



Nutrition Sensitive Annadata Kitchen Garden Model: Growth for Health and Wellbeing of Tribal Poor – A Couple of Case Studies

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Abstract

The experience and lessons learnt from the underutilized backyards of landless women make it imperative to create alternate livelihood options. Among them horticultural practices with strict adherence to sustainable technologies will be an everlasting solution. It ensures balanced household consumption of vegetables and fruits in their daily food habits and prevents nutritional maladies. 2552 farm families of *Bhumia*, *Paroja*, *Kandha* and *Penthia* tribal women of the Kundra Block, Koraput district, Odisha are involved in an organic Annadata Kitchen Garden model in their backyards. It ranges from 5-20 cents covering three seasons in a year. Multiple nutri-crops are grown with an initial investment of Rs 1200 to 2000/-. Till date, 329 such units have been established. It was observed through research that use of organic manure, botanical preparations and Integrated Pest Management tactics could enhance the crop productivity. The landless women not only serve the entire family with nutritious food but also get a reasonable income from the surplus produce. This paper analyzes dietary habits, diversity and household consumption.



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Introduction


Odisha is predominantly an agricultural state with a cultivated area of 90.54 lakhs ha and average production of 25.44 million tons.¹ Koraput is situated 18°48' 48.5532"N latitude and 82°42'

44.3988"E longitude, the average rainfall is 1505.8mm (District Statistical Handbook), Out of 51649 geographical area the irrigated area covers 5503 hectares, rain fed 14246 hectares. The soil type is matured red and lateritic mixed grey soil,

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annual rain fall 1521.8 with an average of 84 rainy days. The district economy mainly depends on agriculture and which mainly depends on rainfall. The rainfall depends on South-West monsoon. Out of total cropping area of 296000ha in Koraput, irrigation potential in Kharif is 30.71% and in Rabi is 21.51%. Generally crops grown during rabi namely paddy, wheat, maize, finger millet, green gram, black gram, groundnut, mustard, field pea, sunflower etc. needs assured irrigation.

Koraput district is contiguous with the main land of Eastern Ghats, having 24 % land under forests cover. The district experiences a dry sub-humid climate with dry summers and cool winters with mean maximum & minimum temperate of 30.6 °C and 17.03 °C respectively. April and May are the hottest months and December and January are the coolest months. The area falls under the Eastern Ghats high land agro-climatic zone having the ecological situation of high elevation and medium rain fall.

Koraput is one of the 69 districts of India identified as being notably disadvantaged regarding poverty, hunger, infant mortality, immunization, literacy, school enrolment and gender disparity. Once covered with dense forest that supported hunting and gathering, in addition to “shifting cultivation” agriculture, mineral-rich Koraput district is undergoing rapid deforestation and incursion by mining interests, hydroelectric dams and other development projects. Climate change has impacted the tribals’ traditional agricultural methods on the uplands, resulting in erosion and decreasing crop yields. Many are obliged to migrate for work during non-agricultural seasons, yet exploitation of labourers undermines this survival strategy as well. Monsoon is the most critical time. Food stores from last year’s harvest are depleted but crops have not yet matured in the current season.

Tribal people mainly depend upon rainfall for their agriculture and kharif paddy is the only source of income for them for many years. They used to purchase vegetables from the local markets and household consumption was not balanced. To supplement this situation, M. S. Swaminathan Research Foundation in one of its project Mahila Kisan Sashaktikaran Pariyojana (MKSP) took new initiatives to empower the women

to cultivate vegetables in their backyard on a pilot scale.

“Purchasing vegetables from local markets was a nightmare and very expensive. The markets are only weekly markets and very far from our household. So we restricted to consume ragi gruel and ragi based foods and less nutritive foods”

*-Raimati Ghiuria,
35 year old women from Nuaguda*

Materials and Methods

Kitchen gardens were based on a model called Annadata Kitchen Garden, which is a structured garden with multiple crops. This was practiced from 2013 onwards and helped to consume more vegetables and fruits in their daily household consumption. Their dietary habits have changed due to this intervention.

