## Bundelkhand Rural Poverty Alleviation Model- ABSSS
## Tikamgarh block, Tikamgarh district, MP

# Value chain study of major crops

Supported by: SDTT & Allied Trust

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# Introduction

Akhil Bhartiya Samaj Sewa Sansthan (ABSSS) is implementing a 3-year (2011-13) "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. 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

To realise the third objective, the project is undertaking a number of activities for sustainable enhancement of agriculture production, which will lead to higher income and better living standards of the target group.

The effort requires a sound understanding of existing agriculture production patterns and its economics. Hence, the current value chain study of major crops in project villages was undertaken in March 2012.

## *Objectives of the study*

The objectives of the study were:

- to identify major and minor crop choices (including vegetables) of target group farmers
- to analyse value chain of major and minor crops, and identify key issues affecting higher value realisation
- to suggest measures for higher value realisation from cultivation of major and minor crops in project area.

## *Methodology*

The study was conducted through focused group discussions and small surveys conducted in 20 villages that are selected under the project for intensive intervention (see appendix for listing of villages). Almost all members of the project team were involved in

gathering information through these methods, in a systematic and planned way. Data was obtained from a number of sources, including:

- village-level workers of the project
- select beneficiaries of project
- leading farmers in project villages
- middlemen/traders in and around project villages, and in Tikamgarh town, who deal in seeds, fertilisers and other inputs, or ouputs
- officebearers of cooperative societies, which supply seeds and fertilisers to farmers in project villages
- processors of agriculture produce, like owners of flour and oil mills
- retail vendors of agricultural produce and vegetables

In this way, the entire value chain was studied:

Input suppliers ⇒ Farmers ⇒Traders ⇒ Processors ⇒Retailers

The collected data from each agency/actor in the value chain was analysed and results of the analysis were discussed internally, to identify grey areas, and possible errors in data collection. Particularly, the project's village-level workers were quick to identify some glaring errors and omissions. As necessary, data was re-collected and re-analysed.

The entire effort was conducted in February-March 2012 under the guidance of a development communications professional with extensive experience of surveys and analysis of data.

Earlier, the project had conducted an exhaustive baseline survey, which provided information under broad heads about the project area and the target group.

This report incorporates data from the baseline survey as well as the discussions and surveys conducted specifically for the purpose of this study.

## *Structure of the report*

The following sections of the report are as below:
1. Project Area: brief description of physical environment and target group
2. Major & Minor Crops: farmer preferences reflected in number of cultivators and area under cultivation
3. Input and Output Markets: existing markets, agents and general marketing processes
4. Profitability of Cultivation: economics of cultivation of different crops, based on average estimation of input costs and price realised for outputs
5. Value Enhancement Possibilities: measures for realising higher value from agriculture/vegetable cultivation in project area, in a sustainable way.

# 1. Project Area

## *Location*

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*

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. According to geological formations, the district can be classified into two broad regions:

- Hill ranges rising to height of 200-400m amsl.
- Inter-hill valleys

***Granite masses intruded by quartz reef mark the geology of the district.***

## *Geology*

The hill ranges are made up of hard compact and resistant granite masses intruded by quartz reef. The valleys are covered by colluvial and detrital of parent rock along with organic material. The thickness of alluvial fill varies from 10-16 meters.

The substratum of the entire district is composed of Bundelkhand granite and gneisses, which are profusely intruded by quartz reefs and pegmatites. Long narrow ridges formed by quartz-reef are intrusive into the granite. These quartz reefs act as water dividers and cut off flow of groundwater.

## *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 nutrient parameters, as obtained from soil tests conducted in the project villages is generally as shown in Table 1.1.

**Table 1.1: Soil nutrient status**

| **Parameter** | **Value** | **Rating** |
|---|---|---|
| pH | 7-7.6 | Normal |
| EC | 0.10-0.20 | Normal |
| Organic carbon | 0.27-0.70% | Low to Medium |
| Available phosphorous | 2-12kg/ha | Low |
| Available potash | 50 to 200kg/ha | Low to Medium |

## *Climate*

The climate of is characterized by a hot summer and general dryness except during the southwest monsoon season. The normal maximum temperature during the month of May is 41.8° C and minimum during the month of January is 7.0°C.

The normal annual rainfall received is 1057.1 mm. However, in 8 out of 9 years before the start of the project (2002 to 2010), rainfall was below normal, and in one year (2007), it was 50% below normal. Maximum rainfall (about 90%) is received during southwest monsoon period from June to September.

During the southwest monsoon season the relative humidity generally exceeds 87% in August. The driest part of the year is the summer season, when relative humidity is less than 35%. Maximum wind velocity of 9.3 km/hr is observed during the month of June and minimum wind velocity is 3.0 km/hr during the month of December

## *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*

A total of 2565 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.

## *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.

## *Irrigation facilities*

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.

There are 980 dug wells and 183 borewells in the Project villages. That is, there is roughly one well per three farmers. Availability of water through the year in these wells is shown in Table 1.2. It can be seen that normally 80% of wells have water in Kharif and

Rabi, and some amount of water in summer. It must be however noted that nearly two-thirds of farmers, cultivating around 40% of the cultivated land, do not have wells.

**Table 1.2: Number of wells in Project villages, by normal availability of water in different periods**

| Period in which water is available | No. of dug wells | No. of borewells |
|---|---|---|
| June-December | 189 | 10 |
| June-April | 577 | 96 |
| June-June (whole year) | 214 | 183 |

According to Central Groundwater Board (CGWB) analysis of groundwater in Tikamgarh block, the water does not contain any chemicals above permissible limits. However, the water has high salinity and is hence not suitable for crops with low salt tolerance. The groundwater resources in Tikamgarh block are considered adequate by CGWB and there is considerable scope for further exploitation of groundwater resources in a sustainable way.

# 2. Major & Minor Crops

## *Cropping Pattern*

Of the total 6823 acres of cultivable land in the 20 villages, around 80% (5485 acres) is sown in the Kharif season, and around 70% (4919 acres) is sown in the Rabi season. Lower cultivation in Rabi season is attributed to the following reasons:

- Migration by some HHs during Rabi
- Low fertility of soil, and inability of some HHs to invest in large doses of fertilisers, which makes only cultivation in Kharif cost-effective
- Inability of some HHs to afford irrigation costs, and reluctance to grow non-irrigated crops like gram, due to heavy crop losses caused by pests and insects.

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 below shows the cultivated area by season.

**Table 2.1: Cultivated area by season**

| **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 (see table 2.2), 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) and vegetables (7%).

