

VEGETABLE CULTIVATION AS AN ALTERNATIVE SOURCE OF INCOME FOR SMALL FARMERS IN BUNDELKHAND

***An initiative of ABSSS under the SDTT-supported
BRPAM project, in Tikamgarh block of Tikamgarh
district, MP***

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Background

Traditionally, Bundelkhand is not known as a major vegetable production region. Cultivation of vegetables for sale in market and generation of income has been restricted to a few locations, such as Newari block of Tikamgarh district, and/or households of certain socioeconomic groups (eg Lodhs) having irrigation facilities, many heads of cattle (and thus FYM), and tradition of cultivating vegetables.

However, there is scope and need for promoting vegetable cultivation as an alternative source of income for small farmers in the Bundelkhand region, for the simple reason that on a per unit of land basis, vegetable cultivation is far more profitable than cultivation of staple crops. Vegetable cultivation will also help improve nutritional status of families, especially women and children.

The prerequisites and challenges of successful vegetable cultivation on a commercial scale are well known:

- Apart from suitable agro-climatic conditions, assured supply of water is required.
- Vegetable cultivation requires more labour and attention than cultivation of staple crops.
- As most vegetables are highly perishable, and have limited shelf life, quick access to market, or to cold storage facilities, is the key factor determining whether a particular location is suitable for vegetable cultivation or not.

Keeping above in mind the above, there is scope for promoting vegetable cultivation as an alternative or even primary source of income for small farmers in particular locations of Bundelkhand.

The Tikamgarh block of Tikamgarh district, MP, is one such area, as (i) agro-climatic conditions are suited for the cultivation of a number of vegetables including brinjal, chilli, tomato, potatoes, garden peas, etc (ii) a large part of the cultivated area is irrigated, mainly through dug wells (iii) most villages in the block are well connected by tar roads to the large markets in Tikamgarh and Sagar towns.

Under its Bundelkhand Rural Poverty Alleviation Model (BRPAM) project (March 2011 to August 2014, and extended), ABSSS decided to leverage these advantages to promote vegetable cultivation, particularly among SC/ST households, who form the target group of the project, and have traditionally not done vegetable cultivation on a commercial scale.

Bhagwat Prasad

Director

Brief profile of Project area

The 20 villages/hamlets selected for intensive intervention under the Project are located in Tikamgarh block of Tikamgarh district, MP, at a distance of 20 to 40 km from Tikamgarh town, and 50 to 70 km from Sagar town. The topography of the Project area is generally marked by a gentle slope from south towards north. Around 75% of the soil found in the Project villages is of the coarse-grained grey variety locally known as Parua, or coarse-grained reddish brown variety known as Rakar. Soil tests show that soil has normal pH and EC, low to medium organic-carbon content, low phosphorous content and low to medium potash content.

The climate of the area is characterized by a hot summer and general dryness except during the southwest monsoon season. The normal maximum temperature, recorded in May, is 41.8° C and minimum temperature, recorded in January, is 7.0°C. The normal annual rainfall received in the district is 1057.1 mm. Maximum rainfall (about 90%) is received during southwest monsoon period from June to September. Relative humidity exceeds 87% in August. The driest part of the year is the summer season, when relative humidity is less than 35%. May is the driest month of the year. Data on rainfall for last 12 recent years shows that in six years rainfall was significantly below normal, and in one year (2007), it was 50% below normal. In two years including 2013-14, rainfall was much above normal. In any year, highest rainfall generally falls in June-July.

Around 2500 families live in the 20 villages/hamlets covered intensively by the Project. Of these, 30% belong to SC groups, 14% belong to ST groups and 56% belong to OBC groups. Barring 6% of the families, all families own some agricultural land. However, 44% of the families own less than 2.5 acres (1 ha) and another 38% own between 2.5 to 5 acres (1 to 2 ha). Thus 80% of the population comprises marginal and small farmers.

Of the total 6823 acres of cultivable land in the 20 villages/hamlets, around 60% (4037 acres) is irrigated, and of this, around 67% is irrigated by privately-owned dug wells. Around 15% of the irrigated land is irrigated by tubewells, and 13% of the irrigated land is irrigated by lifting water from nallas or rivers.