“I have been practicing paddy cultivation in the lowlands and millets in the uplands for our survival. Cost of cultivation in paddy is more than any other crop and depends on monsoon as we don’t have irrigation facility. Agriculture was a gamble until we started practicing vegetable cultivation in our backyards”

*-Nilabati Khilo,
42 year old tribal women, Jholaguda*

Kitchen gardens are common in India, which serves as an additional source of income and caters to

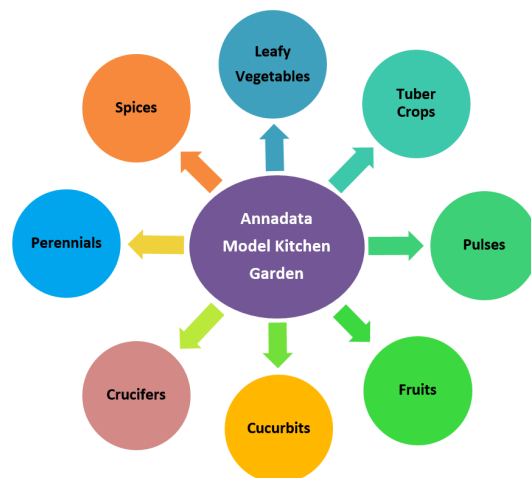


Fig 1. Crop Diversity

the daily household nutritional needs of the rural family. However a structured garden with multiple crops including annuals, perennials with a mix up of vegetables, fruits and flower crops has its own advantages over a mono-cropping system.

Vegetables are rich source of nutrition which contains carbohydrates, protein, minerals and multivitamins.² This helps to fight against anemia, malnutrition and hidden hunger.³ India is the second largest producer of vegetables in the world⁴ and in particular over past couple of years, Odisha has been witnessing a substantial rise in prices of vegetables. This is giving a positive incentive to increase production, productivity and quality of produce.⁵

Why Annadata Kitchen Garden Model of Vegetable Cultivation?

Vegetable cultivation requires less water than paddy as Koraput district is purely rainfed and the profit

margin is more with less care and attention. Women SHGs, individuals, farm families were growing vegetables which is an appropriate supplement for their dietary food habit. However, the garden was not organized and it was mono-cropping. M. S. Swaminathan Research Foundation introduced a unique model called Annadata Kitchen Garden Model which is a structured model with a diversity of crops (Plate 1; Figure 1) suited to all the seasons rainy, winter and summer which was not prevalent earlier. The available backyard land of size 5, 10 and 20 cents was utilized for the above purpose. The crops ranged from leafy vegetables to spices covering the entire basket of food and balanced their nutritional demands.

Moreover it is cultivated in a purely organic mode with a bunch of sustainable technologies such as use of bioinputs and natural resources. This was compared with conventional or non-IPM growers

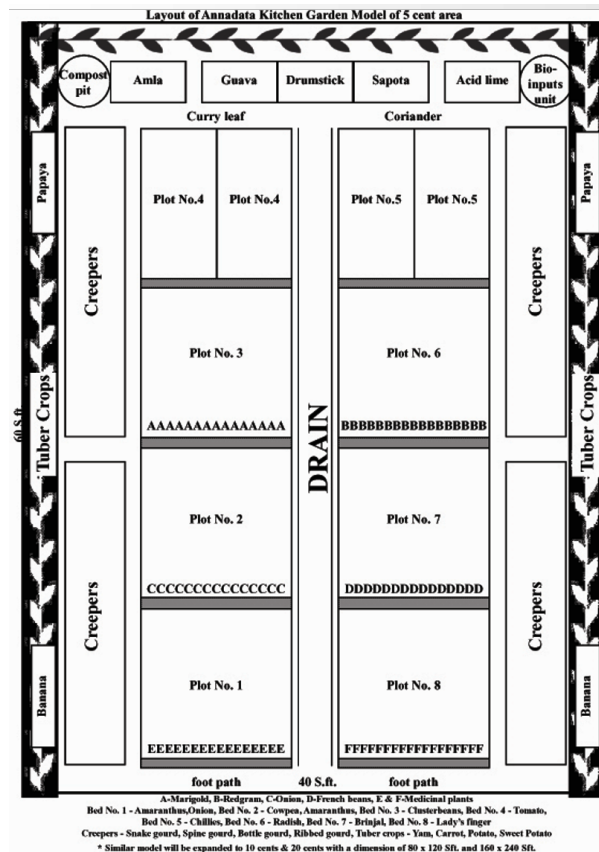


Plate 1: Annadata Layout

and the diversity of insect pests and its natural enemies showed a wide variation (vide results and discussion Table 1).

