Bundelkhand Rural Poverty Alleviation Model (BRPAM) – ABSSS

Vegetable production by small farmers with subsidized drip-irrigation systems: benefits and implications

Tikamgarh block, Tikamgarh district, MP
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Executive Summary

Under the Bundelkhand Rural Poverty Alleviation Model (BRPAM) development Project in Tikamgarh block of Tikamgarh district, MP, Akhil Bhartiya Samaj Sewa Sansthan (ABSSS) encouraged small and marginal farmers, particularly of SC/ST groups, to take up vegetable production on a small but commercial scale.

The Project also motivated 38 families to take advantage of a state government subsidy-scheme and invest in drip irrigation systems for small-plot vegetable cultivation. The present study is aimed at understanding the benefits and implications of subsidized drip irrigation for vegetable cultivation by small and marginal farmers.

The study was conducted through focused group discussions (FGDs) and intensive survey. Actual area under vegetable crop, with drip irrigation, and actual production of each vegetable from each plot, from September 2013 (when drip systems began to be installed) till June 2014 were tracked. The quantum of vegetable sold in markets, as also price obtained, was also recorded.

Of the total 6823 acres of cultivable land in the 20 villages covered intensively by the Project, around 80% is sown in the kharif season, and around 70% is sown in the rabi season. Area under cereals and oilseeds is almost the same and together these two crop categories account for nearly 70% of the gross cropped area, followed by pulses (around 25% of area). Vegetables account for only 4% of gross cropped area. Chilli, tomato and brinjal account for two-thirds of the area under commercial vegetable-cultivation.

Analysis of data obtained from KVK Tikamgarh shows that vegetables account for only 4% of total cropped area in the district. Yields of most major vegetables in Tikamgarh are comparable with average MP and India yields.

The 38 families who chose to install drip irrigation systems for vegetable cultivation were beneficiaries of a government assistance-scheme for a maximum area of 0.5ha. The cost of a drip-irrigation system for this unit of land is Rs 70,710, as per MP government rates. The quantum of government subsidy is Rs 56,566 (80% of total cost); the remaining Rs 14,144 has to be paid by the farmer

Despite the high subsidy, no farmer in the Project area availed of the scheme till Project intervention, for the following reasons:

- Few farmers were not aware of the scheme.
- The contribution of Rs 14,000 was considered risky, as the benefits of drip irrigation had not been established in the Project area.

Under the above circumstances, ABSSS held many farmer meetings, to inform target group families about the government scheme, and encourage them to take its benefit. Farmers were urged to undertake commercial-scale vegetable cultivation on a plot size of half an acre (2000 sqm). To establish benefits of drip irrigation, ABSSS offered to pay

100% of farmer's contribution, through Project funding, to interested farmers selected by SHGs and farmer's groups. In this way, 13 farmers were initially supported towards the beginning of rabi 2013 for vegetable cultivation on half-acre plots. Subsequently, after the benefits of drip irrigation became clear, the Project support to farmers was reduced, to Rs 9000 for SC/ST farmers, and Rs 5000 for OBC farmers.

All participating farmers, as well as some other target-group farmers who were motivated to do vegetable cultivation, were given inputs including quality seeds, seed treatment materials, crop management chemicals and some fertilizers. The Project has been promoting use of **Beejamrut, Jeevamrut, Ghanbeejamrut, Aagneyaashatra & Saptdhanankur** and all participating farmers were encouraged to produce Jeevamrut and use it, through the drip irrigation system.

Most of the drip-irrigation beneficiaries started vegetable cultivation in October-November 2013 (three beneficiaries subsequently chose to cultivate wheat rather than vegetables). All the beneficiaries were doing commercial-scale vegetable cultivation for the first time. Crops were damaged in December 2013, due to unseasonal rains. But even with these limitations, the net income from vegetable cultivation with drip irrigation was attractive, compared to net income from other crops, and income that could have been got through equivalent wage labour. There were also other significant benefits reported by farmers.

Nevertheless, heavily subsidized drip irrigation is not a complete solution for addressing income-poverty of small and marginal farmers. The subsidy implicitly favours farmers owning wells, having large households, and a tradition of growing vegetables. Subsidized drip irrigation cannot be a substitute to investment in water-resource development for the benefit of poor farmers. That said, even without using subsidized drip irrigation, vegetable cultivation is a remunerative livelihood option for small farmers in the Project area who have access to water.

Bhagwat Prasad
Director

Introduction

Akhil Bhartiya Samaj Sewa Sansthan (ABSSS) is implementing "Bundelkhand Rural Poverty Alleviation Model" (BRPAM) development Project in 40 villages of Tikamgarh block of Tikamgarh district, MP, with support from Sir Dorabji Tata Trust and Allied Trust. Of the 40 villages, 20 are selected for intensive intervention.

The goal of the Project is to:

"Enhance the livelihood security and wellbeing of marginalised poor and women through sustainable natural resource management & better access over rights & entitlements"

Specific objectives of the Project include:

- To form and build capacity of community organizations especially of women and marginalised social groups for democratic realisation of entitlements.
- To enhance participation, savings, role and decision-making power of women in household and community development.
- To enhance income & living standards of the people of target group from land and agriculture through scientific natural resource management and improved agricultural practices & animal husbandry

Towards realization of the third objective, the Project encouraged small and marginal farmers, particularly of 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 and fertilizers. The Project also motivated 38 families to take advantage of a state government subsidy-scheme and invest in drip irrigation systems for small-plot vegetable cultivation. The present study is aimed at understanding the benefits and implications of their choice.

Objectives of the study

The objectives of the study were:

- To estimate cost and non-cost implications of vegetable cultivation by small farmers with use of drip irrigation in the Project area
- To identify the factors that are likely to influence large-scale adoption of drip irrigation for vegetable cultivation by farmers in the Project area

Methodology

The study was conducted through focused group discussions (FGDs) and intensive survey. FGDs were conducted with groups of beneficiaries and in-depth discussions were held separately with women members of beneficiary families. Socioeconomic data of all beneficiary families was obtained through a survey. Actual area under vegetable crop with drip irrigation, and actual production of each vegetable from each plot, from September 2013 (when drip systems began to be installed, and planting was started) till

June 15, 2014 (when most farmers had removed their vegetable plants) were recorded using farmer diaries, maintained with the help of Project field workers. The quantum of vegetable sold in markets, as also price obtained, were also recorded. All data was analysed and results of the analysis were discussed internally. As necessary, data was re-collected and re-analysed. Total input cost, including monetary value of household labour, was separately estimated. Thereafter net returns per farmer were calculated. The entire effort was conducted under the guidance of a development communications professional.

Structure of report

The report is organized as follows:

- Section 1 provides an overview of the Project area, with focus on crop cultivation.
- Section 2 provides an overview of vegetable cultivation in the Project region.
- Section 3 explains the rationale for promotion of vegetable-cultivation with drip irrigation by the Project; details of the government subsidy scheme availed; details of the drip systems installed; mobilization process, and support provided.
- Section 4 provides an analysis of net returns earned by farmers and other benefits reported by them.
- Section 5 discusses conclusions of the study.

1. Project area

The 20 villages 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, which is the headquarters of the district.