Of the total cultivable land, 80% is sown in the Kharif season and 20% is sown in the Rabi season. Wheat, soyabean, and urad are the major crops accounting for 60% of the gross cropped area. Mustard, til and paddy account for around 5% of gross cultivated area. Around one-fourth of households cultivate vegetables in kitchen gardens and/or parts of their land. Main kitchen garden vegetables are tomato, brinjal, bottle gourd, pumpkin and bhindi (lady's finger). In addition, a few families grow coriander and cucumber. Some vegetables are grown on commercial scale, with chilli, tomato, and brinjal accounting for two-thirds of the area under commercial vegetable-cultivation. However, the commercial scale is modest: except for onion, which is grown by a couple of farmers in areas over 1 acre, average area under commercial vegetable-cultivation per cultivating household ranges from 0.3 to 0.7 acres. Moreover, till project intervention, the commercial cultivation of vegetables was done only by farmers belonging to OBC and General Groups.

Choice of vegetable cultivation as an alternative source of income

In 2013-14, vegetable cultivation was chosen by the Project as an alternative income generation activity for the following reasons:

- Due to rising input costs, and increasingly uncertain climate conditions, cultivation of staple crops like wheat is becoming unremunerative for farmers. Comparatively, potential returns from vegetable cultivation are very attractive. As calculated by the Project team, in consultation with farmers, the gross returns from cultivation of one acre of wheat, soyabean and urad in the Project area are approximately Rs 9500, Rs 7600 and Rs 3600 respectively (see Appendix for details of calculation). On the other hand, assuming average yield of tomato in Tikamgarh (18t/ha, or 7200kg/acre) and average selling price of only Rs 5/kg, gross returns from cultivation of tomato in one acre would be Rs 36,000, or four to ten times returns from staple crops.
- There are no local industries providing alternative sources of employment.
- While there is a substantial cattle-resource in the area, and there is theoretically good scope for developing dairy as a source of income, there are basic limitations like paucity of veterinary and crossbreeding services, and lack of organized structure for collection and sale of milk. Overcoming these limitations requires huge investments, which are beyond the reach of the project.
- While there is good scope for developing fruit-cultivation as a source of income, it has a gestation period that cannot be afforded by many small and marginal farmers who are under severe income pressure and require quick returns to avoid distress migration. Also, it was feared that there is not much scope for some getting good returns from fruits like mangoes as there are a number of brick kilns in the area, which emit smoke that damages the fruit.
- Many families were already growing vegetables on a small scale, and there were some farmers doing commercial-scale vegetable cultivation. Hence, the basic idea of vegetable cultivation was not new to the Project area.
- Soil and water conditions in the Project area had been improved through watershed development works undertaken by the Project. There are a number of private wells in the Project area, and some group wells have been constructed/upgraded through the Project. Thus, a good amount of water was available for vegetable cultivation.
- There are two local markets with the Project area, and Tikamgarh town, and Sagar town are also easily accessible by road. Thus, farmers would not face difficulty selling vegetable produce.

Promotion of vegetable cultivation

Through village-level meetings, where cost-benefits (and risks) of vegetable cultivation were explained, the Project encouraged small farmers, particularly SC/ST farmers, to take up vegetable production on a small but commercial scale, with help of Project support, in the form of quality seeds.

In 2013-14, around 50 families were initially given input support for vegetable cultivation. Additionally, the Project encouraged 38 families, of which most are from SC/ST groups, to take advantage of a government scheme and install highly subsidized drip irrigation systems for vegetable cultivation. As the technology was new to the area, and beneficiary farmers had to pay a contributory amount, the Project gave 100% support to 13 farmers at the start of Rabi 2013 for installing drip systems. After the benefits of drip irrigation became clear, and farmers came forward on their own, the Project support to farmers was reduced, to Rs 9000 for SC/ST farmers, and Rs 5000 for OBC farmers. Project support was given through SHG/kisan samiti meetings, after judging a farmer's interest, and viability of vegetable cultivation on his plot. The main criteria for determining viability were suitability of land, and assured access to water for most of the year. In this way, support was given to 13+25 farmers. Details of the 38 farmers are given in Table 1.