Annadata kitchen garden has been designed in the rural outskirts of Kundra and Boipariguda Blocks. Nuaguda, Jholaguda, Kharaguda, Pialkani, Khutguda, Chiliguda, Munja, Santaliaguda, Tentulpar, Chendia jhilligaon are few prominent villages which practice this model in an organic mode from 2015. Till date there are 329 units of such garden. The gradual increase and replication clearly shows that Mahila Kisans was impressed with the model. The penetration of such viable units proves that they are successful, socially acceptable, environment friendly

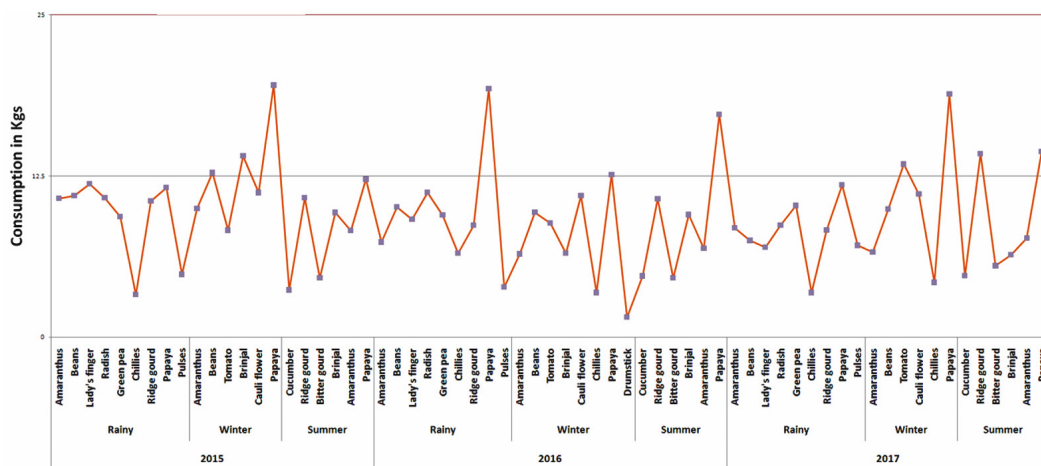
and caters to the wholesome dietary habits.

"Out of the discussion majority of the Mahila Kisans felt the importance of vegetable garden and came forward to take this on a pilot basis. They convinced their husbands and grew cauliflower or brinjal or lady's finger as a monocrop in their 5 cents of land with an investment of just Rs. 950/. After observing the benefit of the model, they expanded the practice to 10 (Rs. 1200/-) and 20 cents (Rs. 1860/-) in a structured layout as shown in the figure."

The Annadata kitchen garden is grown throughout the season with a land holding size of 5, 10 and 20 cents. Summer, rainy and winter is the three seasons



Plate 2: Bhumia Tribe Cultivating Diversified Crops



*Values are mean of dietary consumption in Kgs per family of 62 units

Fig. 2: Dietary pattern of tribal poor during a year

Table 1: Prevalence of pests and their natural enemies in the IPM* and Non-IPM vegetable garden**

Arthropod fauna	Population status	
	IPM adopters*	Non-IPM adopters**
Insect Pests		
<i>Leucinodes orbonalis</i>	2-3% damaged fruiting bodies; 1 larva per 10 plants; 1 damaged plant from 20 randomly selected plants	30% damaged fruiting bodies; 1 larva per plant; 3 damaged plants from 20 randomly selected plants
<i>Helicoverpa armigera</i>	5% infested flowers and fruits	10% infested flowers and fruits
<i>Amrasca biguttula</i>	1 jassid/nymph per five leaves; third grade jassid injury	2 jassids/nymph per leaf; second grade jassid injury (yellowing in the margin of leaves)
<i>Bemesia tabaci</i>	Less than 5 nymphs per leaf	5-10 nymphs per leaf
Beneficial insects		
Parasitoids		
Egg parasitoid	<i>Trichogramma</i> spp.	Absent
Larval parasitoids	<i>Campoletis chlorideae</i> ; <i>Bracon hebetor</i> , <i>B. greeni</i> , <i>Apanteles</i> sp., 1-2 cocoons/ parasitized larvae per 5 plants	Absent
Predators		
Coccinellids	<i>Cheilomenes sexmaculatus</i> , <i>Coccinella septempunctata</i> , <i>Cryptolaemus montrouzieri</i> , <i>Anagrus</i> sp. 10 – 20 per 5 plants	Absent
Dragon flies	<i>Pantala flavescens</i>	1 or 2 per plant
Damsel flies	<i>Agriochemis feminafemina</i> - Abundant	
Green lace wings	<i>Chrysoperla carnea</i> – 5-10 adults per plant	1 or 2 per plant
Aranae		
Spiders	<i>Oxyopes</i> sp., and <i>Tetragnatha</i> sp. - Numerous	
Predatory birds		
House sparrow	<i>Passer domesticus</i>	Absent
Black drongo	<i>Dicrurus macrocercus</i>	
Common mynah	<i>Acridotheres tristis</i> - Abundant	
Others		
Earthworms	60% population	10-15% population