Topography and geology
Tikamgarh district lies in the Bundelkhand plateau between Jamuni, a tributary of Betwa, and Dhasan rivers, in the northern part of MP. The northern part of Tikamgarh district is at height of about 200m above the mean sea level (amsl), while the southern part is at a height of around 300m. Thus, the district's topography is marked by a gentle slope from south towards north. The substratum of the entire district is composed of Bundelkhand granite and gneisses, which are profusely intruded by quartz reefs and pegmatites.

Soils
Soils derived from parent rocks are of four types:

- coarse-grained reddish brown soils known locally as Rakar
- coarse-grained grey to greyish brown soils known as Parua
- clay loam black soils known as Kabar
- clayey-black soils known as Mar

Around 75% of the soil found in the district and the Project villages is of the Parua or Rakar variety. Soil tests conducted in the Project villages show that soil has normal pH and EC, low to medium organic-carbon content, low phosphorous content and low to medium potash content.

Climate
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 by Tikamgarh district is 1057.1 mm. Maximum rainfall (about 90%) is received during southwest-monsoon period from June to September. The 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 (Table 1.1) for 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. Highest rainfall generally falls in June-July. Due to the sloping topography, and the granite substratum, most of the water is lost in runoff.

Table 1.1: Rainfall data for 12 years

No	Year	Rainfall in mm in month (1-12)												Total mm
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	
1	2002	0	0	0	0.4	8	101	1	602.9	67.3	0	4.5	0	785.1
2	2003	0	24.2	0	0	0	98.8	213.8	172.4	444	0	0	5	958.2
3	2004	2.5	0	0	0	14	119	114.2	424	53	35	0	0	761.7
4	2005	0	0	27.4	0	0	38	556	74	111	0	0	0	806.4
5	2006	0	0	80	0	12	8.4	516.6	160.6	45	19.4	0	0	842
6	2007	0	44	10	0	6	12.1	64.9	134	60	0	0	2	333
7	2008	0	0	0	0	2	754	262	313	57	13	5	0	1406
8	2009	31	0	0	0	17	49	238	205	117	152	52	4	865
9	2010	0	34	0	0	0	15	201	191	157.01	16	13	0	627
10	2011	0	4	0	0	8	606	299	305	207	0	0	0	1429
11	2012	7	0	0	9	0	27	461	404	69	0	0	0	977
12	2013	0	86	7	0	0	170	620	476	5	81	NA	NA	1445

Land use

Tikamgarh is a predominantly rural district with urban population restricted to 30% of total population. Data on land use in Tikamgarh block reported in the 2006-07 *District Statistical Handbook* shows that nearly 60% of the land is cultivated, and of this, over 50% is under double cropping. Only 5% of the land is under different categories of forestland.

Demographics

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. The main SC groups are: Ahirwar, Vanshkar, Chadar and Khangar. The main ST groups are Saur and Gond. The main OBC groups are: Lodhi, Yadav, Kushwaha, Vishwakarma, Rai, Sahu, Raikwar, Napit and Patel. The general population (less than 1% of total) consists of a few Thakur, Jain and Brahmin families.

Half the villages have a significant ST population, and in 3 villages (Sapon, Sauryana, Basiyan Khera) and Haidarpur adivasi basti, the ST population is predominant.

Land ownership

Barring 6% of the total families in the 20 villages, all families own some agricultural land. However, 44% of the total 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. An in-depth survey of 100 HHs done under the Project showed a clear relation between social category and land owned, as average land owned by OBC HHs is 3.9 acres, while it is 2.8 acres for SC and ST HHs (however, SC HHs have on average encroached on 2.7 acres of forestland, for which they had not got pattas, at the time of the survey).

Irrigation

Groundwater tapped through dug wells is the main source of irrigation in the entire Tikamgarh district, and the situation is the same in the 20 Project villages. Of the total 6823 acres of cultivable land, 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.

Cropping pattern

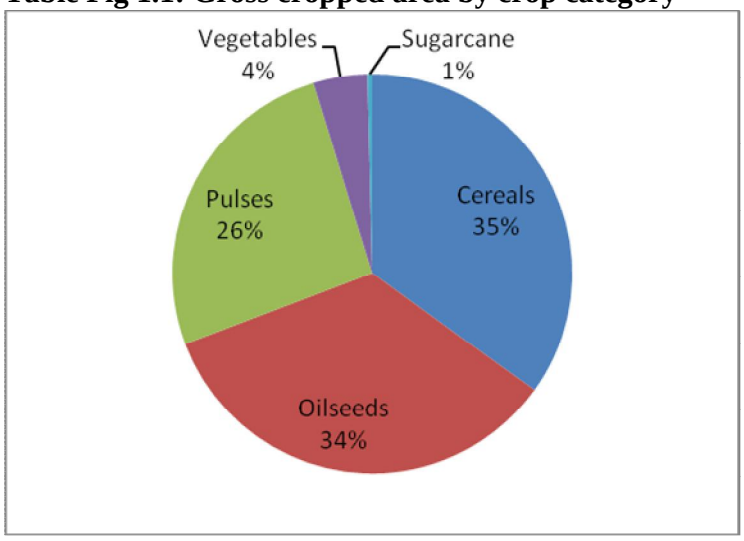
Of the total 6823 acres of cultivable land in the 20 villages, around 80% is sown in the Kharif season, and around 70% is sown in the Rabi season. Around 38% of the cultivable land is double-cropped, compared to the district average of 50%. A tiny part of the land is under cultivation in summer under some vegetable crops. Table 1.2 shows the cultivated area by season.

Table 1.2: Cultivated area by season (2012-13)

Category	Cultivated area (acres)
Kharif season crops	5485
Rabi season crops	4919
Both season crop (sugarcane)	43
Seasonal vegetables	478
Gross cultivated area	10925

Looking at the gross cropped area by category of crop (Fig 1.1), we see that area under cereals and oilseeds is almost the same and together these two crop categories account for nearly 70% of the gross cropped area, followed by pulses (around 25% of area). Vegetables account for only 4% of gross cropped area.

Table Fig 1.1: Gross cropped area by crop category



Major crops

Wheat, soyabean, and urad are the major crops, as shown in Table 1.3, accounting for 60% of the gross cropped area, with wheat occupying 26% of the area, followed by soyabean (19%) and urad (17%). While almost all households cultivate wheat, two-thirds of households cultivate urad and soyabean. The average area under cultivation per household for each of these crops is 1 to 1.3 acres.

Table 1.3: Major crops (2012-13)

Crop	Cultivated area (acres)	No. of cultivating households	Common seed varieties Cultivated
Wheat	2805	2525	Lok-1, WH
Soyabean	2082	1622	JS-335, JS-9305
Urad	1849	1881	"Kala"
Total	6736		

Minor crops

Excluding vegetable crops, a variety of minor crops are grown. The important minor crops, accounting for over 5% of gross cultivated area, are mustard, til and paddy. Mustard is grown in small patches or intercropped with gram by 44% of households. Til is also grown by an equal proportion of households in Kharif in area of around 0.7 acres per household. Paddy is cultivated by around 23% households. Mung, barley and gram are grown by 15-20% households in small patches. Mung and lentil is usually grown along plot boundaries. Area under cultivation of minor crops per household is less than 1 acre per crop. The commonly grown seed varieties of mustard and til are local ones.

