidimensional and is presumed exists when is adequate and continuous nutritious food availability, access, and utilization in a sustainable manner. Several studies suggest that nutrition gardens can be an option for food and nutritional security in disaster, conflict, and other post crisis situations (Galhena et al., 2013). To address malnutrition, it is therefore important to give focus on potential linkages between agriculture and nutrition. Women play a very crucial role in agricultural development and allied activities including main crop production, livestock production, horticulture, post-harvesting operations etc. Evidence is available across the globe linking farm diversification to diet diversification and better nutrition outcome as well as livelihood security. Jindal and Dhaliwal, 2017 has reported that 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. It is, therefore needed to work with small and marginal farmers, for nutrition sensitive farming system with highly nutritious crops, fruits and vegetables.

### Concept of Farming System for Nutrition

Farming System for Nutrition (FSN) as defined by Prof. M S. Swaminathan, envisages the introduction of location-specific agricultural remedies for nutritional maladies prevailing in an area through mainstreaming nutritional criteria in the selection of farming system components involving crops, animals and wherever feasible fish (Nagarajan et al 2014). Farming System for Nutrition approach is a combination of sustainable measures including advanced crop production practices, bio fortification, promotion of nutrition gardens of fruits and vegetables, livestock and poultry development, and setting up of small-scale fisheries, combined with nutrition awareness; the objective being to address malnutrition in all its forms, viz. calorie deprivation, protein deficiency and 'hidden hunger' (i.e. micronutrient deficiencies). To overcome the nutritional deficiency among rural folk it was a need to work with life-cycle approach in nutrition, importance of bio fortification, role of agro biodiversity in farming systems and the need to mainstream neglected and underutilized crops were highlighted. The concept of 'genetic garden' of naturally fortified and bio fortified crops for awareness and planting materials was included in FSN model. On the basis of above concept, Krishi Vigyan Kendra (KVKh x), Aurangabad has taking initiative to bridge the gap between nutrition and agriculture through FSN model with the objective of increase the nutritional availability and also secure the livelihood of farm families. Bio fortified pearl millet was demonstrated to be an efficacious approach to improve iron status in adolescent children through a six-month study conducted in rural Maharashtra, India. After only four months, iron deficiency was significantly reduced, and serum ferritin and total body iron were significantly improved in secondary school going children who consumed iron pearl millet flat bread twice daily. Children who were iron deficient at baseline were 64 percent more likely to resolve their deficiency by six months (Finkelstein JL et al.2015). Considering all these scenario the study was design with the objective of development of FSN model at village level which ensure healthy diet that contains adequate quantities of vitamins and macro and micro-nutrients by producing various kinds of vegetables, iron rich staple food like pearl millet and sorghum in organic method and become nutritional and livelihood security.

## II MATERIALS AND METHODS

The present study on Farming System for Nutrition (FSN) was implemented by Krishi Vigyan Kendra, Aurangabad at farmer's field of Lakhegaon village tq. Paithan dist. Aurangabad during last three years under Nutri sensitive Agricultural Research Innovation (NARI) project, ICAR and MCEAR with the financial support of UNICEF and technical support of MSSRF, Chennai. Total 30 rural household were purposively selected for this study on the basis of low Hb level and who was willingly kept her land for the trial. It has also been ensured that the family should be of 4-6 members. For individual household on an area of 0.20 ha was taken for the establishment of FSN model. The study was conducted in both the *kharif* and *rabi* seasons. In the season of *kharif* pearl millet was shown on an area of 0.05 ha. and pulses (Red gram, green gram and black gram) on an area of 0.05 ha after harvesting of *kharif* crops wheat and sorghum were shown in same field. Krishi Vigyan Kendra has provided bio fortified seed of pearl millet, sorghum and seeds & planting material of improved varieties of vegetables to the selected households. The yield data for each crop were recorded with all selected respondents in both the season and were averaged out. The nutrient availability to every individual member of the household was calculated by using the food composition tables given by Gopalan, *et al* 2013. Then the nutrient availability was compared with the recommended dietary allowances given by ICMR (2011) for Indians.