*IPM includes use of biopesticide as sprays, *Trichogramma* cards, pheromones, mechanical elimination with a very few chemical pesticides sprays;

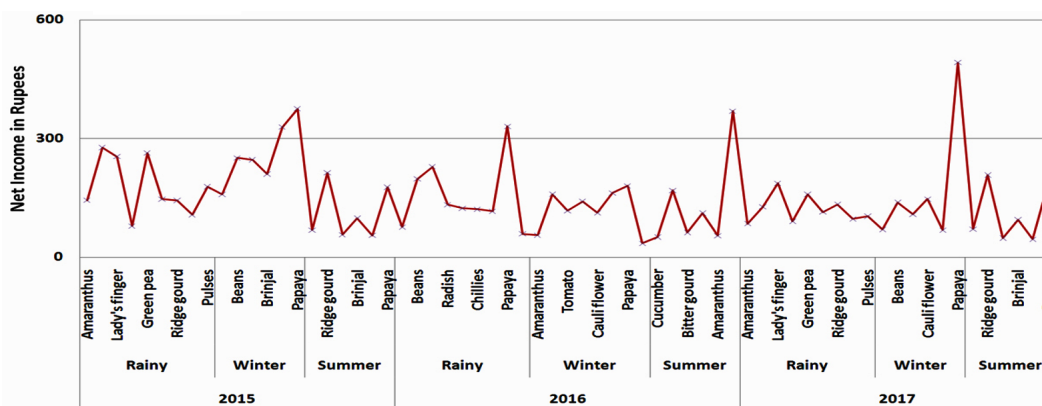
** Use of mostly chemical pesticides as sprays

Table 2: Comparative production and income status of Annadata Kitchen Garden

Year	Season	Crops	Production (Kgs)	Consumption (Kgs)	Sales (Kgs)	Net Income (Rs)
2015	Rainy	Amaranthus	17.95	10.77	7.18	143.7
		Beans	20.16	10.96	9.22	276.77
		Lady's finger	22.04	11.88	10.16	254.03
		Radish	18.66	10.8	7.85	78.54
		Green pea	15.91	9.33	6.58	263.22
		Chillies	8.17	3.29	4.88	146.61
		Ridge gourd	17.72	10.54	7.17	143.54
		Papaya	16.96	11.59	5.37	107.41
		Pulses	7.82	4.85	2.96	178.06
	Winter	Amaranthus	17.9	9.97	7.94	158.71
		Beans	21.1	12.74	8.35	250.65
		Tomato	16.47	8.27	8.19	245.81
		Brinjal	24.56	14.06	10.5	210
		Cauli flower	22.15	11.19	10.95	328.55
		Papaya	38.29	19.53	18.76	375.16
	Summer	Cucumber	8.19	3.65	4.55	68.23
		Ridge gourd	20.48	10.81	9.68	212.9
		Bitter gourd	8.39	4.58	3.81	57.1
Brinjal		14.56	9.65	4.92	98.39	
Amaranthus		13.74	8.24	5.5	55	
Papaya		19.6	12.24	7.35	176.52	
2016	Rainy	Amaranthus	13.7	7.35	6.35	76.16
		Beans	19.06	10.08	8.98	197.65
		Lady's finger	16.74	9.13	7.61	228.39
		Radish	18.56	11.21	7.35	132.39
		Green pea	15.65	9.47	6.18	123.55
		Chillies	10.53	6.5	4.03	120.97
		Ridge gourd	16.39	8.68	7.71	115.65
		Papaya	37.61	19.26	18.35	330.39
		Pulses	5.71	3.87	1.84	58.84
	Winter	Amaranthus	12	6.44	5.56	55.65
		Beans	16.9	9.68	7.23	158.97
		Tomato	16.63	8.84	7.79	116.85
		Brinjal	13.56	6.52	7.05	140.97
		Cauli flower	18.45	10.97	7.48	112.26
		Chillies	9.92	3.44	6.48	162.1
		Papaya	21.58	12.58	9	180
		Drumstick	2.94	1.53	1.78	35.08
		Summer	Cucumber	8.97	4.73	4.24
Ridge gourd	20.08		10.73	9.35	168.39	
Bitter gourd	8.06		4.6	3.47	62.42	
Brinjal	14.55		9.48	5.06	111.42	
Amaranthus	12.29		6.89	5.4	54.03	
Papaya	32.03		17.27	14.76	368.95	
2017	Rainy	Amaranthus	16.92	8.47	8.45	84.52