**Table 2.2: Cultivated area by crop category**

| **Category** | **Cultivated area (acres)** |
|---|---|
| Cereals | 3816 |
| Oilseeds | 3751 |
| Pulses | 2837 |
| Vegetables | 478 |
| Other cash crop (sugarcane) | 43 |
| Gross cultivated area | 10925 |

## *Major crops*

Wheat, soyabean, and urad are the major crops, as shown in the table below, 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 the 2565 households cultivate wheat, urad and soyabean are cultivated by 73% and 63% households respectively. The average area under cultivation per household for each of these crops is 1 to 1.3 acres.

Lok-1 is the most common seed variety of wheat sown. Some other varieties of wheat grown are: GW 322, GW 366, C 306, C 308, "Katiya" and Sona.

JS-335 is the common variety of soyabean sown. Other varieties sown include JS 9305, JS 9560 and a local variety called "Patel 85". The commonly grown seed variety of urad is one locally simply as "Kala" (black). In some years, the "hara" or green variety is grown.

**Table 2.3: Major crops**

| 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*

**Table 2.4: Minor crops**

| Crop | Cultivated area (acres) | No. of cultivating households |
|---|---|---|
| Mustard | 877 | 1133 |
| Til | 770 | 1133 |
| Paddy | 561 | 612 |
| Gram | 418 | 543 |
| Barley | 408 | 541 |
| Peas | 246 | 304 |
| Lentil | 155 | 229 |
| Mung | 169 | 412 |
| Sugarcane | 43 | 52 |
| Groundnut | 22 | 33 |
| Kodo | 29 | 55 |
| Maize | 10 | 20 |
| Jowar | 3 | 3 |
| Total | 3785 | |

Excluding vegetable crops, a variety of minor crops are grown, as shown in Table 2.4. 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 2.5, the major kitchen garden vegetables are tomato, brinjal, bottle gourd, pumpkin and bhendi (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 2.5: Vegetables cultivated in kitchen gardens/household plots**

| Vegetables | No. of cultivating Households |
|---|---|
| Tomato | 527 |
| Brinjal | 173 |
| Bottle gourd | 143 |
| Chilli | 103 |
| Pumpkin | 98 |
| Bhendi | 35 |

**Table 2.6: Vegetables cultivated on agriculture land**

| 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 |
| Bhendi | 9 | 20 |
| Coriander | 5 | 15 |
| Others | 17 | 35 |
| Total | 477 | |

Most of these vegetables, along with potato, onion and arbi are grown in parts of fields as well, with chilli, tomato, and brinjal accounting for two-thirds of the area under vegetable cultivation (Table 2.6). Except for onion, which is grown by a couple of farmers in areas over 1 acre, average area under vegetable cultivation per cultivating household ranges from 0.3 to 0.7 acres.

***Vegetables are cultivated in kitchen gardens and parts of agricultural plots***

## *Seed replacement rate*

Seed replacement rate (SRR), defined as the “percentage of area sown out of total area of crop planted by using certified/quality seeds other than the farm-saved seed", is a critical factor determing yields.

Through focused group discussions, we gathered that in only around 21% of gross cultivated area in Project area is sown with seeds other than farmer- saved seed.

Highest SRR of 34% is for soyabean, followed by udad and wheat (24%).

Around 15-20% farmers procure seeds from other farmers, and around 30-40% of land under mustard and til is sown with seeds purchased in loose and unlabelled form from local shops. But as is no certification or guarantee about the quality of these seeds in both these cases, use of such seeds cannot strictly be considered as seed replacement.

SRR for other crops like paddy and gram is negligible.

In general, it appears that while the majority of farmers are aware about the need for seed replacement, and wish to replace seeds, they are constrained by non-availability of quality seeds in adequate quantities, and at the right time. This situation is explained in the next section.

# 3. Input and Output Channels

In this section, we look at channels available to farmers for procuring necessary inputs and selling their produce. We first look at the distribution of channel facilities available within and near the 20 villages.

**Table 3.1: Distribution of facilities across 20 villages**

| Facility | No. of villages in which facility is available | No. of villages in which facility is available within 5 km |
|---|---|---|
| Pukka road | 4 | 16 |
| Electricity | 19 | 1 |
| Bus service | 4 | 16 |
| Bank | 0 | 8 |
| Weekly market | 1 | 15 |
| Shop for seeds/fertilisers | 0 | 12 |
| Flour mill | 5 | 14 |
| Oil expeller | 3 | 11 |

The data shows that while 80% of villages are fairly well connected to markets for sale of produce, 40% villages do not enjoy quick access to sources of seeds and fertilisers.

Cooperative societies are supposed to be the main source of supply of these items. There are 6 cooperative societies with members drawn from project villages. Most of the societies are in poor shape with a large number of defaulters. (Table 3.2)

**Table 3.2: Cooperative societies servicing Project villages**

| S. no. | Name of the Society | No. of Project villages covered | Total members | Defaulters |
|---|---|---|---|---|
| 1 | Ajnor | 3 | 1344 | 525 |
| 2 | Laar | 4 | 1120 | 416 |
| 3 | Budera | 3 | 923 | 385 |
| 4 | Badagaon | 5 | 1508 | 584 |
| 5 | Kakarwaha | 1 | 900 | 287 |
| 6 | Dargua | 5 | 1100 | 462 |

## *Sources of Seeds*

Through discussions and detailed surveys of sample farmers (10 per crop), we obtained information on sources of seeds for different crops and quantities obtained from each source. Table 3.3 shows the estimated percentage of seed obtained from different sources. The data shows that for all major crops as well as minor crops, the main source of seed is the farmer's previous year production of grain, or production of another farmer in the village. In the latter case, payment is made in grain equivalent to 1.5 times the weight of seed obtained.

**Table 3.3: Crop-wise percentage of seed obtained from different sources**

| **Crop** | **Percentage of seed obtained from different sources** | | | | |
|---|---|---|---|---|---|
| | Self/other farmer | Coop Society | Local shop | Agriculture dept. | Govt. Seed depot |
| Wheat | 80 | 10 | 8 | 0 | 2 |
| Soyabean | 59 | 17 | 7 | 17 | 0 |
| Urad | 70 | 0 | 14 | 16 | 0 |
| Mustard | 71 | 0 | 29 | 0 | 0 |
| Til | 59 | 0 | 41 | 0 | 0 |

While farmers in general are aware of the need for seed replacement, a routine complaint is that seeds are never available in required quantities from the cooperative societies or government agencies. Hence, farmers have to perforce use grain as seed. Very few farmers seem to be aware of proper seed selection and storage practices. A part of the grain is simply kept aside for use as seed the next year.

The local cooperative societies provide seeds for only wheat and soyabean, and the agriculture department supplies some amount of seed for soyabean and urad. Seed supply from the government seed depot is negligible.