Vegetable crops

Around one-fourth of households cultivate vegetables in kitchen gardens and/or parts of their land. As shown in Table 1.4, the major kitchen garden vegetables are tomato, brinjal, bottle gourd, pumpkin and bhindi (lady's finger). In addition, a few families grow coriander and cucumber. Seeds are generally obtained from the previous season's produce or other farmers. A few farmers buy labeled seeds in packets.

Table 1.4: Vegetables cultivated in kitchen gardens/household plots

Vegetables	No. of cultivating Households (2012-13)
Tomato	527
Brinjal	173
Bottle gourd	143
Chilli	103
Pumpkin	98
Okra (Bhindi)	35

Most of these vegetables, along with potato, onion and arbi are grown for sale, 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.

Table 1.5: Vegetables cultivated on commercial scale (2012-13)

Vegetables	Sown area (acres)	No. of cultivating households
Chilli	132	181
Tomato	106	269
Brinjal	81	205
Potato	70	224
Onion	42	22
Arbi	16	48
Bhindi	9	20
Coriander	5	15
Others	17	35
Total	477	

Income sources

An in-depth study of 100 HHs revealed that almost all HHs do agriculture but it clearly does not meet needs, as over 80% of HHs also do wage labour. Around half the HHs are engaged in collection and sale of NTFP or fruits (primarily ber, which is found in the wild in large volume in the project area). Only a fourth of HHs are engaged in livestock rearing as a livelihood activity, though the majority of HHs own some livestock. Over one-third of HHs have at least one family member who migrates, usually for 6-9 months, to seek wage labour outside the Project area. The proportion increases in drought years.

Infrastructure

The Project villages are well-connected by road. Electricity is available in almost all villages, but supply is erratic. Weekly markets near villages are the main outlets for sale and purchase of produce and inputs. Near the Project area there are two large villages, Laar and Badagaon, with traders for all crops, horticultural produce, livestock products, agriculture inputs and domestic animals.

2. Vegetable production in the region

Agriculture and allied services account for 44% of the Madhya Pradesh's GDP and 78% of state's total workforce is directly engaged in agriculture. Nearly half the total geographic area is cultivated. But only around 4% of the cultivated area is under horticulture crops and the state accounts for barely 3% of the horticulture production in the country[1]. Details of the major horticulture crops of MP are given in Table 2.1

Table 2.1: Production summary of major horticulture crops in MP[2]

Crop	Area (million ha)	Production (million tonnes)	Major production districts
Potato	0.06	0.74	Sidhi, Satna, Rewa, Raigarh, Sagar and Tikamgarh
Onion	0.06	1.02	Khargone and Khandwa
Peas	0.02	0.25	Ujjain
Brinjal	0.02	0.28	-
Guava	0.01	0.28	Rewa and Jabalpur
Papaya	0.002	0.28	Dhar, Khandwa, Ratlam and Guna
Banana	0.04	1.72	Burhanpur, Barwani and Dhar
Orange (Mandarin)	0.04	0.68	Chhindwada, Mandsaur, Betul, Ujjain and Shajapur
Spices	0.29	0.41	-

Districts of the state covered under the National Horticulture Mission are: Betul, Bhopal, Hoshangabad, Sagar, Jabalpur, Ujjain, Jhabua, Dewas, Indore, Chhindwara, Mandsaur, Shajapur, Badwani, Ratlam, Burhanpur, Dhar, Khargone , Khandwa Mandla, Dindori, Chhatarpur, Harda, Rewa, Gwalior, Rajgarh, Neemach, Satna, Guna, Sehore, Sidhi, Alirajpur, Singroli, Ashoknagar, and Vidisha.

Vegetable production in Tikamgarh district

Analysis of data obtained from KVK Tikamgarh shows that vegetables account for only 4% of total cropped area in the district (the data broadly matches the data obtained by us for the Project area, and shown in Fig 1.1). Area under vegetables increases in good rainfall years, but the proportion to total area cultivated remains roughly the same.

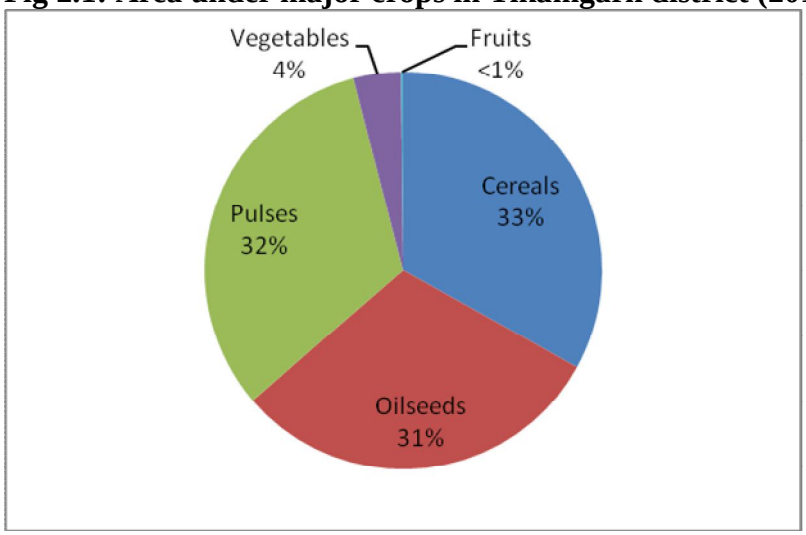
Fig 2.2 shows that garden pea is the main vegetables grown in the district. (However, as shown earlier in Table 1.5, chilli, tomato, brinjal and potato are the main vegetable crops grown in the Project area, with negligible area under garden pea). Average yields (t/ha)

[1] Report of the Joint Inspection Team for reviewing progress of National Horticulture Mission Progress in MP, May 2013

[2] ibid

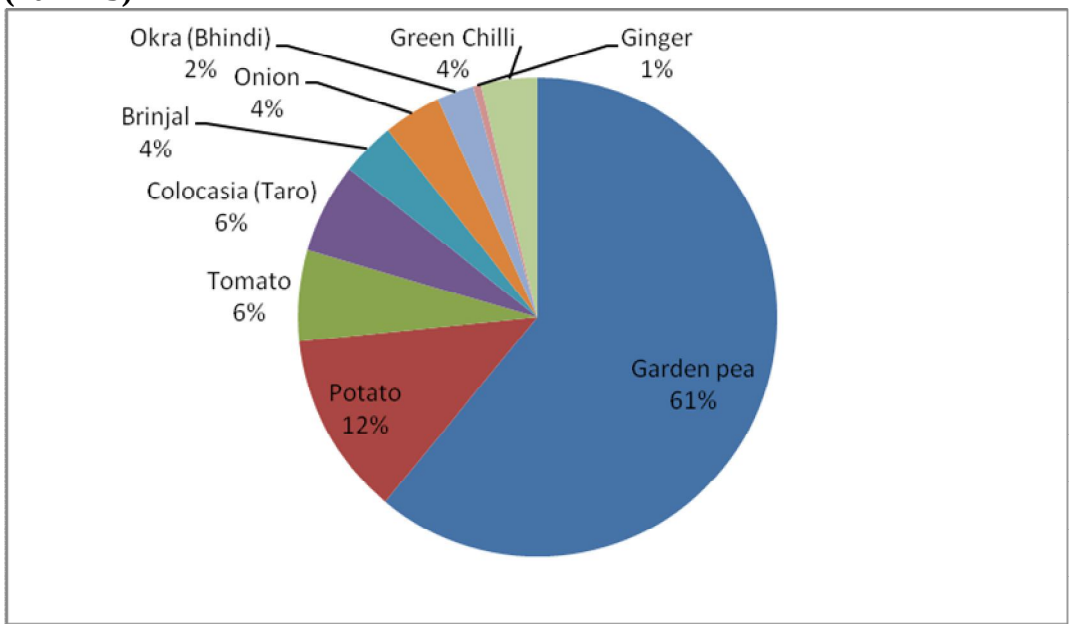
for all vegetables grown in the district, with comparison figures for MP and India, are shown in Table 2.2. It can be seen that yields of most major vegetables in Tikamgarh are comparable with average MP and India yields. However, yield of brinjal in Tikamgarh is significantly higher than MP and India yields.