Table 1: Details of drip-irrigation beneficiary farmers

Total number of beneficiary farmers	38
SC beneficiaries	25
ST beneficiaries	5
OBC beneficiaries	7
General category beneficiaries	1
Beneficiaries owning up to 1ha land (marginal farmers)	9
Beneficiaries owning 1-2ha land (small farmers)	18
Beneficiaries owning >2ha land (semi-medium and medium farmers)	11
Beneficiaries owning cattle	35
Avg. no. of large animals (cows, bulls, buffaloes) owned per beneficiary family	3.6
Beneficiaries having cows for production of Jeevamrut	26
Beneficiaries producing FYM	8
Avg. area (sqm) under vegetable cultivation with drip irrigation, per farmer	1923

Through close liaison with the horticulture department and approved drip system suppliers, the Project facilitated the entire process of getting the subsidy and installing drip systems in farmers' plots. As a result, around 17 acres were brought under drip irrigation in the Project area for the first time.

Including the drip-irrigation beneficiaries, the total number of farmers supported by the Project till February 2015 to take up vegetable cultivation was 91, of which 34 (37%) belonged to SC groups, and 13 (14%) belonged to ST groups. Most of the other beneficiaries are OBC-group farmers with small land holdings. The proportion of SC+ST families (51%) is significant as virtually no member of these groups had done vegetable cultivation on a commercial scale

before. Households choosing to start vegetable cultivation had generally the following characteristics: (i) they had a dug well (ii) the working adults desired to stay in the village rather than undertake migration for livelihood (iii) the family had least two working adults (usually a husband and wife).

The total area under vegetables of the 91 farmers, as on 31 March 2015, was 153,490 sqm, or 38.4 acres. The average area under vegetables per farmer worked out to around 1700sqm, or a little less than half an acre. This is a viable unit of cultivation considering input costs and availability of household labour.

Considering market demand, and the main vegetables being already grown in the Project area, the range of vegetables promoted was limited to chilli, tomato, and brinjal. Some families also grew peas, potato, cauliflower and onion on a small scale. Chilli accounted for the major area (60%) under cultivation, followed by brinjal (25%) and tomato (15%). Chilli was preferred more than other vegetables by farmers for the following reasons: (i) Good yields and returns had been obtained by chilli-growing farmers supported by the Project in the previous year. (ii) Chilli has longer shelf life. It can be dried and sold for a higher value.

All farmers were given quality (packed) seeds of well-known and locally available varieties. They were given on-field guidance on sowing, transplanting and staking by Project staff. All participating farmers were trained and encouraged to produce and use Beejamrut, Jeevamrut, Ghan Jeevamrut, Agni-ashtra and natural pest management. Farmers who did not have cows collected the dung and urine of animals of other farmers, either free or on payment of a nominal price for cow urine, to make Jeevamrut. **To sustainably reduce inputs, farmers were encouraged to use only FYM, along with use Beejamrut, Jeevamrut, Ghan Jeevamrut, Agni-aashtra, Bramha-aashtra, Neemaashtra and natural pest management and allied formulations, in place of chemical fertilizers.**

All the beneficiary farmers used household labour for establishment of nursery, planting, staking, irrigation, weeding, protection of plants from birds and animals, harvesting and sale of produce. While both men and women took part in these activities, it was seen that in many families, the contribution of women was higher in operations like weeding, and sale of produce in market.



Cultivation costs

Table 2: Average cultivation costs incurred per acre

Particulars	Amount (Rs) per vegetable		
	Chilli	Brinjal	Tomato
<i>Operational costs</i>			
Land preparation (2 ploughings)	1200	1200	1200
Nursery preparation	1500	1200	1200
Transplanting	1500	1500	1500
Application of FYM & Jeevamrut, etc	1800	1800	1800
Weeding & interculture operations	3000	3000	3000
Harvesting	2400	2100	3000
Irrigation charges	3000	3000	4000
Transportation charges	1200	1500	1500
Total operational cost	15600	15300	17200
<i>Materials:</i>			
Planting material	2100	700	1800
FYM	2400	2400	2400
Jeevamrut, Agniyastra etc	1000	1000	1000
Total material cost	5500	4100	5200
TOTAL COST (operational + material)	21,100	19,400	22,400
Cost per sqm	5.3	4.8	5.6

Average costs incurred for cultivation of the three selected vegetables in 2014-15 is shown in Table 2, on per acre and per sqm basis. Although only household labour was used by the famers, value of this labour is also taken into account, at the rate of Rs 150 per man-day. Cost of chilli, brinjal and tomato seed was Rs 350, Rs 100 and Rs 300 per 10gm respectively. Spacing rate for all three plants was 100 x 100 cm.

