Problem Identification and Action Plan Preparation at Village Level: A Detailed PRA Exercise

Soumen Naskar, Sajeev, M.V., Gouranga Biswas, Narottam Kumar Meena & Ram Swarup Jat.

The article below presents results of a PRA exercise conducted at Sohenkhera village of Chittorgarh district of Rajasthan to understand various researchable, development and extension gaps existing in the village and to formulate solution to the researchable problems related to agriculture to address the needs of the farmers. The article provides detailed methodology of utilizing 26 PRA tools and analyzing them to reach at conclusions. The methodology of problem identification and making of problem tree and solution tree and final action plan is also given in detail.

1.   Basic information of the village

Key Informants: Mohd. Rafeeque, Ratan Lal Jat, Gopu Jat, Bhaironlal Jat, Narayan Gayari, Kishan Gayari, Amarchand Lohar.

Basic information about the village was collected from the villagers (KIs), which constituted the primary data. The local panchayat member Mr. Mohd. Rafeeque helped a lot in gathering the primary data. Apart from this the secondary data were collected from the Agriculture Department, Panchayat Office, Patwari of Revenue Department, Veterinary Officer, KVK, Chittorgarh, Bio-resource Centre of MPUAT and Bhadsoda Sanwaliaji Mandir. The primary and secondary data collected from different sources were then crosschecked by triangulation between different stakeholders.

Name of the village   :   Sohenkhera

Gram Panchayat   :   Bagund

Panchayat Samiti   :   Bhadesar

Uptehsil   :   Bhadsoda

District   :   Chittorgarh

State   :   Rajasthan

Climate

Mean annual rainfall- 1100 mm (2006)

Annual temperature Range- 13-45° C (Max. 45° C, Min. 1° C)

Relative humidity: 20%

Scientist Probationers, 80th FOCARS, NAARM, Hyderabad and presently Scientists at NRC on Pig, Gauhaty, Assam, Zonal Project Directorate, Zone - III, Barapani, Meghalaya, CIBA, Kakdwip, West Bengal, NRC on Orchids, Pakyong, Sikkim and NRC on Groundnut, Junagarh, Gujarat respectively.

Geographical coordinates (in hectares)

Total area- 412.87

Cultivated area- 332

Irrigated area- 138.14

Residential area- 6.07

Other area: Fallow land: 35.16

Pasture land: 35.05

Panchayat land: 3.25

Demographic pattern

Total household number   -   99

Total number of families   - 124

Number of joint families   - 109

Number of nuclear families   -   15

Total population   - 530

Number of male   - 263

Number of female   - 267

Literacy- 31.35% (Male- 51%, Female- 12%)

Community categorization

Number of Muslim families- 11

Number of Hindu families- 113

Number of tribal families- 5

Name of tribe(s) - Bheel

Major caste structure- Gayari & Jat (OBC)

Major social occupation- Agriculture & animal Husbandry

Occupational distribution of family

Families engaged in agriculture- 121

Families engaged in agriculture + business- 1

Families with government service (+Animal Husbandry): 2

Agricultural scenario

Land distribution (in hectares):

Kharif- 189 (0.18 I + 188.82 UI)

Rabi- 147.48 (138.14 I + 9.34 UI)

Summer- 1.56 (I), (I-Irrigated, UI- Unirrigated)

Average land holding per household- 2.9 Hectare

Largest land holding by any person- 8 Hectare

Kharif crops (in hectares for 2005-2006)

Maize- 137.26(UI)

Black Gram- 3.28(UI)

Sesame- 0.34(UI)

Groundnut- 39.86(UI)

Soya bean- 2.3(UI)

Lucerne- 0.17(I)

Sorghum (fodder)- 5.78(UI)

Total area cultivated (Hectares) - 0.17 (I) & 188.82 (UI)

(I-Irrigated, UI- Unirrigated)

Rabi crops (in hectares for 2005-2006)

Wheat- 35.32(I)

Barley- 2.47(I)

Chick pea-5.24(I)

Fenugreek- 1.22(I)

Mustard- 93.61(I) & 3.94(UI)

Taramira- 0.16(UI)

Potato- 0.5(I)

Onion- 0.11(I)

Lucerne- 3.73(I)

Total area cultivated (Ha) - 138.14(I) & 9.34(UI)

(I-Irrigated, UI- Unirrigated)

Summer crops (in hectares for 2005-2006)

Sorghum fodder- 0.05(I)

Ground nut- 1.51(I)

Total- 1.56(I) (I-Irrigated)

Highest recorded yield/hectare   :   Wheat- 50 qtl.