Fig 2.1: Area under major crops in Tikamgarh district (2010-11)



Source: KVK, Tikamgarh

Fig 2.2: Breakup of area under vegetable crops and spices in Tikamgarh district (2012-13)



Source: KVK, Tikamgarh

Table 2.2: Productivity (t/ha) of main vegetable crops

Crop	Avg yield in T'grh	Avg yield in MP	Avg yield in India
Garden pea	7-9	11	10
Potato	17-20	20.6	22.7
Tomato	18-20	15	19
Colocasia	18-20	NA	NA
Brinjal	21-22	12-15	17.5
Onion	22-28	22.2	16.1
Okra	16-19	NA	11.6
Green Chilli	6-8	NA	8.6

Sources: Tikamgarh yields (for 2010-11 and 2012-13) are from KVK Tikamgarh; MP and India yields are from *Vegetable Statistics*, 2013, Technical Bulletin no 51, Varanasi: Indian Council of Agriculture Research.

3. Promotion of vegetable production by small farmers, with drip irrigation

In tune with its objectives the BRAP Project promoted vegetable production by small farmers for the following reasons:

- Compared to cultivation of staple crops, vegetable production gives very good returns. For example, 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 4200 respectively. 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.
- 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.
- 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 is available for vegetable cultivation.
- There are two markets in the Project area, and Tikamgarh town, at a distance of 20-40km from Project villages is also easily accessible by road. Thus, farmers would not face difficulty selling vegetable produce.

Hence, the Project encouraged 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 and fertilizers. Around 50 families were 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 drip irrigation systems for vegetable cultivation. Following good returns obtained by them, 14 farmers also decided to take advantage of the government scheme for drip irrigation. As a result, around 17 acres have been brought under drip irrigation in the Project area for the first time.

Salient features of Govt scheme for promotion of drip irrigation

The families who have installed drip irrigation systems in fields are beneficiaries of a centrally sponsored scheme on micro irrigation, launched in 2005-06, and implemented by the MP state government as follows:

- The scheme is implemented in 50 districts of the state, including 34 districts covered under the National Horticulture Mission.
- For a maximum area of 5ha per beneficiary family, the scheme provides 40% of the cost of drip and sprinkler irrigation systems through central funding; 30% of the cost is met by the state government (40% in case of SC/ST beneficiaries) and the rest is to be borne by beneficiaries.
- For a maximum area of 0.5ha per family, 75% assistance is provided entirely through central government funding.

The declared objectives of the scheme are:

- Increase in crop productivity
- Improvement in quality of agriculture produce
- Conservation of water and sustainable use of water
- Higher energy efficiency in agriculture sector
- Higher fertilizer-use efficiency and reduced use of fertilizers
- Savings in power consumption
- Savings in labour expenses
- Empowering farmers with improved technological packages, including new growing methods; and irrigation, furtigation and crop management practices to overcome unpredictable conditions.

The use of micro irrigation systems is expected to increase yields by 20%-40%, and lead to 20%-60% saving in water, and 30%-50% saving in fertilizers. It is also expected to reduce incidence of pests and diseases, and need for weeding.

The crops to be covered by the scheme include fruits like mango, aonla and banana; vegetables; flowers; medicinal and aromatic crops; and some other crops.

The Project-area beneficiaries are beneficiaries of the assistance-scheme for a maximum area of 0.5ha. The cost of a drip-irrigation system for this unit of land is Rs 70,710, as per MP government rates. The quantum of government subsidy is Rs 56,566 (80% of total cost); the remaining Rs 14,144 has to be paid by the farmer.

The process of getting benefit of the scheme is as follows:

- Interested farmers have to submit a form to the District Micro Irrigation Committee, along with documents proving ownership and location of land, and social-group (SC/ST/OBC) status.
- After scrutiny of applications, the District Committee announces the list of beneficiaries, who have to the deposit their beneficiary contribution in a specified bank account of the Committee. The drip system is then installed in the farmer's field.

In Tikamgarh, the entire process from application to installation generally takes less than a month.

Only selected, pre-approved drip systems qualify for the subsidy, and beneficiaries have no say in choice of manufacturer or type of system. The sales representatives of the manufacturers themselves contact farmers whose applications have been approved, and the representatives arrange for installation of the drip systems in farmers' plots at their own cost. It is quite clear that the drip-system manufacturers are themselves major "beneficiaries" of the government subsidy: the more drip systems they install, the more money they earn.

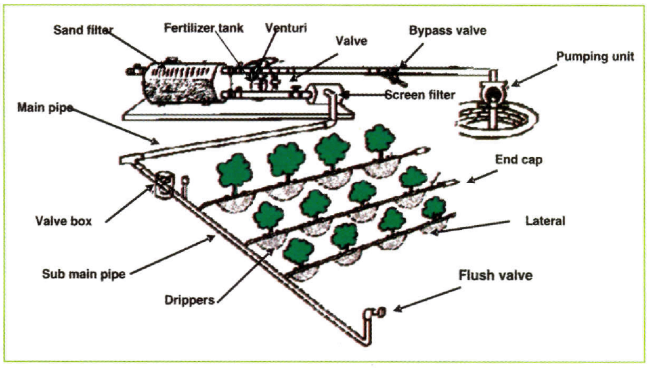
Components of drip irrigation system

The drip irrigation system installed in a farmer's plot comprises the following components (see figure 3.1):

- The "header assembly" including a controller ("bypass") valve; a venturi tube to reduce pressure of water and increase its velocity, and a backflow preventer ("non-return" or "backwash" valve). The bypass valve is used to control water pressure and speed of water flow.
- A small tank for mixing soluble fertilizers in water.
- Sand separator (hydrocyclone filter) to remove silt, sand from water; sand filter to remove organic impurities like algae, trash and leaves; and screen filter to remove physical impurities from water.
- Polyethylene, UV-stabilized main pipe and submain pipe.
- Lateral emission tubes, laid out in parallel rows across the plot.
- Drippers in tubes, which can be inserted at different locations, and are designed to prevent entry of mud into tube.
- End caps of lateral tubes and flush valve at the end of submain.