The most "reliable" external suppliers of seeds are some private seed sellers. There are 10 licensed seed dealers in project villages, apart from 13 in Tikamgarh town. That apart, there appear some unlicensed distributors of the license-holders. Seeds are generally sold in loose, unpacked and unlabeled form. As such, the purchasing farmer has no way of knowing whether the seed is of good quality, or where it has come from. Also, the price to be paid varies according to demand. Thus, while seeds of standard varieties of wheat grown in the area are officially available for Rs 18-20/kg, some farmers have bought seeds from shopkeepers at Rs 26/kg.

## *Sources of Fertilisers*

Both DAP and urea are used by farmers for cultivation of wheat. To a lesser extent, both these fertilisers are also used by many rice-cultivators and a few farmers who cultivate til.

For other major crops like soyabean, urad and mustard, only urea is used. Farmers who grow potato on a commercial scale also use DAP+ urea. Commercial cultivators of tomato and chilli use only urea. Most farmers who cultivate vegetables for sale also use farmyard manure, which is sourced from the village itself.

Cooperative societies are the authorised suppliers for DAP and urea, but it is seen that the societies meet only around 45% of the demand in the kharif season and barely 20-30% of the demand in rabi, when demand is higher as almost all households cultivate wheat. Hence, farmers are compelled to buy fertilisers from private sellers. There are 8 licensed fertiliser sellers in project villages, apart from 19 at Tikamgarh town. As in case of seeds, the private sellers charge a premium depending on demand. The premium ranges from 10-40% above the fixed price at the cooperative society. The DAP demand-supply gap is chronic and few farmers are aware of the SSP/rock phosphate alternative, and equivalent quantities to be used.

## *Sources of crop management chemicals*

Inorganic pesticides and insecticides are generally not used by farmers, except for commercial cultivation of potato and tomato.

**Table 3.4: Crop management formulations sold by pvt dealers**

| Formulation | Recommended for | Purpose |
|---|---|---|
| 24-D-38 EC | Wheat | Weed control |
| Imazethapyr 10% SL | Soyabean, urad | Weed control |
| Metalaxyl | Wheat | Control of soil-borne pathogens |
| Indoxacarb | Gram | Insect control |
| Chloroplus (Chlorpyriphos) | Gram | Insect control |
| Deltamethrin | Soyabean, urad | Insect control (aphids, mealy bugs, etc) |
| Rogor (Dimethoate) | Chilli | Insect control |
| Carbendazim | Onion | Fungal disease control |

Almost no farmers are aware of the brand name of any pesticide/insecticide. They simply approach shopkeepers stocking these materials in Lar, Badagaon or Tikamgarh, explain the problem they are facing, and purchase the recommended chemical. At the time of purchase, they are told by the shopkeeper about dosage. While farmers do follow the dosage, the number of times spraying is done largely depends on the cash available with the farmer for purchase of chemicals. From enquiries with sellers, we found the chemicals that are generally recommended and sold for different crops (see table 3.4)

## *Output Channels*

According to the Madhya Pradesh Krishi Upaj Mandi Adhiniyam (MPKUMA, or MP Agricultural Marketing Act) of 1972, a farmer in the state can sell his agricultural

produce only in government-regulated wholesale markets known as mandis. At these markets, farmers' produce is purchased by licensed buyers/traders, commission agents, or procurement agencies that buy at the government's minimum support price (MSP) offered for certain commodities like wheat and paddy. All other commodities are sold at the mandis through open auction. This system is considered the best method to protect farmers against exploitation from unscrupulous buyers.

However, in practice, many farmers continue to sell through the older channel of middlemen who visit villages during and after harvest time. A major advantage of this system is that farmers do not have to spend time or money in transporting the produce to the wholesale market. The advantage is particularly significant for small and marginal farmers, who have small marketable lots, after retaining produce for family consumption.

On the other hand, farmers who sell through the village channel lose in the following ways:

- They do not have access to exact wholesale market rates and fluctuations.
- They cannot get the best possible price, obtainable through an auction. They cannot even get MSP for produce like wheat. At any given time, they get price 10-20% less than what is prevalent in the mandi
- Their produce is not weighed exactly before purchase.
- They do not get proper sales receipts, which can be used to raise finance

In the Project villages, it is seen that only large farmers with substantial produce of wheat or soyabean go directly to the mandi and sell their output. In all other cases, the produce is sold to middlemen in some villages, and middlemen from the large villages of Lar and Badagaon who visit farmers after harvest and buy their produce after sorting. These middlemen, who pay cash at time of purchase or even lend advances, procure produce from several villages and sell it in the mandi. For sale of vegetables, cultivators take their produce to nearby weekly markets and do direct sale.

There are two *mandis* (wholesale markets) near the project area: one main mandi in Tikamgarh town, and one sub-mandi in Badagaon. There are a total of 149 registered buyers in these mandis, who purchase all field crops, including all cereals, pulses and oilseeds grown in the region. Any farmer—or any middleman—can put up any amount of produce for auction at the mandi, without paying any fees or producing any documents[1]. Only a nominal "entry pass" fee of Rs 5-30 has to be paid, if the produce is brought in motor vehicles like tractors or trucks. Once the produce is sold, the farmer has to pay loading charges at the rate of Rs 7 per quintal.

[1] In case of produce bought by procurement agencies at MSP, farmers have to show land records for selling over 10 quintals—this is to ensure that they do not buy produce of other farmers at a lower rate and get benefit of MSP for themselves. However, even this rule is not followed strictly. One result is that produce brought by middlemen to the mandi is sometimes higher than total production in the area officially covered by the mandi. This happened in case of wheat after 2012 Rabi. It is believed that middlemen bought wheat from farmers in UP and sold it in the Tikamgarh mandi, to avail high MSP.

Registered buyers/traders at the mandi pay the market's managing committee a fee of 2.2% on value of produce bought, in addition to fee for grant and renewal of license, and a deposit.

The process of selling and buying at the mandi is as follows:

- The farmer displays his produce in a heap in the mandi yard or stands besides his tractor/truck loaded with the produce
- A government employee of the mandi and the traders move from heap to heap, pick up samples of the produce and make a price estimate for each heap, depending on the quality. For example, in case of soyabean, the highest or the fair average quality (FAQ) price is offered to a sample that is estimated to contain not more than 2% dirt, 2% damaged seeds and 10% moisture. This is called a a 2-2-10 quality sample. FAQ price is discounted according to estimated proportion of deviation from a 2-2-10 sample. (Samples with lower than 2-2-10 deviation also fetch FAQ price).
- The auction begins when the auctioneer, the government employee, sets the initial bid for a sample.
- From here the traders bid upwards until the produce is sold. This final price is usually decided in seconds.
- Once the final price is set, the farmer's produce is bagged and weighed on a manually operated scale. After weighing, the full value of the farmers produce is calculated and the farmer is paid in cash.