		Beans	14.53	7.48	7.05	126.87
		Lady's finger	14.42	6.97	7.45	186.29
		Radish	16.22	8.68	7.54	90.48
		Green pea	18.13	10.19	7.94	158.71
		Chillies	8	3.44	4.56	114.11
		Ridge gourd	17.18	8.29	8.89	133.31
		Papaya	18.23	11.79	6.44	96.53
		Pulses	8.84	7.11	1.73	103.55
Winter		Amaranthus	11.61	6.6	5.02	70.23
		Beans	16.84	9.92	6.92	138.39
		Tomato	24.18	13.4	10.77	107.74
		Cauli flower	20.24	11.08	9.16	146.58
		Chillies	8.79	4.23	4.56	68.47
Summer		Papaya	35.24	18.85	16.39	491.61
		Cucumber	10.53	4.75	5.78	70.66
		Ridge gourd	21.51	14.23	7.28	207.34
		Bitter gourd	11.2	5.53	5.67	48.33
		Brinjal	13.71	6.38	7.33	94.34
		Amaranthus	14.14	7.67	6.47	44.89
		Papaya	23.62	14.38	9.24	183.22

* Values are mean of 62 Annadata Kitchen Garden Units



*Values are mean of Net income in Rupees per family of 62 units

Fig. 3: Economic benefit through vegetable production

in which suitable crops are chosen. The predominant crops include high yielding varieties of brinjal, lady's finger, cauliflower, beans, garden pea, onion, tomato, chillies, red gram, cabbage, carrot, leafy vegetables, curry leaf, coriander and intercropped with French marigold and French beans. In the border, on the fences creepers like bitter gourd, snake gourd, bottle gourd and tuber crop such as elephant yam are cultivated. papaya, drumstick, guava, sapota,

acid lime is few perennials which are grown along the border. The layout (Plate 1) shows clearly how efficiently the space can be utilized with multiple cropping systems so that the income will be more from per unit area utilized.

Mahila Kisans were trained to grow Annadata Kitchen garden with a systematic procedure. 42 trainee days were covered during the first and

second year of the project. 20 villages from each block were selected plus at present there are 329 units available. Farmers who were cultivating paddy in their uplands with more external inputs ended up with very meager yield. At this juncture the viable alternative solution was Annadata Kitchen garden units.

Sustainable Technologies – An Added Advantage

The tribal women added farmyard manure, vermicompost, kitchen waste compost during the last ploughing instead of inorganic fertilizers. For the management of pests and diseases as well as better growth, prophylactic application of botanical preparations made from local resources (neem and pongamia mixed in cow dung and cow urine) namely *neemastra*, *agneyastra*, *handikatha*, *jeebamrita*. These local organic bioinputs act as pest repellents, antifeedants and plant growth promoters.

"Nilabati Khilo, 45 years old Mahila Kisan lives with her husband Mr. Madana Khilo at Jholaguda village, Lima Gram Panchayat of Kundra Block, Koraput district. She has grown about 10 varieties of vegetables along with few perennial crops⁶ as suggested by the MKSP project scientist. She doesn't apply any chemical pesticides and chemical fertilizers in the garden but apply only bio-fertilizers and bio-pesticides⁷ like bio-compost, cow dung, Handi khata, Beejamruta, Jeebamruta, and Neemastra etc."

Results and Discussion

Due to prophylactic spraying of bioinputs, installation of yellow sticky traps, erection of bird perches and intercropping with marigold as trap crop the incidence of pests reduced and beneficial species increased as against non-IPM practitioners (Table 1). There was less percentage of crop damage hence led to decent yield and income.

Out of the total 329 units of Annadata kitchen garden the results will focus on the average of randomly selected 62 units during three years namely 2015, 2016 and 2017. The crop diversity, production, household consumption and net income derived from the surplus sales are discussed below.

The production ranged from 38.29 Kgs, being the highest recorded in papaya to the least yield in drumstick (2.94 Kg) (Table 2). Earlier the rural community was dependent on external sources. At present they are able to consume 84.01 Kgs per season (approx. 4 months) during rainy days to a minimum of 49.17 Kg during summer (Figure 2). Overall it meets their nutritive demands as it was not a regular habit earlier. The dietary diversity was evident clearly which lead to reduction in malnutrition.⁸ The net income against the vegetables and fruits grown in the garden ranged from Rs. 35.08 to Rs. 491.61. Among the seasons it was proved that rainy season is the ideal over the others (Table 2; Figure 3).

Conclusion

The Annadata kitchen garden includes usage of diversified seeds and improved sustainable farming practices. Adoption of this model at household enhances access to vegetables and fruits, increases skill sets in usage of sustainable agricultural practices and utilization of nutri-dense foods and also provides additional income generation activities and such model can be promoted for replication in similar ecological and social condition.

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