Generally, the header assembly is close to the pumped source of water, which is invariably an open well, as shown in the figure 3.1. The main components (header assembly, with tank and filters) are shown in Pic 3.1.

Fig 3.1: Components of drip irrigation system




Pic 3.1: Main components of the drip irrigation system (before installation of main pipe and emission tubes)

Under the micro irrigation scheme in MP, it is the representatives of approved drip-system manufacturers who decide the layout of the system in a farmer's plot, according to dimensions of the plot, and crop to be irrigated.


Mobilization of farmers

Despite the high subsidy for drip irrigation, no farmer in the Project area availed of the scheme till Project intervention, for the following reasons:

- Few farmers were aware of the scheme.
- The contribution of Rs 14,000 was considered risky, as the benefits of drip irrigation had not been established in the Project area.

Under the above circumstances, ABSSS held many farmer meetings, to inform target group families about the government scheme, and encourage them to take its benefit. Farmers were urged to undertake commercial-scale vegetable cultivation on a plot size of half an acre (2000 sqm). To establish benefits of drip irrigation, ABSSS initially offered to pay 100% of farmer's contribution (Rs 14,000), through Project funding, to interested farmers selected by SHGs and farmer's groups. In this way, 13 farmers were initially supported towards the start of rabi 2013 for vegetable cultivation one half-acre plots. It was seen that despite Project support, marginal farmers were generally not keen to go in for vegetable cultivation; they were more keen on using their limited land for cultivation of foodgrains, and ensure food security.

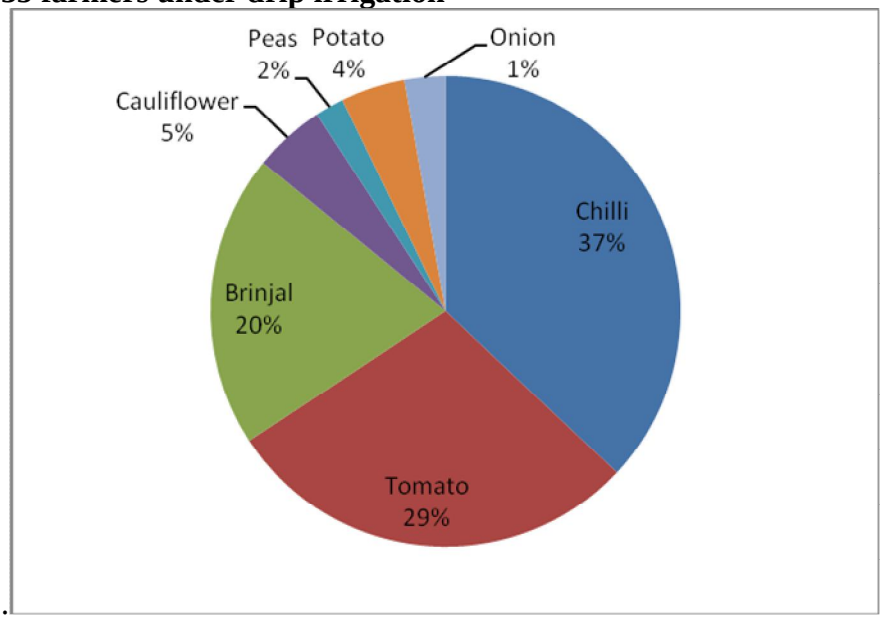
After the benefits of drip irrigation became clear, and farmers came forward on their own, the Project support to farmers was reduced, to Rs 9000 for SC/ST farmers, and Rs 5000 for OBC farmers. Including the 13 farmers who had to pay no money for the drip irrigation system, the average contribution of the selected farmers for the drip irrigation system was around Rs 3600.

Project support was given through SHG/kisan samiti meetings, after gauging 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 in rabi 2013. In all cases, the recommended unit of cultivation was half an acre, but farmers started vegetable cultivation in an average area of around 1400 sqm (35% of an acre); they may increase the area in future. One farmer has done vegetable cultivation in an area of one acre. Three farmers opted out of vegetable cultivation as they found it too labour-intensive; they chose to cultivate wheat instead.

Of the 35 vegetable-cultivating farmers, 25 belong to SC groups and 3 belong to ST groups. Over 70% are marginal and small farmers. Almost all farmers own cattle, with an average of 3.6 large animals (cows, bulls, buffaloes) per family, and 70% own cows. But only 25% produce FYM in sizable quantity.

Fig 3.2: Percentage area under different vegetable crops (June 2014) in total area of 35 farmers under drip irrigation



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Choice of vegetables

Considering market demand, and the main vegetables being already grown in the Project area (Table 1.5), the range of vegetables promoted by the Project was generally limited to chilli, tomato, and brinjal. However, some families also grew peas, potato, cauliflower and onion on a small scale. Fig 3.2 shows the area under different vegetable crops in total area of 35 farmers under vegetable cultivation with drip irrigation. As can be seen chilli, tomato and brinjal accounted for 86% of the total vegetable area.

Input and technical support

All participating farmers were given quality (packed) seeds of well-known and locally available varieties, for choice of vegetable decided by them in consultation with Project staff.

Farmers were given chemicals for seed treatment. They were given on-field guidance on sowing, transplanting and staking.

The Project has been promoting use of **Organic Farming i.e. Beejamrut, Jeevamrut, Ghanbeejamrut, Aagneyaashatra & Saptdhanankur**, and all participating farmers were encouraged to produce Jeevamrut (Pic 3.2) and use it, through the drip irrigation system. A few 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.

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Pic 3.2: Preparation of Jeevamrut & other Organic inputs

Farmers used their own or purchased FYM. Some farmers were provided with urea, DAP and/or Potash, on assessment of crop growth by the Project's agriculture resource person. As required, farmers were given crop management chemicals with Project support.

Farmers had to incur paid-out costs only for ploughing and application of FYM. Cost incurred on electricity, to pump water from wells and feed into the drip irrigation system, was nominal. (In MP, farmers using electric pumps have to pay a flat electricity cost for the cropping season; the cost is low and spread over several crops).

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 in retail market. 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, plant protection and sale of produce in market.

Vegetable production by small farmers with subsidized drip irrigation: ABSSS, Tikamgarh, June 2014

Pics 3.3 & 3.4: Harvested produce and (below) sale in local market

4. Net income and other benefits

Most of the drip-irrigation beneficiaries started vegetable cultivation in October-November 2013. All the beneficiaries were doing commercial-scale vegetable cultivation for the first time. Crops were damaged in December 2013, due to unseasonal rains. But even with these limitations, the net income from vegetable cultivation with drip irrigation was attractive. There were also other significant benefits reported by farmers.