Needless to say, the auction price of produce is dependent on price in other wholesale markets. In case of some produce, like soyabean, the price is dependent on global prices. Mandi prices of soyabean in MP closely track the Chicago Board of Trade (CBOT) prices for the commodity.

Under the MP Agriculture Marketing Act, farmers can directly sell to consumers a maximum of 4 quintals at one time. However, there are no *krushak bazars*, or farmers' stalls, in the Tikamgarh mandis, for farmers to sell their produce directly to consumers.

## *Value addition of output*

There is no mill for refining wheat flour near project villages, and there are no dal mills in Tikamgarh block—the dal is sent to Damoh or Sagar for milling. Soyabean refineries too are not present in the entire district—the produce is sent to Bina, Sagar, Indore or Bhopal for oil extraction.

There is locally available facility for value-addition only in case of mustard and til: there are several diesel-engine oil expellers near project villages. Farmers do not have to pay for oil extraction. Rather, they receive Rs 2 and Rs 3 per kg of mustard and til seed respectively they give for extraction. The catch is that the oil-expeller retains the byproduct (deoiled mustard or til cake), which he then sells for Rs 9/kg (mustard cake) or Rs 15/kg (til cake).

The profitability of this arrangement for the oil-expeller can be seen from Table 3.5, which shows data for extraction at the normal rate of 45 kg/hour.

**Table 3.5: Profitability of mustard/til oil extraction (45 kg/hour)**

| Sr no | Head | Mustard | Til |
|---|---|---|---|
| 1 | Amount paid to farmer (Rs) | 90 | 135 |
| 2 | Cost of diesel (2 litres) in rupees | 91 | 91 |
| 3 | Total cost (Rs) | 181 | 226 |
| 3 | Byproduct extracted (kg) | 28 | 20 |
| 4 | Selling rate of byproduct (Rs/kg) | 9 | 15 |
| 5 | Total selling price of byproduct (Sn 3* Sn 4) | 252 | 300 |
| 6 | Net profit (Sn 5- Sn2) in rupees | 71 | 74 |

***Local market (haat) near project villages***

# 4. Profitability of Cultivation

As 80% of the farmers are marginal or small landholders, agriculture primarily meets home consumption purposes. Only soyabean, and to some extent mustard, til and a few vegetables are grown for the purpose of sale. Hence, most farmers do not think in terms of profitability of cultivation or net income from different crops. Nevertheless, we have to make calculations in these terms, as farmers incur expenditure on cultivation, and there is risk of partial or even total loss.

It is quite difficult to estimate net returns of a large number small or marginal farmers as there are many cost variables. Some households have enough hands for all farming operations and so do not hire labour, while other households do, for some or many operations. Quantity of fertilisers purchased varies according to cash available with a household in the cultivation season, and availability of fertiliser in the market: if DAP is scarce, farmers use more urea. Expenditure incurred depends on timing and source of purchase: if a farmer buys fertilisers from shopkeepers at peak demand time, he pays much more than those who purchase at the start of the season, or manage to get the items from the cooperative society. A few farmers use weedicides, insecticides or pesticides, while many do not. Some use these chemical formulations during a particular year, but not in other years. There are many variables in the price side too. As already noted, most farmers do not sell produce; hence we have to put a notional cash value to the produce on the basis of price realisable in the local market. This price varies according to time and location of sale: if a farmer holds on to his harvest and/or sells it in the wholesale market, he gets a higher price than the farmer who sells immediately to the middleman who comes to the village. Finally, we have to remember that in a given year and across years, there are substantial variations in yield, depending on rainfall, soil conditions, seed variety, inputs given, and farmers' crop management practices.

Bearing this in mind, the profitability estimates we have derived are to be treated as rough averages. The estimates are based on detailed interviews with sample farmers (around 20 per crop) on costs they incurred and production they got in 2010-11 kharif and rabi seasons. We focused on 7 crops, namely wheat, soyabean, urad, til, mustard, gram and paddy, which together account for around 90% of the gross cropped area. We also separately estimated profitability of cultivation of some vegetables.

Based on farmer interviews, the net returns from the 7 crops were calculated on per acre basis, and are shown in Table 4.1. Costs shown in the table are averages of actual costs incurred by interviewed farmers. The following points may be noted:

- For ploughing, some farmers use hired tractors, others used hired animal-driven ploughs. A tractor is hired at at the rate of Rs 500/hr and 1-acre can be ploughed once in 0.75 to 1.5 hrs. The cost of hiring an animal-drive plough is Rs 300/day. For wheat, the field is generally ploughed three times, whereas for other crops, it is ploughed one to two times

- Seed cost is average of cost incurred by farmers who purchased seeds. The same cost rate is applied to farmers using own seeds.

**Table 4.1: Production cost and net returns per acre from 7 crops**

| **Details** | **Crop** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Wheat | Soyabean | Urad | Mustard | Til | Gram | Paddy |
| **Input quantity** | | | | | | | |
| Seed (kg) | 70 | 40 | 8 | 4 | 2 | 45 | 40 |
| DAP (kg) | 80 | 50 | 25 | 40 | 40 | 50 | 50 |
| Urea (kg) | 50 | 0 | 0 | 20 | 20 | 0 | 30 |
| Labour (hrs) | 150 | 140 | 140 | 100 | 100 | 100 | 200 |
| **Rate per unit (Rs)** | | | | | | | |
| Seed (kg) | 21 | 20 | 31 | 20 | 50 | 25 | 18 |
| DAP (kg) | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Urea (kg) | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| Labour (8-hrs) | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **Operational cost (Rs.)** | | | | | | | |
| Ploughing | 750 | 500 | 500 | 500 | 500 | 500 | 500 |
| Seed | 1470 | 800 | 248 | 80 | 100 | 1125 | 720 |
| Fertilizers | 2135 | 1100 | 550 | 1030 | 1030 | 1100 | 1325 |
| Irrigation | 1200 | 0 | 0 | 600 | 0 | 600 | 0 |
| Labour | 1875 | 1750 | 1750 | 1250 | 1250 | 1250 | 2500 |
| Threshing | 600 | 450 | 450 | 0 | 0 | 450 | 0 |
| Insecticide | 0 | 0 | 0 | 0 | 0 | 250 | 0 |
| Total cost | 8030 | 4600 | 3498 | 3460 | 2880 | 5275 | 5045 |
| **Returns rate** | | | | | | | |
| Yield (kg) | 915 | 390 | 210 | 260 | 133 | 300 | 425 |
| Selling price (Rs/kg) | 13* | 20 | 22 | 19 | 35 | 20 | 10 |
| **Gross returns (Rs)** | 11895 | 7800 | 4620 | 4940 | 4655 | 6000 | 4250 |
| **Net returns (Rs)** | 3865 | 3200 | 1122 | 1480 | 1775 | 725 | -795 |

*including price obtained for fodder

- Many farmers do not use fertilisers for any crop other than wheat, and their yields are lower than yields used for calculation in the table. Likewise, many farmers use fertilisers at a lower per-acre rate for wheat, and get lower yields.
- FYM cost is not included as very few farmers use it for the 7 selected crops.
- Apart from household labour, hired labour is used by some households for sowing, weeding, harvesting and other operations. For purpose of calculation, no difference is made between the two kinds of labour. That is, labour rate of Rs 100/8hrs is applied uniformly to total labour hours.
- Almost all farmers use own pumps, so pump-hiring cost is not included.
- Crop management chemicals are used only by a few farmers, and only for gram. Hence, cost of insecticide/pesticide is not included for other crops.
- Value of produce is based on average yield per acre and price offered by local middleman.