Pomegranate And vegetable Growth



Production

Production details of the three vegetable crops in 2014-15, till 31 March, 2015, are given in Table 3¹. (Production was expected to continue for three more months, till May 2015).

Table 3: Production details per vegetable (2014-15)

Particulars	Quantity per vegetable		
	Chilli	Brinjal	Tomato
No. of cultivating farmers	91	91	91
Total cultivated area (sqm)	92,094	38,372	23,023
Total production (kg)	47,821	69,894	31,331
Production t/ha	5.19	18.21	13.61
Production per sqm (kg)	0.49	1.73	1.26
Gross Income per sqm	14.85	23.32	18.16
Less- Input cost per sqm	5.28	4.85	5.6
Net income per sqm	9.57	18.47	12.56



The yields (chilli: 5.19t/ha; brinjal: 18.21t/ha;) was much higher than average yield in Tikamgarh district in 2012-13, as per IIVR, Varanasi (chilli: 0.9t/ha; brinjal: 15t/ha; data for the year 2012-13); tomato: 13.31t/ha were lower than average yields in Tikamgarh district in 2012-2013 as per IIVR, Varanasi data (tomato: 15t/ha)². While considering the lower yield, the following factors have to be taken into account for the following reasons:

- Production data is only 31 May, 2015 and does not reflect total production.
- Chemical fertilizers like DAP and urea were not used to boost yields.
- There were unseasonal rains in Bundelkhand region in January, February and March 2015, even April also causing severe damage to all crops.

Overall, yields obtained from drip-irrigation plots were not significantly higher than yields obtained from plots where farmers used conventional (flood) irrigation methods.

However, the saving of water in drip-irrigation plots was huge: per unit of land under vegetable, the drip-irrigation farmers used around one-sixth the water used by other vegetable cultivators.



¹ Production and sale details were recorded per farmer, through farmer diaries, updated and checked weekly by Project staff.

² *Vegetable Statistics published by Indian Institute of Vegetable Research Varanasi - 221 305 (Uttar Pradesh)(Indian Council of Agricultural Research) Technical Bulletin No. 51 Printed: March 2013, 500 copies (page no. 120, 148, 246)

Jeevamrut preparation in local pots-



Marketing

There are two weekly markets (haat) in the Project area, and most of the vegetable produce was sold directly by individual farmers on market days. Some sale also happened directly through farmers' fields. As volumes of production rose, a few



farmers took their produce to the Tikamgarh wholesale market, on motorcycles and tempos, and sold it there.

Under project guidance, an informal arrangement for collective marketing was also initiated this year, when groups of farmers brought their produce to a common place, weighed it and then loaded it onto a truck at their cost. A total of 5 tonnes of produce was then transported and sold in the Sagar and Jabalpur wholesale markets. After deducting transportation costs, the farmers distributed the profits according to the quantum of produce they had contributed. The net income was 10-15% higher than what they would have obtained through sale individually and locally. More importantly, the aggregated collection and transportation prevented flooding of the local market with produce, which would have depressed prices and harmed all vegetable cultivators in the area.

Farmers have expressed confidence about resorting to collective marketing, as and when required (whenever local markets are flooded with produce). At this stage, no need for an institutional marketing structure is felt, particularly as farmers are from the same socioeconomic group and the same area. However, if the number of vegetable-cultivating farmers increases significantly, a formal arrangement for collective marketing may have to be put in place, particularly for sale in distant markets in a cost-effective manner.



Income

Details of income obtained sale of the three vegetable crops in 2014-15, till 31 May, 2015, are given in Table 4. (Income was expected to come, till June 2015). Value of produce used for home consumption is not taken into account.

Table 4: Income details per vegetable (2014-15)

Crops	Area acre	Area in sqm	Production (Kg.)	Gross Income (Rs)	input Cost (rs)	Net income
Brinjal	9.593	38372.5	69894	894919	186106.63	708812.38
Chilly	23.024	92094.0	47821	1367332	485795.85	881536.15
Tomato	5.756	23023.0	31331	418126	128928.80	289197.20
Sub-total	38.36	153489.5	149046	2680377	0.00	1879545.73
Others vegetable crops			26239	277865	0	277865.00
Total		153489.5	175285	2958242	800831.28	2157410.73
Income per acre				77117.8832		56223.02

It can be seen that with an average of a little less than half an acre under vegetable cultivation, and average investment of Rs 8800 per farmer, farmers earned average net income of around Rs 56223. This is a **very high return on investment for the farmers, as average net returns from even an acre of cultivation of a cash crop like soyabean in the Project area is only around Rs 5000** (see Appendix) from an investment of around the same amount.