Mustard- 23 qtl

Maize- 28 qtl

Chick pea- 14 qtl

Total cropped area: 332 ha

Water sources

Wells- 26, tube wells- 1, water harvesting structure- 10.8 ha (Aug-Nov)

Fish species found

Murrells, minnows, spiny eels, glass fish and barbs (during monsoon).

Animal Husbandry

Cattle: 234 (Breeding bull- 5, Bullock- 158, Desi cow- 63,

Crossbred cow- 8)

Buffalo: 303 (Breeding bull- 2, Bullock- 50, She buffalo- 251)

Sheep: 103 (Ram & young male- 15, Ewe & young female- 88)

Goat: 332 (Buck & young male- 46, Doe & young female- 286)

Horse: 12 (all mare)

Poultry: 10 (2 cock, 8 hen)

Major breeds of livestock & poultry

Cattle- Nagori, Nimari, Jersey & HF crossbred nondescript

Buffalo- Nondescript, upgraded stock with Surti (earlier) & Murrah (ongoing), Pure Murrah

Sheep- Nondescript, Sonadi

Goat- Marwari, Jhakrana, Sirohi (Deogarh) pure & crossbred, nondescript

Horse- Kathiawari

Poultry- Nirbhik

Average milk, meat & wool yield

Cattle: Crossbred- 5-7 litre/day, Nondescript- 2-2.5 litre/day

Buffalo: Murrah- 6.5 litre/day, Nondescript (with Surti) - 4-5 litre/day

Goat- 20-22 Kg at one year

Sheep- 200-250 gm wool/shearing, three shearing/year

Grasses: *Cyanodon dactylon*, sudan, napier, doob.

The basic information collected from primary and secondary sources show that the village is entirely dependent on agriculture and animal husbandry for the livelihood. The farmers are taking crops in all the three seasons and animal husbandry is also practiced along with. Almost all the kharif and rabi crops are cultivated regardless of the productivity. The same situation is there with respect to rearing of animals. Joint families dominate in this village where all caste and religious people are living harmoniously. The literacy level is very low among the villagers especially with respect to women.

2.   **Village Transect**

> **Key Informants:** Md Rafeeque, Narayan Gayari, Ganeshlal Gayari, Bhalla Jat, Gangaram Gayari.

High land in the village	Field visit
Intercropping (Lucerne+Papaya)	Villagers traveling atop bus

Transects are systematic walks with key informants through the area of interest, observing, asking, listening, looking, and seeking problems and solutions. The main objective of the transect walk is to understand and study the major land uses, topography, water resources, natural vegetation and different ecological zones by observing, interacting and discussing with the KIs, while walking in the deciding direction. The findings can be mapped on a transect diagram. Most transect walks result in the outsiders discovering surprising local practices such as indigenous conservation practices, multiple uses of plants, and a great variety of crops. It has been instructive for many professionals to realize how much they do not see or do not think to ask about. The items for discussion include topics such as soil type, water resources, crops, vegetables, fruit plants, trees and shrubs, forages, animals, land use pattern, interventions, problems and opportunities. The village transect of Sohenkhera is presented along with.