The figures in the table show that in terms of "return on investment" (RoI), soyabean and til are the most profitable crops, followed by wheat, mustard, urad and gram, in that order. RoI for paddy is negative.

RoI is not the primary or only consideration for most farmers, as they own marginal or small plots, and cultivation is done primarily to meet consumption needs. Only in case of soyabean and udad is the produce generally sold. Hence, in case of small plot-holders we have to estimate net benefit of cultivation of other crops (mainly wheat) in terms of the difference in cost of producing x quantity of produce and price payable if the same quantity is purchased in the local market. The estimation is shown in Table 4.2, which considers a land-holding of 2.5 acres, with cultivation of wheat, soyabean, urad and til matching average areas under these crops. Costs and returns are calculated on the basis of data given in Table 4.1.

**Table 4.2: Net benefit for small/marginal cultivators from 2.5-acres**

| **Crop** | **Area under cultivation (acres)** | **Cost of Production (Rs)** | **Sale value (Rs)** | **Purchase price of equivalent produce (Rs)** | **Net benefit (Rs)** |
|---|---|---|---|---|---|
| Soyabean | 1 | 4130 | 7800 | 0 | 3670 |
| Urad | 0.8 | 2422 | 3696 | 0 | 1274 |
| Til | 0.7 | 2002 | 0 | 4050 (oil extracted ) | 2048 |
| Wheat | 1.2 | 9486 | 0 | 16,470* | 6834 |
| Gross cropped in 1 year | 3.7 | 18,040 | 11,496 | 20,520 | 13,826 |

*incuding price of fodder; local selling price of wheat is Rs 12/kg

We can see that in the above pattern of cultivation, a household gets cash income of around Rs 4000 from soyabean and urad, cooking oil of net value of around Rs 2000 and wheat of net value of around Rs 7000. The total realised cash benefit plus notional cash

benefit from 8 months of farming is around Rs 14,000. If 2 members of the family were to instead do wage labour in this period, and they were to get work for 120, then at wage of Rs 100/personday, the cash benefit would be almost double (Rs 24,000).

## *Profitability of Vegetable Cultivation*

For determining profitability of vegetable cultivation, we looked at tomato, which is grown by the highest number of farmers on a commercial scale. The Ankur seed variety is preferred, and if we consider an area of 1-acre, 16 kg of urea is used along with two trolley loads of FYM. In one season, the plot is irrigated for 36 hours. Some insecticides/pesticides are used. Considerable labour is required, and is usually hired, for weeding and harvesting. Around 3000 kg produce is obtained and average selling price at local market is Rs 6/kg. The net returns, as obtained from cost data gathered from a cross-section of farmers are shown in Table 4.3.

**Table 4.3: Cost of production and net returns from 1-acre of tomato cultivation**

| **Head** | **Amount (Rs)** |
|---|---|
| Seeds | 400 |
| Ploughing | 500 |
| Urea | 118 |
| FYM | 1800 |
| Labour | 5800 |
| Irrigation | 1800 |
| Crop mgmt chemical | 200 |
| Total cost | 10618 |
| Gross value | 18000 |
| Net returns | 7382 |

It can be seen that the capital required for tomato cultivation is higher than that required for any crop considered in Table 4.1 and RoI is lower than RoI for soyabean.

# 5. Value Enhancement Possibilities

If we consider the four main stages in an agricultural value-chain, possibilities for value enhancement emerge as follows:

| **KEY VALUE ENHANCING OPTIONS** | Reduce Costs/ Use Better Quality Inputs ⇓ | Reduce Costs/ Increase Yield/ Choose High Value Crops ⇓ | Choose High-Value Options ⇓ | Realise Higher Price ⇓ |
|---|---|---|---|---|
| **VALUE CHAIN STAGES** | Input Procurement ⇒ | Production ⇒ | Value Addition ⇒ | Marketing |

We will consider the value-enhancing options at each stage, keeping in mind that any option should meet the following parameters:

- It should be viable in local conditions, including physical and social environment, available public infrastructure and markets.
- It has the potential to enjoy community participation; it should not be remote from community's experience or knowledge
- It should have proven results: there should be results from comparable regions, or results should be provable in project area through a pilot.
- Results should be realisable in short or medium-term (within project period).
- Risk-factor should be low.
- Capital requirement should be low: finance needs have to be such that they can be met through SHG savings or soft bank-loan.
- Estimated learning-curve should match community's learning capacity.

## *Enhancing Value through Input Procurement*

We have already seen the difficulties faced by target households when procuring inputs like seeds, fertilisers and crop management chemicals. While the available facilities for supply of inputs cannot be changed, it is possible to returns through:

- Advance and bulk purchase of seeds, including seeds from sources outside Tikamgarh block: This would be feasible if SHGs and farmer groups do joint crop planning and pool capital for bulk purchase. Including transportation costs, bulk purchase may be cost-effective even if done at other places like Sagar and Bhopal.
- Reducing seed quantities: It is seen that seed quantities used by farmers is very high, mainly due to practice of broadcast rather than line sowing. The project has already demonstrated in Rabi 2011-12 how mustard production can be multiplied with lesser quantity of seeds, through line sowing. This success story has to be widely disseminated and replicated.
- Rational use of inorganic fertilisers: Coupled with excessive seed quantity, farmers supply nutrients through inorganic ("chemical") fertilisers irrationally, as Table 5.1

indicates. A major flaw in farmers' thinking is blind faith in DAP and ignorance about alternatives like SSP/rock phosphate, which is not prone to import price fluctuations, or balanced fertiliser formulations like IFFCO's NPK product, which provides vitally needed K as well. Pilot demos undertaken by the Project in Rabi 2011-12 have shown that by using IFFCO's NPK product, along with urea and some zinc sulphate, yield could be increased or maintained at substantially lower fertiliser cost.