The return was also very significant in 2014-15 as unseasonal rains wiped out farmers' chances of getting virtually any returns from staple crops. On the other hand, only two of the 91 farmers suffered a net loss from vegetable cultivation.



Learning's:

- The ABSSS initiative shows that **diversified vegetable cultivation on plots of around half acre is a good source of income generation for small farmers in Bundelkhand**, subject to suitable soil conditions and availability of water. A basket of three vegetables suited to the agro-climatic conditions, and having good market demand, can reduce risks even as it ensures reasonable economies of scale.
- The ABSSS vegetable cultivation initiative followed intensive soil and water conservation (SWC) and some water resource development (WRD) efforts taken under the SDTT-supported project, which led to increase in water availability, and thereby paved the way for sustainable vegetable cultivation. **It is the combination of SWC, WRD and vegetable cultivation that is required in Bundelkhand**, as otherwise intensive vegetable cultivation could lead to short-term benefits but long-term loss, in terms of drastic depletion of water resources (as has happened in Niwari block of Tikamgarh district).
- The **use of Beejamrut, Jeevamrut, Ghan Jeevamrut, Agni-aashtra, Bramha-aashtra, Neemaashtra and natural pest management and allied formulations, in place of chemical fertilizers, is notable**. All farmers reported that they had got better quality of produce, without major pest/disease problems. However, some use of pesticides had to be done. Whether Jeevamrut+ FYM is adequate for sustained and remunerative yields is to be seen. In any case, efforts need to be made to improve the quality and quantity of locally produced FYM.



- Another point to be noted is that as vegetables have repeated production cycles after one sowing, **vegetable farmers could get returns despite unseasonal rains**, which almost completely destroyed the production of main Rabi crops. Hence, vegetable cultivation may be recommended from a climate-change perspective also. However, it must be pointed out that most vegetables are highly sensitive to drought, extreme heat and

flooding conditions. Affect on vegetable production due to environmental stresses will depend on the plant's developmental stage and the length and severity of the stress.

- Lastly, it must be pointed out that vegetable cultivation is a viable and remunerative livelihood option in the Project area as it has **easy access to large markets**. The same condition is not available in many parts of Bundelkhand, particularly in interior areas of UP Bundelkhand, and in hilly/forested areas.



Appendix

Average cultivation cost and net returns per acre from main crops in Project area (as per value chain study done by Project in Nov 2012)

Particulars	Amount (Rs) per crop		
	Wheat	Soyabean	Urad
Cost of seeds	1188	800	253
Ploughing cost	1500	1000	1000
Cost of fertilizers	2620	1125	564
Cost of hired labour (for harvesting etc)	1200	1800	1700
Irrigation cost	1800	0	0
Cost of crop mgmt chemicals	0	0	0
Threshing cost	500	500	300
Total cost with purchased seed	8808	5225	3817
Total cost with own seed	7620	4425	3564
Gross production value	9375	7605	4200
Net returns with purchased seed and hired labour	567	2380	383
Net returns with own seed and hired labour	1755	3180	636
Net returns with own seed and own labour	2955	4980	2336

Average cost parameters per crop, per acre

Cost parameter	Amount per crop		
	Wheat	Soyabean	Urad
Seed quantity used (kg)	60	40	8
Seed cost (Rs/kg)	19.80	20	31
DAP used (kg)	100	50	25
Urea used (kg)	50	0	0

Average gross value parameters per crop, per acre

Parameters	Amount per crop		
	Wheat	Soyabean	Urad
Production (kg/acre)*	625	390	210
Selling price (Rs/kg)	12 + 3 (fodder)	19.50	22

*As per data of Crop Production Statistics Information System, Ministry of Agriculture, GOI, average per acre yield of wheat, soyabean and urad in Tikamgarh district is 540 kg, 370kg and 84 kg respectively.