## III RESULT AND DISCUSSION

**Table I: Per unit annual production and income status of FSN model (0.20 ha)**

Sr. No.	Crops	Area (ha)	Productions (Kg)	Consumption by family (Kg)	Sold (Kg)	Income (Rs.)
<b>A</b>	<b>Cereals</b>					
1	Bio fortified Pearl millet	0.05	300	200	100	3000
2	R. Sorghum	0.05	200	100	100	3500
3	R. Wheat	0.05	250	100	150	4500
	<b>Subtotal</b>		<b>800</b>	<b>400</b>	<b>400</b>	<b>11000</b>
<b>B</b>	<b>Pulses</b>	<b>0.05</b>				

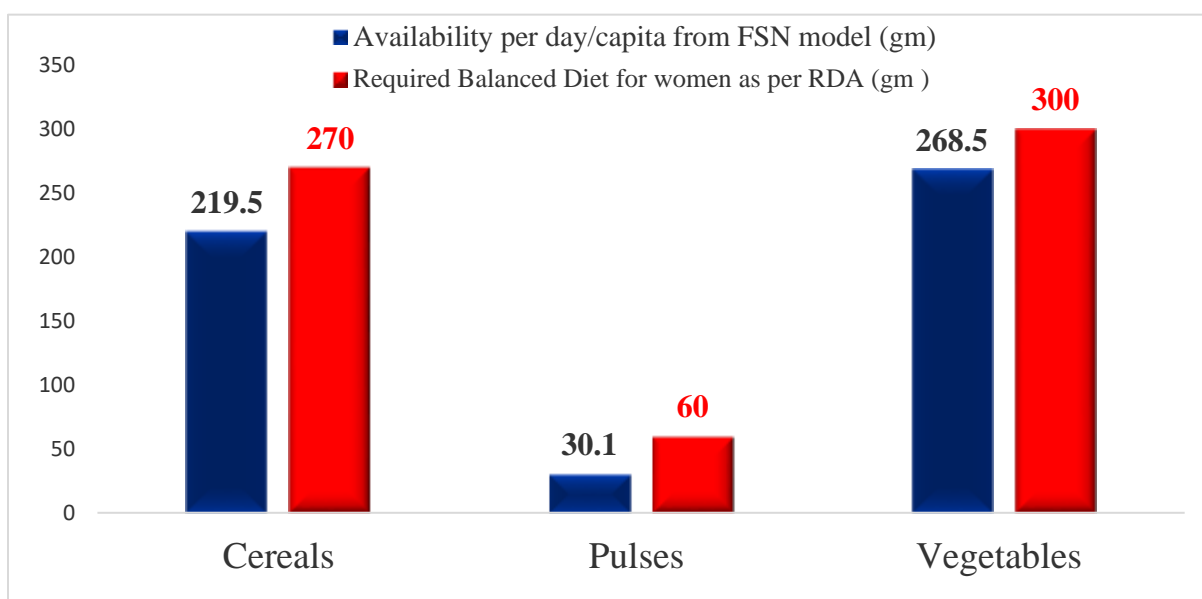
4	Kh.Red gram	0.01	30	30	-	-
5	Kh.Green gram	0.02	25	15	10	800
6	Kh.Black gram	0.02	20	10	10	600
	<b>Subtotal</b>		<b>75</b>	<b>55</b>	<b>20</b>	<b>1400</b>
<b>C</b>	<b>Vegetables</b>	<b>0.10</b>				
7	Spinach	0.02 all leafy	200	48	152	6080
8	Fenugreek		75	25	50	2500
9	Coriander leaves		25	15	10	500
10	Shepu		128	50	78	3900
11	Rajgeera tender		8	8	-	-
12	Chuka tender		6	6	-	-
13	Tomato	0.01	600	40	560	22400
14	Brinjal	0.01	550	42	508	20320
15	Bhendi	0.01	300	48	252	10080
16	Chilli	0.01	50	10	90	4500
17	Beet root	0.01	15	5	10	200
18	Carrot		15	8	7	280
19	Radish		15	5	10	250
20	Bitter gourd	0.01	130	52	78	3120
21	Bottle gourd	0.01	150	48	102	4080
22	Ridge gourd	0.01	100	60	40	1600
23	Drumstick	2 plant on bund	60	20	40	2000
	<b>Subtotal</b>		2427	490	1987	81810
	<b>Grant total</b>		<b>3302</b>	<b>945</b>	<b>2407</b>	<b>94210</b>