**Table 5.1: Recommended and actul use (kg/acre) of nutrients for irrigated wheat**

| Nutrient | Recommended use* | Actual use |
|---|---|---|
| N | 32-48 | 40-60 |
| P | 16-20 | 15-30 |
| K | 16 | 0 |

*As per Tikamgarh KVK

- Reduced dependence on inorganic fertilisers; Dependence on inorganic fertilisers, particularly for vegetable cultivation, can be reduced through production of quality FYM, compost, and vermicompost by SHGs/farmer groups. Measures like green manuring can help improve soil health and reduce need for supply of some nutrients through inoragnic sources.
- Advocacy for better seed & fertiliser supply through cooperative societies and government agencies: Notwithstanding the above-mentioned options, the target households will require substantial amount of seeds and fertilisers through these sources, and can use various advocacy measures (including media advocacy) to demand timely supply of these inputs in required quantities.
- Use of SSP/rock-phosphate instead of DAP: Being dependent on imports, DAP will always be vulnerable to short supply and price fluctuations. Hence, following the government's policy, farmers should be encouraged to use SSP or rock phosphate as a substitute along with urea as required. Farmers will need to be given information on suitable doses according to crop and soil nutrient status.

## *Enhancing Production Value*

Production value can be enhanced by reducing costs, increasing yield or choosing high-value crops. As already discussed, production cost can be reduced through line sowing and lower seed-quantity usage, and rational use of fertilisers.

There does not seem to be scope for increasing yield, if we compare Project area yield averages with yield averages for Tikamgarh district as a whole (Table 5.2). If anything, Project area yields are higher, except in case of gram, which is grown in less than 5% of gross cultivated area.

**Table 5.1: Yield (kg/ha) comparisons of important crops**

| Crop | Avg yield in Tikamgarh | Avg yield in Project area |
|---|---|---|
| Wheat | 1340 | 1560 |
| Soyabean | 920 | 970 |
| Urad | 330 | 525 |
| Mustard | 420 | 440 |
| Til | 330 | 333 |
| Gram | 1130 | 722 |

Tikamgarh figures are for 2005-06 and sourced from Districtwise crop production statistics, Crop Production Statistics Information System, Ministry of Agriculture, GOI

However, the picture changes considerably if we look at crop losses. As reported by farmers, nearly 40% of urad production is lost due to fungal and viral diseases. There are highly feasible measures to reduce disease-incidence, such as: crop rotation, use of certified seeds, seed treatment, wide-row planting, intercropping and if necessary, spraying of some insecticides/pesticides.

Likewise, there is 40% and 30% production loss in case of mustard, which can be reduced through above-mentioned measures. In case of soyabean and wheat, 20% production loss due to diseases and insects is reported. These too can be considerably reduced through dissemination of information through farmer groups. As seen earlier, the majority of farmers are unaware of even the names of chemical formulations required to tackle common disease and pest problems. It must be however stressed that while informed use of chemical formulations will prevent crop loss in the short-term, the long-term solution lies in:

- crop rotation
- improvement of soil health
- use of quality seeds
- seed treatment
- proper spacing between plants
- suitable intercropping

Project demos have established that mustard yield can be increased by around 40% by using Lahar variety seeds and there is unexplored yield-increase potential through use of quality seeds of other crops. There is also unexplored yield-increase potential through practice of SRI for cultivation of rice in low-lying areas with suitable soil.

Turning to vegetables, we see that though tomato is quite extensively cultivated, and the project conditions are suitable, the average yield (3 tonnes/acre) is very low. It is in fact half the average yield reported in other tomato-growing areas of MP, and that itself is lower than the yield reported from other regions. Chief causes of low tomato yield are:

- Improper crop rotation and inadequate soil preparation
- Inadequate use of FYM

- Poor crop management—some farmers do not even use stakes
- Haphazard pest and disease management—based on scanty information on inorganic formulations and little information about organic alternatives such as neem-based formulations.

If these deficiencies are plugged, yield of up to 10 tonnes/acre can be obtained even without use of hybrid seeds, and though overall costs will be higher, the RoI will also be higher. According to NABARD's costing, production of tomatoes following a fully organic method, will cost Rs 24,300 per acre. Assuming selling price of only Rs 5/kg, the net return for 10t/acre will be Rs 23,000, after deducting interest on capital.

Considering the wide range of crops already grown in Project area, and government recommendations on suitable crops for the region, there does not appear to be significant scope for introducing some new and high-value crop. However, there is one vegetable, cultivated by some farmers, namely arbi (yam), which has high profit potential, as shown in table 5.2. An average of 200 kg produce is obtained from 1-acre and sells in the local market at Rs 15/kg. However, cultivators report that half the production is generally lost and the complete crop is also sometimes lost due to diseases. We have also seen that cultivators do not irrigate the crop, though it consistently requires moist soil. A pilot demo may be undertaken to show best practices of arbi cultivation.

**Table 5.2: Net returns from 1-acre arbi cultivation**

| **Head** | **Amount (Rs)** |
|---|---|
| Seeds | 6000 |
| Ploughing | 1000 |
| Inorganic fertilisers | 0 |
| FYM | 1800 |
| Labour | 2200 |
| Irrigation | 0 |
| Crop mgmt chemical | 0 |
| Total cost | 11000 |
| Gross value | 30000 |
| Net returns | 19000 |

To sum up this part of the discussion, production value can be enhanced by:

- Integrated methods to reduce disease-incidence, particularly in urad
- Establishing higher yields through use of high-quality seeds of appropriate varieties, with line-sowing
- Promotion of organic PoP for tomato cultivation, to double yield
- Demonstrating proper cultivation of arbi (suitable only for deep and moist soils)

## *Enhancing Value through Value Addition*

Theoretically, there is scope for value-addition in almost all crops grown in the project area. But practically speaking, the scope is highly limited as the food-product market is now characterised by high-cost branding, packaging and advertising. We must also consider that the nearest city, Tikamgarh, is a small town with little tourist traffic. There is thus little scope even for "health foods", which can be made, packed and sold by rural communities at low cost. Moreover, health foods like dahlia (made from wheat) are ruled out because the required variety of wheat is not grown in the project area.

There is no dal mill in Tikamgarh block and so this investment is potentially viable. However, the equipment cost of energy-efficient and versatile dal milling technology developed by Central Food Technology Research Institute (CFTRI) is over Rs 900,000. Including land, building and backup power facilities, the total project cost estimated by NABARD is over Rs 12,00,000. This is well beyond the capacity of the target community at this stage. Moreover, the technology is viable only if electricity is assured—which is not the case in the project area.

Investment required for oil expellers is much lower (Rs 75,000) and within the saving and loan-taking capacity of community-based organisations. However, there are already an adequate number of oil expellers in and around the project area. There is stiff price competition among these units, and the business is anyway seasonal.