Net income

Net income got by 35 drip-irrigation beneficiaries supported by the Project was calculated as follows:

- Cultivation and production data, till June 15, 2014, was collected from all beneficiary-farmers, through farmer diaries updated weekly. Details of farmers, and their cultivation area and production for the three main vegetable crops are given in Appendix 1.
- Costs of cultivation, **including market value of household labour**, were first calculated on a per acre basis; these costs for the three main vegetable crops (chilli, tomato and brinjal) are shown in Appendix 2. Subsequently, costs of cultivation per farmer, per vegetable crop, were estimated, on the basis of sown area per vegetable. (It must be noted that **costs so derived are higher than what farmers actually incurred and what the Project spent**, but they have been used for net-income calculations as they match NABARD estimates, and enable comparison).
- Gross income was calculated on the basis of actual prices obtained for vegetables sold in the local market by beneficiaries (average Rs 22/kg for chilli, Rs 10/kg for tomato, Rs 8/kg for brinjal);
- Actual sale income per farmer, per vegetable crop was obtained through farmer diaries updated weekly.
- Net income per farmer, per crop, was derived by deducting cost of cultivation from gross income.

A summary of data obtained as per above parameters is shown in Table 4.1. From the data we can observe that:

- Despite limitations mentioned earlier, and ignoring value of produce used for home consumption, farmers got net income of around Rs 450,000 from a total area of around 5ha (48,682 sqm), or **net income at the rate of around Rs 92,500/ha, which was 8 times the average net returns from cultivation of wheat (Rs 11,200/ha) obtained in the Project area**
- Return @ Rs 92,500/ha was obtained although yield of tomato was affected by unseasonal rains and was much less than the Tikamgarh average (13t/ha against Tikamgarh average of 18t/ha) and yield of many chilli growers was also similarly affected. It can be thus reasonably stated that **average net returns in the rabi season, in normal weather conditions, with average yields, and at current vegetable-selling prices, would be at a rate around Rs 125,000/ha, or Rs 50,000 per acre**. Through careful crop management, at least 2 of the 35 beneficiary farmers got much higher returns, @ above Rs 250,000/ha. Higher returns can be also obtained

through cultivation of vegetables in kharif and through simple value-addition. For example, by drying, storing and then selling chilli, 3 farmers got additional income of Rs 15,000 @ Rs 100/kg of dried chilli.

- The average net income per farmer from average vegetable plot of only 1400 sqm was Rs 12,868, which was close to the amount payable for the drip irrigation system (Rs 14,000). One can thus reasonably say that **the investment for subsidized drip irrigation in 0.5ha plots can be recovered in the first year itself**, if vegetable cultivation is done on area of around 2000 sqm (0.2ha).

Table 4.1: Net income (Rs) from vegetable cultivation of 35 beneficiary farmers (Oct 2013-June 2014)

A	B	C	D	E	F	G	H
S no	**Vegetable**	**Area (sqm)**	**Prod. (kg)**	**Gross income (Rs)**	**Cost of cultivation, including labour (Rs)**	**Net Income (E-F)**	**Return on Investment (%)**
1	Chilli	18,003	10,967	245,047	119,720	125,327	4.7
2	Tomato	14,011	18,677	198,174	85,467	112,707	31.9
3	Brinjal	9784	27,762	219,185	52,589	166,596	216.8
4	Cauliflower	2394	1180	15,145	14,384	761	-94.7
5	Peas	966	234	4820	5804	-984	-116.9
6	Potato	2153	2689	41,190	13,779	27,411	98.6
7	Onion	1371	2675	27,345	8774	18,571	111.7
8	**TOTAL**	**48,682**	**64,184**	**750,906**	**300,517**	**450,389**	**49.9**

- On an average, the household-labour put in by farmers amounted to around 80 person-days. The **average net return of Rs 12, 868 was marginally higher than what farmers could have obtained from equivalent days of wage labour** (Rs 150* 80 days= Rs 12,000).

Not surprisingly, many beneficiaries reported that they have decided to concentrate on vegetable-cultivation, leaving aside wage-labour opportunities, which are anyway not available regularly. Some farmers also reported that they would be investing in construction of a hut near their vegetable plot, so that they could take care of the plants better.

One beneficiary, Hariram Namdev (Pic 4.1) of Nainvari village, has taken the biggest step forward. A tailor owning only two acres of land, of which only acre is irrigated; he has invested for a full acre of horticulture-production. For this purpose, he first bought a diesel pumpset for Rs 20,000, to draw water from a well at one end of his plot. Subsequently, he invested nearly Rs 20,000 for field preparation, including application of FYM. In the 1-acre plot, which is covered by a subsidized drip-irrigation system, he planted vegetables in five bands: potato (425 sqm), tomato (700 sqm), brinjal (780 sqm), chilli (600 sqm) and peas (380sqm). Additionally, he planted 46 pomegranate saplings, 5 mango saplings, 5 aonla saplings, 12 guava saplings, 9 saplings of karonda and 22

saplings of lime. He expects to get annual net income of at least Rs 100,000. (Earlier, working as a tailor, he says he "never got to see Rs 10,000 in a month").

Pic 4.1: Hariram Namdev, tailor turned vegetable farmer

Other benefits

Farmers reported several other benefits of using drip-irrigation, as follows:

- There was tremendous saving in water. Farmers estimated that if they had used the conventional flood irrigation system to water their vegetable plots, they would have used six times more water.
- Due to saving in water, there was less chance of crop failure. Farmers could think of expanding the area under irrigation and crop production in summer.
- The use of the drip system led to reduced incidence of disease, reduced damage by insects, and reduced weed growth (Pic 4.3).
- The average brinjal yield of farmers (28.4 t/ha) was significantly higher than the average brinjal yield in Tikamgarh district (22 t/ha). Some farmers also got tomato and chilli yields much higher than the district average.
- Farmers reported better quality of produce, and better price realization. Some farmers said this was mainly because Jeevamrut was mixed with irrigation water, leading to vegetables having a "natural shine" and "better taste".
- The ease of irrigation led to savings in time and labour.
- Water was distributed evenly across the field, and there was less soil erosion.

Issues of concern

Along with the above-mentioned benefits, some issues of concern emerged from our analysis, as follows:

- There was wide variation in yields. For example, yields of chilli varied from less than 3 t/ha to over 15 t/ha; yields of tomato and brinjal varied from less than 10 t/ha to over 40 t/ha.
- Due to low yields, 3 farmers got negative returns and 2 farmers got net income of less than Rs 5,000, though all these farmers had over 1000 sqm under vegetables. On the other hand, 12 farmers got net income of over Rs 15,000.

The above facts strongly indicate **that introduction of drip irrigation system for small farmers, and/or input support to them for vegetable cultivation, has to be supported by organized group-learning, so that farmers can learn from those getting high yields**.

Pic 4.2: Chilli crop ready for taking to the local market

Pic 4:3: Drip-irrigated plots were marked by low incidence of weeds and soil erosion

Pic 4.4: Zilla Panchayat CEO and district horticulture officials observing beneficiary plot

Pic : Chilli & Brinjal crop ready for taking to the local market

Vegetable production by small farmers with subsidized drip irrigation: ABSSS, Tikamgarh, June 2014

Pic : Farmers use options to dry Chilli crop for extra income

5. Conclusions

Following the positive returns obtained by 35 beneficiary farmers, 14 farmers in the Project area applied for the government's subsidized drip irrigation system, without Project support. Analyzing data about the total number of 49 (35+14) drip-irrigation users, and the results obtained till June 15, 2014, we can reasonably identify the following as factors that will influence large-scale adoption of drip irrigation for vegetable production in the Project area, and similar areas:

Only farmers with wells will invest in drip irrigation

Installation of a drip system makes sense only when there is an assured source of water for most of the year. For this reason, farmers who do not have wells, who lift water from seasonal nallas, or who do rainfed cultivation only, are unlikely to invest in drip irrigation systems.