From above table it was revealed that, total annual production of cereals (Pearl millet, R. Sorghum and R. wheat) on an area of 0.10 ha was 800 kg among which 400 kg they kept for their family consumption and 400 kg were sold and earn Rs.11000 from cereals. In cereal category iron rich pearl millet was also introduced for enhancing the nutritional status of family. In the category of pulses (Red gram, Green gram and black gram) on an area of 0.05 ha they were produce 75 kg pulses in *kharif* season among that 55 kg kept for consumption and 20 kg were sold and earn Rs.1400. Under the category of vegetables on an area of 0.10 ha they produced 17 types of vegetables which are having vitamins and minerals rich and total production of vegetables was 2427 kg. Under the leafy vegetables category Spinach, Fenugreek, Shepu, Rajgeera tender, Chuka tender and Coriander leaves were grown and produce total 442 kg leafy vegetables among that 152 kg of leafy vegetables were consumed while 290 kg were sold and earn Rs 12980. From other category of vegetables total 1985 kg vegetables like Tomato, Bhendi, Brinjal, Chilli, Beet root, Carrot, Radish, Bitter gourd, Bottle gourd, Ridge gourd, Drumstick were produced and 338 kg vegetables were consumed while 1697 kg were sold in market and earn Rs. 68830. Finally it was observed from above table 490 kg vegetables were consumed in a year by whole family (5 members) means each member consume 268.4 gm vegetables per day which was 89.5 % of Recommended Daily Allowances (RDA) apart of that they earned Rs. 81810 from vegetables only. Ultimately, it was recorded that respondents were fulfilled their daily requirement of cereals (81.3 %), Pulses (54.7%), vegetables (89.7%) and also earned total Rs. 94210 from FSN model.

**Table II: Comparison between required balanced diet by ICMR and availability through FSN model**

Food staff category	Availability per day/capita from FSN model (gm)	Required Balanced Diet for moderately active person as per RDA (gm )	Percentage availability against RDA (%)
Cereals	219.5	270	81.3
Pulses	30.1	60	50.2
Vegetables	268.5	300	89.5

Source: RDA -2010 for moderately active person



**Figure 1** Availability of foodstuff per day/capita from FSN model (gm) as against required balanced diet for women as per RDA (gm )

Data in table II showed availability of foodstuff per day/capita from FSN model (gm) as against required balanced diet for women as per RDA (gm) and depicted in fig. no1 and found that 219.5 gm cereals, 30.1gm pulses and 268.46 gm vegetables per day per capita were obtained from Farming System for Nutrition (FSN) model on an area of 0.20 ha. Household with FSN model was obtained 89.5 per cent (268.5 gm) vegetables of FAO’s recommendation ie.300 gm per day per capita, though vegetables are recognized as the most important source of micronutrients (like iron, calcium, vitamin C, folic acid etc.), yet the per capita vegetables consumption in India (86gm/day) is far below the FAO’s recommendation. As per the ICMR recommendation dietary guideline for Indians –A manual, 2011, daily requirement for an adult is 270 gm cereals and 60 gm pulses while FSN model fulfilled the requirement of 81.3 per cent and 50.2 per cent respectively as compare with RDA.