Udad dal badis (nuggets) are a value-added item that can be made with little capital investment, but enquiries made with food retailers at Tikamgarh show that the demand for this item is low: most households make dal badis at home. There appears to more demand for udad papads, especially from restaurants, and the potential market is quite large if we include Orchha and Jhansi. A hand-operated papad press developed by CFTRI costs Rs 20,000, and excluding rent for premises (500 sq feet), working capital requirement for producing 50 kg papad daily is Rs 20,000 per month. Additionally, 2000 litres of water are required per day for this volume of production. Four persons have to be employed full-time. If SHGs are willing to meet these conditions, a business feasibility report can be worked out.

## *Enhancing Value through Marketing*

As mentioned earlier, farmers mostly sell agricultural produce to middlemen, who deliver it to the wholesale market, directly, or though another middleman. There is a 10-20% difference in the price obtained by the farmer, and the price offered by the wholesaler in Tikamgarh. This difference can be realised by the farmer through bulk collection and sorting at the village level, followed by transportation to Tikamgarh. In other words, SHGs or farmers' groups can themselves become middlemen, operating at lower margins

for the larger benefit. However, it must be stressed that any such business initiative by groups, has to be preceded by considerable preparatory work, as listed in the appendix.

Higher price realisation is also possible by holding on to the produce for a longer period. The holding capacity is however determined by three factors:

- farmers' immediate cash needs—which are usually high and urgent if a loan has been taken for cultivation
- availability of good storage facilities
- perishability of produce

For cereals and pulses, SHGs operating as middlemen can meet farmers' immediate cash needs, and store and sell produce at higher price at appropriate times. This would require investment in storage bins and establishment of some system to keep track of wholesale prices.

Vegetables being highly perishable commodities cannot be stored for long periods unless large investments are made for cold storage facilities. However, with use of plastic crates or baskets, tomatoes can be stored in the shade for a few days. Potatoes can be stored for longer periods using room storage or pit storage methods (see appendix).

## *Towards an Action Plan*

The preceding discussion throws up a number of actionable points. Selection and priortisation of actionable points has to be done by community members, individually and in groups, after considering all the pros and cons of each option, and the requirements of finances, skills and organisation entailed by each option.

While the Project NGO can facilitate this process of selection and prioritisation, the NGO's role is naturally limited by:

- Its own experience and expertise in particular areas, and its ability to leverage support from other agencies
- Project's budgetary and programme framework
- Manpower and time that has to be committed to other ongoing and planned Project activities and processes
- Time-limit of Project, which imposes a limit on the handholding that the NGO can offer to any community initiative.

Considering all above, an action plan for realising higher returns can be worked out through a participatory mode as follows:

Step 1. Target group meetings for sharing analysis results

As a first step, the data and analysis emerging from this study has to be presented and explained to the target group, through village and hamlet-level meetings. Meetings can be organised through existing SHGs and farmers' groups. More than one group may be called for a meeting so that there are an average of 20 participants per meeting (more

participants make the meeting difficult to manage, and lesser number of participants will mean loss of much time in holding meetings at different locations).

**Table 5.3: Stage-wise actionable points to increase returns**

| Pre-production stage | Production/ Cultivation stage | Post-harvest stage |
|---|---|---|
| • Increasing SHG saving/inter-loaning to reduce dependence on moneylender loans for purchasing inputs<br>• Learning about appropriate quality-seed varieties<br>• Making advance and bulk purchase of quality seeds through groups (involves crop planning at group level)<br>• Learning how to reduce seed quantities through line sowing, etc<br>• Campaigning/advocacy for better seed & fertiliser supply through cooperative societies and government agencies<br>• Increasing local production of quality FYM, individually or by groups, and thereby reducing dependence on factory-made fertilisers<br>• Learning to produce vermicompost, especially for vegetables<br>• Learning to plan fertiliser use/purchase according to soil test reports | • Learning to use SSP/rock-phosphate instead of DAP, along with K-supplying fertiliser<br>• Learning to identify and tackle common disease and pest problems for major and minor crops (to be identified)<br>• Learning principles of crop rotation, improving soil health, suitable intercropping, and optimum spacing between plants as per crop<br>• Learning to do seed treatment<br>• Learning SRI method for cultivation of rice in low-lying areas with suitable soil<br>• Learning how to increase yield of tomato or any other vegetable of participants' choice<br>• Learning to produce and use organic pesticides | • Group procurement and sale at mandi<br>• Group investment in storage bins for stocking and selling when wholesale price is high<br>• Exploring business feasibility of local production of value-added products like papad |

Participants have to be informed in advance about the agenda of meeting, viz:

- understand and discuss results of study on returns from agriculture/vegetable-cultivation
- identify viable and community-level ways to increase returns, such that the maximum number of farmers get benefit
- nominate farmer representatives for making detailed action plans.

Before the meetings, Project staff has to prepare charts/flip charts in Hindi to highlight main points of the study.

The presentation of the study findings at meetings should be followed by a question-and-answer session and a discussion, to clarify key points. It is possible that some participants and groups have other views on the study data.

The meeting can then move to Step 2.

Step 2: Open discussion on options to increase returns

As already discussed, there are several realistic options for increasing returns, under each of the four value chain stages. For purpose of simplicity, the stages may be reduced to three, viz:

- Pre-production stage
- Production/Cultivation stage
- Post-harvest stage

The already discussed options for increasing returns at each of these stages should be listed before the group as actionable points, as in Table 5.3. The listing should include any other options suggested by participants in Step 1 above.

Project Staff should then facilitate a free discussion on the various actionable points, highlighting the fact that, from the Project perspective, the "best" options are ones which:

- have potential to benefit maximum number of group members
- can be implemented by the group, with training, technical and management support from the Project over next 12-24 months
- will enjoy wholehearted participation and support of a large number of group members

Step 3: Prioritization of Options

Participants' prioritisation of options can then be obtained by asking them to rank options under each stage. Ranking can be obtained through number of votes gathered for each option as the "best option". Voting can be through show of raised hands.

Ranking and voting would have to be done in two rounds: first, to prioritize options within each production stage, and then to prioritize options across production stages. Considering Project limitations, it may be unrealistic to have more than 5-6 prioritized options for follow-up action.

Step 4: Broad Planning

Participants should be encouraged to make broad plans for prioritised actionable points. The broad plans should cover:

- Sub activities that will have to be undertaken under each actionable point of high priority. For example, group procurement and sale of produce will involve visit to the mandi to gain first-hand information about selling practices there.

- Tentative schedule for each of the identified major activities—in which month or season to be done, with roughly how many participants, and where.

The Project may already have planned activities that match activities prioritised by participants. For example, the Project may already have a planned training programme for production of organic fertilisers. Nevertheless, these activities should be included in the broad planning stage, if listed by participants. The listing of major activities by participants will help the Project:

- fine tune its planned schedule,
- make modifications in terms of timing, location and number of participants under planned activities, and
- make slots for previously unplanned activities.