Farmers with large families are more likely to invest in heavily subsidized drip irrigation

Heavily subsidized drip irrigation is available only for plots of 0.5ha or less and on this much area it makes sense to grow only vegetables. Cultivation of vegetables is more labour intensive than cultivation of staple crops. Hence, small families with less than two adult working members are less likely to invest in heavily subsidized drip irrigation systems. This surmise is supported by data on 35 beneficiary farmers, which shows that most of them have four or more than four family members. To take advantage of the drip-irrigation subsidy, small families, women-headed households, or households with only aged persons, would have to do group farming.

Marginal and small farmers are unlikely to invest in drip systems without subsidy.

The cost of installing a drip irrigation system in a plot of 0.5ha is Rs 70,000, according to the cost worked out by the MP government. At this cost, and at prevalent vegetable yields and prices, farmers would require around two years recovering the investment through sale of vegetables from a 0.5ha plot. If the crop is affected by disease or unseasonal weather, or market prices crash, it would take longer to recover the investment. Small and marginal farmers are not likely to accept this gestation period and risk.

It is possible to get drip systems at a cost much lower than the MP government's approved cost, but these systems do not carry the label of being "certified" by the government. For these reasons, marginal and small farmers in the Project area are unlikely to invest in drip systems without the generous government subsidy.

Even with 80% subsidy, poor farmers are not likely to invest in drip systems.

Even with an 80% subsidy, farmers have to pay Rs 14,000 for the drip system. Poor farmers are likely to find this amount steep, and their capital investment is unlikely to be recovered in a year for the reason given below.

Marginal and small farmers are unlikely to initially install the drip system for cultivation of vegetables on an area of 0.5ha

Although the subsidy is available for a drip system over an area of 0.5ha, or 5000 sqm, it is seen that none of the 49 farmers are doing vegetable cultivation with drip irrigation over this much area. Only 9 farmers (20%) who have installed the system are doing vegetable cultivation on an area of 2000 sqm or more. There are two stated reasons for this: (i) Vegetable cultivation carries a higher risk than cultivation of staple crops. The per-unit cost of inputs is substantially higher, and whereas staple crops can be stored and consumed, vegetables have to be sold quickly, at whatever available price. Hence, small and marginal farmers do not want to take the risk of doing vegetable cultivation over a large area. (ii) For most small and marginal farmers, food security is the first priority. Though cultivation of food grains provides poor (or even nil) cash returns, small farmers are uncomfortable with the idea growing cash crops and using the money to buy food grains from the market.

For these reasons, 20 of the 49 farmers (40%) have only around 1000 sqm or less than 1000 sqm under vegetable cultivation. Net returns from this area, as indicated by our analysis in the previous section, would not help them recover their contribution of Rs 14,000 for the drip system in the first year.

However, if farmers get continuously high returns from vegetables, and enjoy assured availability of food grains at subsidized prices, they may allot a larger part of their land for cultivation of vegetables rather than food grains.

Farmers familiar with vegetable cultivation are more likely to invest in drip irrigation; some social groups are more likely to take advantage of the government subsidy than others.

Certain OBC groups have a tradition of growing vegetables for profit, and they have the required knowhow and confidence. On the other hand, SC and ST groups generally do not have such a background. As a result, they are less likely to take advantage of the government subsidy. In the Project area, the majority of farmers who took the government subsidy are from SC/ST groups, but this was only due to persistent and targeted mobilization-efforts by Project staff.

It can be thus concluded that heavily subsidized drip irrigation is not a complete solution for addressing income-poverty of small and marginal farmers. The subsidy favours farmers owning wells, having large households, and having a tradition of growing vegetables. Subsidized drip irrigation cannot be a substitute to investment in water-resource development for the benefit of poor farmers, and efforts to increase their expertise for sustainable production of food grains.

That said, it must be emphasized that **with or without investment in drip irrigation, but with investment in quality inputs, small-plot vegetable cultivation is a highly**

attractive option for small farmers in the Project area having assured supply of water. This can be seen from Table 5.1, which shows cultivation, production and net income data of 7 farmers in the Project area, who did not install drip irrigation, but had assured source of water and were given input support by the Project for growing vegetables in rabi of 2013-14. As can be seen, from a total area of around 1.1ha, the farmers got total net income of nearly Rs 106,000, and average net income per farmer from an average cultivated area of 1700 sqm was around Rs 15,000. This income is many times the income obtained from wheat (as stated in previous section), the main rabi crop, and higher than income obtainable from wage labour, which is not assured or regularly available.

Table 5.1: Net income (Rs) from vegetable cultivation of 7 farmers (Oct 2013-June 2014) who did not install drip irrigation system, but were given quality inputs by the Project

A	B	C	D	E	F	G	H
S no	**Vegetable**	**Area (sqm)**	**Prod. (kg)**	**Gross Income (Rs)**	**Cost of cultivation, including labour (Rs)**	**Net income (E-F)**	**Return on Investment (%)**
1	Chilli	5721	2904	96,025	38,045	57,980	52.4
2	Tomato	1640	2216	17,592	10,004	7,588	-24.1
3	Brinjal	1529	4329	40,630	8218	32,412	294.4
4	Cauliflower	342	145	1100	2055	-955	-146.5
5	Peas	1102	250	5300	6621	-1321	-120
6	Potato	733	875	8750	4691	4,059	-13.5
7	Onion	846	875	11,605	5414	6,191	14.4
8	TOTAL	11,913	11,594	181,002	75,048	105,954	40.7

Return on Investment (RoI) calculations shown in Table 4.1 and 5.1 show that income from vegetable cultivation can be maximized by focusing on a few vegetables like brinjal, onion and chilli. The basket of vegetables chosen for cultivation would have to be matched to market prices and weather conditions.

Appendix 1: Details of 35 farmers

S no	Name	Father's name	Social Group	Village	Area and production of 3 main vegetable crops					
					Chilli		Tomato		Brinjal	
					Area (sqm)	Prod. (kg)	Area (sqm)	Prod. (kg)	Area (sqm)	Prod. (kg)
1	Pushpa	Munna	SC	Gopalpura	599	360	500	358	200	650
2	Janaki	Doma	SC	Gopalpura	450	230	76	447	391	1263
3	Ganuwa	Doma	SC	Gopalpura	1270	470	397	262	396	900
4	Bhagwandas	Lampu	SC	Gopalpura	719	190	252	222	330	455
5	Dharamdas	Muluwa	SC	Gopalpura	364	131.5	270	78	308	250
6	Ganapat	Parma	SC	Gopalpura	945	340	243	225	351	628
7	Gorelal	Doma	SC	Gopalpura	360	368	219	319	380	1152
8	Ganapata	Nathuwa	SC	Gopalpura	1078	380	530	299	410	1073
9	Mathuwa	Nathuwa	SC	Gopalpura	144	20	108	60	120	80
10	Babulal	Bhulli	ST	MairiKhera	320	344	539	861	616	1604
11	Gyasi	Kashiram	ST	MairiKhera	231	32	358	557	381	580
12	Ramcharan	Halka	SC	MairiKhera	441	215	191	456	190	857
13	Ramsai	Kamatu	SC	Sapon	721	280	867	1400	301	1270
14	Mohan	Ramdayal	ST	Ratanganj	720	1290	240	965	240	NA
15	Govind	Paramlal	OBC	Matiyakhera	749	1892	461	1041	168	NA
16	Gopilal	Kutuwa	SC	Sapon	508	775	630	540	400	1490
17	Ajeet Singh	Takhat	Gen	Sapon	608	1049	256	1277	128	NA
18	Shanti bai	Munnalal	SC	Sapon	515	165	350	490	50	NA
19	Maldi	Kadora	SC	Sapon	493	170	570	590	120	190
20	Arjun	Gyasi	SC	Sapon	88	10	1154	580	60	90
21	Milla	Jujan	SC	Sapon	223	45	150	120	120	130
22	Mona	Bhura	SC	Sapon	223	50	150	180	120	150