Table III: Per day per capita calculated nutritional availability from FSN model

Category wise food staff	Foodstuff available capita /day (gm)	Nutrition availability					
		Protein (gm)	Energy (kal)	Iron (mg)	Calcium (mg)	Vit. C (mg)	Folic acid (µg)
Cereals	219.5	25.07	774.7	14.57	86.15	0	80.49
Pulses	30.1	6.73	108.61	1.39	23.8	0.16	42.93
Vegetables	268.46	4.63	71.71	7.13	216.79	88.79	80.68
<b>Grant total</b>	<b>518.06</b>	<b>36.43</b>	<b>955.02</b>	<b>23.09</b>	<b>326.74</b>	<b>88.95</b>	<b>204.1</b>
RDA		55	1900	21	600	40	100
% of nutrition available as compare to RDA		66.23	50.26	109.5	54.45	222.3	204.1

Source: Nutritive Value of Indian Foods (2011) NIN, Hyderabad

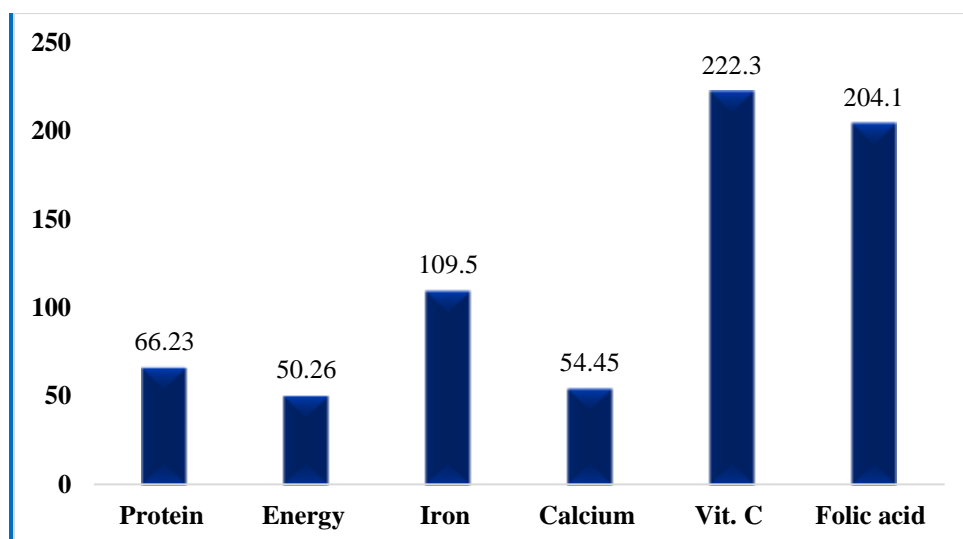


Figure 2 per day per capita percentage of nutritional availability from FSN model

As per ICMR average daily nutrient requirements of an adult is 55gm protein, 1900kcal energy, 21 mg iron, 600 mg calcium, 40 mg vitamin C and 100 µg folic acid whereas FSN model provided 36.43 gm protein, 955 kcal energy, 23.1 mg iron, 326.7 mg calcium, 88.9 mg vitamin C and 204.0 µg folic acid per day to each adult in the family. Further fig. No.2 was indicated that FSN model provided per capita per day calculated nutrition viz. protein, energy, iron, calcium, vitamin C and folic acid were available 66.2, 50.3, 109.5, 54.5, 222.3 and 204.1 per cent respectively as against RDA. Though, all the daily nutrition requirements for an adult can't be met with this FSN model but this model supplements major share of the daily requirements. It was also showed that availability of protein, energy and calcium is near about half of the daily requirement and vitamin C, iron and folic acid was higher than the daily requirement. One way to achieve this goal is to increase the nutritional status and income through this type of model.

#### IV CONCLUSION

From this study, it was concluded that FSN model provided total 518.1gm food stuff (cereal, pulses, vegetables) per capita per day as against RDA recommendation 625 gm (75.16%). FSN model is the easiest way to fulfill the nutritional daily requirement with economical security to rural household. Finally, it was recommended that replication of this model in large scale at village level may overcome the nutritional deficiency and also improve the livelihood security.

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