The group meeting can end with selection/nomination of group representatives for detailed planning.

Step 5: Detailed Planning

After conducting this exercise in all groups, Project can invite group representatives for a workshop to do detailed planning of prioritised activities.

Note: Above exercise can be dovetailed with similar exercise for realising higher value from tree-based produce.

# Appendix

## *List of 20 villages with demographic details*

| Village | Total Families | SC Families | ST Families | General category Families | OBC Families |
|---|---|---|---|---|---|
| Rajapur | 200 | 90 | 0 | 5 | 105 |
| Magra | 202 | 10 | 60 | 0 | 132 |
| Mayrikhera | 209 | 95 | 32 | 0 | 82 |
| Nagara | 400 | 90 | 0 | 0 | 310 |
| Madnikhera | 55 | 54 | 0 | 0 | 1 |
| Satyanagar | 45 | 45 | 0 | 0 | 0 |
| Sapon | 50 | 0 | 40 | 1 | 9 |
| Gopalpura | 135 | 75 | 0 | 0 | 60 |
| Bhagalpura | 40 | 40 | 0 | 0 | 0 |
| Ratanganj | 60 | 0 | 30 | 3 | 27 |
| Sauryana | 64 | 4 | 59 | 0 | 1 |
| Basiyan Khera | 68 | 0 | 36 | 7 | 25 |
| Dudataura | 330 | 30 | 40 | 0 | 260 |
| Ramnagar | 305 | 60 | 0 | 6 | 239 |
| Harinagar | 40 | 16 | 0 | 0 | 24 |
| Matapur | 56 | 32 | 4 | 0 | 20 |
| Madanpur | 42 | 12 | 0 | 0 | 30 |
| Mujra | 98 | 41 | 12 | 1 | 44 |
| Haidarpur Adivasi Basti | 30 | 0 | 30 | 0 | 0 |
| Suda Dharampura | 136 | 60 | 15 | 1 | 60 |
| **Total** | **2565** | **754** | **358** | **24** | **1429** |

## *Organic Tomato Cultivation: Key Steps*

- Proper crop rotation—with crops other than, potato, chilli, brinjal; tomatoes should be not be planted near potatoes.
- Proper land preparation—ploughing 4 to 5 times to achieve fine tilth
- Application of well composed FYM @ around 10 tonnes/acre, or around 1 tonne compost/acre at last ploughing. FYM can be treated with trichoderma at the rate of 500 g per a tractor load of manure. After mixing the required amount of trichoderma, the manure should be allowed to remain in a heap covered with wet gunny bag for proper culturing.
- Selection of suitable open-pollinated seed varieties with proven resistance to bacterial wilt and leaf mosaic virus
- Raised nursery beds in areas prone to waterlogging
- Application of 20 to 25 kg of FYM per seed bed
- Drenching the seed bed first with water and then application of kanranj/neem cake (1.2 kg per seed bed) to avoid mortality of seedlings

- Treatment of seeds with Trichoderma viride (1g/150 g of seed) to avoid damage from damping-off disease
- Sowing of seeds (150 g for 1 acre cultivation) in nursery bed in lines spaced at 5-10 cm, and at a depth of 1-2 cm, with 2 cm spacing between successive seeds
- Covering of seed bed with a fine layer of soil followed by light watering, and then covering with dry straw, grass, sugarcane leaves or thin white plastic sheet to maintain required temperature and moisture till germination
- Nylon net protection for beds, if possible
- Transplantation of seedlings with spacing of 60 cm between rows and 50 cm distance between two successive plants
- Regular weeding and/or use of organic mulches to prevent growth of weeds
- Irrigation once in 7-10 days depending on the soil and weather conditions
- Application of 4% solution of neem seed extract on plants at 15 days interval to control fruit borer insect
- Use of neem based pesticides like neem cake, neem seed kernel extract (NSKE), neem leaf extract, neem oil to act as a repellent to pests, and/or use of biopesticides like Trichogramma

## *Potato Storage Methods*

- Room Storage: Potatoes are stored in single layers on sand in a room with a high plinth and good ventilation, and doors and ventilators fitted with insect-proof wire-nets. Frequent examination is necessary to discard tubers showing rotting symptoms.
- Pit Storage: Tubers are stored in pits 60-75 cm deep and 2.5 metre long and 1 metre wide. These pits are made in a cool shady place. Water is sprinkled inside the pit to achieve the cooling effect. After two days, neem leaves, dry grass or sugarcane trash is lined all round the pit from inside. Bamboo chimneys of 1.5 metre length are placed inside the pit 1 metre apart for facilitating evaporation of the moisture deposited due to transpiration of the stored tubers. Pits are then filled with tubers leaving 15 cm on top followed by a one-foot layer of dry grass. A thatch is provided over the pit as protection from rain and sun.

## *Preparatory Steps for Collective Business*

Any business initiative by rural groups of farmers/producers who have been traditionally remote from mainstream business activities has to be preceded by considerable preparatory work including:

- Generation of awareness about the benefits of collective business
- Identification of groups with high interest and willingness to take the risk (discussed below)
- Exposure visits for gaining familiarity with markets
- Business planning, based on cost and price trends
- Determination of roles for different group members in business operations
- Establishing relationships with reliable input suppliers and bulk buyers

- Identification and grooming of group leaders and building their capacity for conducting group meetings, resolving disputes, record-keeping, basic auditing, and communication and negotiation with market players
- Building group's knowledge and skills about technologies involved and quality control practices
- Determination of minimum volumes required to make transportation of produce to wholesale market viable (as per payload capacity of vehicle chosen for transportation, vehicle-hiring cost and other factors)
- Selection and preparation of sites for storage/processing
- Arranging finance for proper storing/weighing/processing facilities and transportation
- Obtaining, if applicable, license for trading or manufacture
- Planning collection/procurement on inputs
- Fixing of purchase price in case some produce or raw material is to be bought from outside the group, to make up for any shortfall (as per payload capacity of vehicle chosen for transportation)
- Fixing of distress sale price, in case of unforeseen circumstances such as damage to produce due to rain, slump in market prices, etc.
- Fixing of profit-sharing ratio and mechanism, keeping in mind working-capital need for next season, and reserves needed to cushion impact of shocks

Groups have to be ready to bear the following risks:

- Opposition from middlemen, who may instigate dissent within village/group, physically obstruct aggregation and collective marketing, or use measures like boycott of entire villages
- Reduced or even nil availability of produce in some seasons due to weather fluctuations
- Slump in wholesale market prices due to high supply
- Loss of stored produce due to theft, moisture, rain, bacterial/fungal infection.