S no	Name	Father's name	Social Group	Village	Area and production of 3 main vegetable crops					
					Chilli		Tomato		Brinjal	
					Area (sqm)	Prod. (kg)	Area (sqm)	Prod. (kg)	Area (sqm)	Prod. (kg)
23	Nanni	Nannoo	SC	Sapon	825	495	570	860	254	1090
24	Basiya	Anupa	SC	Sapon	60	25	300	180	87	100
25	Malla	Alma	SC	Sapon	323	70	246	280	84	160
26	Kamla	Mathuwa	SC	Sapon	160	170	128	280	64	280
27	Manuwa	Kuhunsaiya	SC	Sapon	510	245	334	260	291	610
28	Barelal	Ramprasad	OBC	Sapon	1120	365	1126	540	410	520
29	Jhullu	Jhalli	OBC	Sapon	1159	550	532	2300	512	2330
30	Nandu	Ghasiya	OBC	Sapon	108	70	144	690	216	1020
31	Durju	Jagna	OBC	Sapon	345	50	236	170	318	265
32	Dayaram	Dharamdas	OBC	Sapon	1312	70	1199	1200	1471	2070
33	Rituwa	Anupa	SC	Sapon	60	0	300	320	87	430
34	Bandu	Thubna	SC	Sapon	0	0	64	50	0	0
35	Mohan	Alma	SC	Sapon	252	50	321	220	210	310

Appendix 2: Estimated per acre cost of cultivation of 3 main vegetables

(For one cropping cycle, at 2014 costs applicable in Project area)

S. no.	Particulars	Unit	Tomato			Brinjal			Chilli		
			Quantity	Rate	Amount (Rs.)	Quantity	Rate	Amount (Rs.)	Quantity	Rate	Amount (Rs.)
1	**Operations**										
1.1	Land preparation- 2 times	Lumpsum			1200			1200			1200
1.2	Preparation and raising of nursery	Person days	8	150	1200	8	150	1200	10	150	1500
1.3	Transplanting	Person days	10	150	1500	10	150	1500	10	150	1500
1.4	Application of FYM, pesticides	Person days	12	150	1800	12	150	1800	12	150	1800
1.5	Weeding & intercultural operations	Person days	21	150	3250	20	150	3000	20	150	3000
1.6	Harvesting	Person days	20	150	3000	14	150	2100	16	150	2400
1.7	Irrigation	Person days	15	150	2250	20	150	3000	20	150	3000
1.8	Transportation	Lumpsum			1500			1500			1200
1.9	**TOTAL OPERATIONAL COST**				**15700**			**15300**			**15600**
2	**Materials**										
2.1	Planting materials-seed	Gram	150	30	4500	200	10	2000	200	35	7000
2.2	FYM	Trolley	2	1200	2400	2	1200	2400	2	1200	2400
2.3	Seed treatment chemicals, fertilizers & pesticides	Lumpsum			1800			1800			1200
2.4	**TOTAL MATERIALS COST**				**8700**			**6200**			**10600**
3	**COST OF CULTIVATION (1.9+2.4)**				**24400**			**21500**			**26200**

Akhil Bhartiya Samaj Sewa Sansthan (ABSSS):

Headquartered at Chitrakoot, Akhil Bhartiya Samaj Sewa Sansthan (ABSSS) works in the Uttar Pradesh part of Bundelkhand region, one of the most backward regions of the country. ABSSS was incorporated in 1978 under the Societies Registration Act and works primarily with the Kol community in Patha region of Chitrakoot district, as well as other dalits and poor people.

Originally a forest dwelling tribe, the Kols suffered unspeakable atrocities at the hands of landlords, moneylenders, mafias & contractor for several generations. Their identity was systematically eroded through unspeakable social, cultural and economic subjugation. Often in collusion with the local bureaucracy and politicians, local landlords used forcible occupation of land, physical abuse, bonded labour and rape to keep Kols in subjugation.

Gaya Prasad Gopal, the founder director of ABSSS, set out to change all this in the late 1970s. He set up ABSSS with a few local associates and began to take up issues affecting the Kols, by approaching district officials, the media and other influential persons to mobilise support. Activities grew more systematically from 1992-93 when Action Aid provided support for a 10 year Program. Bilance also supported ABSSS from 1992.

A combination of non-violent struggle and constructive work (rachna aur sangarsh) were the strategies followed to bring about change. The initial strategy was of struggle, to voice opposition to exploitation, and move government to action. It led to much success: bonded laborers were identified and released; criminal action was launched against sexual exploiters; landless Kols were issued pattas (land lease) for land. Alongside the struggle, ABSSS began constructive work in the Patha region, in the areas of education, health and integrated water resource development.

Beginning initially with Kols, ABSSS began to works with all dalits and other poor groups as well. Besides working directly in villages, ABSSS also nurtured and mentored local NGO initiatives by local people from the region, in Banda, Mahoba, Hamirpur and Lalitpur districts under the DFID-supported PACS Program.

Over the years ABSSS veered towards land and water resource development through various watershed projects. ABSSS is working as a Project Facilitation Agency under a NABARD watershed development scheme, in association with the UP State Government. Based on that work, ABSSS got the opportunity to implement integrated watershed development project at two sites, in Chitrakoot and Banda districts, with financial support from SDTT, Mumbai and technical support from PRADAN, Bundelkhand Rural Poverty alleviation Initiative under Bundelkhand Initiative in 25 GPs & 40 hamlets of Tikamgarh district of MP, a Water Security program in Banda district of Uttar Pradesh specially 20 intensive GPs and 69 extensive GPs in Naraini & Mahua Block of Banda districts, with financial support from WaterAid and women's Self help Group (WSGHs) in Jaithari Block of Anuppur District of MP with financial support from NABARD RO, Bhopal; Social Mobilization Services for Bonded Labour Awareness Project: Building the Capacity of Communities to Combat Vulnerability to Bonded Labour with financial support from BBC Media Action, New Delhi.

While struggle continues and comes rather naturally to ABSSS, ABSSS is consciously focusing on improving livelihoods by developing the potential of available natural resources and dovetailing these efforts with rights-based initiatives for demand of livelihood, women empowerment, water, sanitation & hygiene, health, food security and education related entitlements.