VILLAGE TRANSECT :

KIs:
Md Rafique
Narayan Gayari
Ganeshlal Gayari
Bhalla Jat
Gangaram Gayari

	High Land	Medium Land	Low land
1. Soil type	Sandy loam	Clayey loam, Black cotton soil	Black soil, Saline soil
2. Water resources	Nil	Wells & tube wells	Pond water (seasonal)
3. Crops	Nil	Wheat, Mustard, Ground nut, Chickpea	Wheat
4. Vegetables	Nil	Tomato, Broad beans, Cucumber, Chilly	Nil
5. Fruit plants	Nil	Mango, Lemon, Aonla, Ber, Papaya, Sehjana	Nil
6. Trees & Shrubs	Babul, Cactus, Ther-beri	Neem, Carange, Babul, Mahua, Palash, Eucalyptus, Amaltas, Chandan, Propopis, Bamboo	Nil
7. Forages	Babul leaves, Cynodon, Penisetum	Lucerne, Sudan grass, Napier grass, Doob grass, Dry fodder	Doob grass, Sudan grass
8. Animals	Nil	Cattle, Buffalo, Sheep, Goat, Horse, Poultry	Fish (Murrels, minnows) — seasonal only

Contd ......

This village is directly in contact with the KVK, Chittorgarh and MPUAT, Udaipur. Even though they have witnessed many technological interventions in agriculture and animal husbandry practices, majority of the high cost technologies were given to influential farmers only while the remaining farmers are still following improper crop and animal husbandry management practices which have pushed them to very poor living standards. The top down approach followed by the various development agencies involved has taken its toll on the poor of this village.

9. Land use pattern	Barren	Household, crops & animals	Crops (rabi)
10. Interventions	Nil	Water tank (Drinking), flour mill, Biogas plant, Vermicomposting, Smokeless chula, Improved crossbred animals, Maize sheller, Sprayer, Poultry	Water harvesting bundh
11. Problems	i) Soil erosion resulted in soil degradation ii) Water scarcity iii) Lack of vegetation cover	(A) HOUSE HOLD: i) No sewage drainage ii) Poor sanitary system (B) AGRICULTURE: i) Poor soil fertility (N Deficient) ii) Pest problems (rodent, termite, Harry caterpillar, Aphid, pod borer, stem borer, Grasshopper). iii) Wilt disease in chick pea, root rot in groundnut, powdery mildew. iv) Inadequate irrigation water v) No line sowing vi) No agroclinic (C) Livestock: i) Less fodder supply ii) Poor management practices iii) Very poor hygienic condition in animals iv) No veterinary aid centre	i) Poor soil fertility (Saline soil patches) ii) No pisciculture practice
12. Opportunities	i) Agroforestry ii) Growing grass iii) Development as pasture land	(A) HOUSE HOLD: Total sanitary programme (B) Agriculture: i) Rain water harvesting (in situ) ii) IPM Practices iii) Crop diversification iv) Quality seed production v) Lined irrigation channel vi) Drip irrigation system vii) Floriculture viii) Opening of agroclinic (C) Livestock: i) Cooperative dairy farming ii) Backyard poultry rearing iii) Biogas plant iv) Scientific husbandry	i) Short duration fish farming (3-4 months) ii) Cultivation of salinity tolerant varieties iii) Growing grass as fodder.

3.   Agro ecosystem map

KIs: Rameswar Gayari, Ratan Lal Jat, Umachand Gayari, Bhagavan Bheel, Basir Khan

Agro-ecological or agro-ecosystem map shows the macro and micro ecological (sub-systems) features in a village. The meteorological parameters like rainfall, temperature, relative humidity and the major flora and fauna of the village and the basic land use pattern such as crops, agro-forestry, forest cover, wasteland, animals and the natural resources like soil type, water resources (wells, river, channel, ponds etc.), common property resources (CPRs), use of locally available resources are depicted in this map. This map helps in the preparation of perspective planning for the village development.

Here the villagers were encouraged to draw the major land marks such as roads, boundaries, household area, low lying land and high lands first. Then based on the land topography they were asked to indicate soil types, crops, trees, animals, water resources etc.

The village Sohenkhera is situated in the Chittorgarh District of Rajasthan and surrounded by villages viz. Bhadsoda in the north, Bagund and Daulatpura in the east, Amarpura in the south and Sutharon ki Khera in the west. The maximum rainfall occurs during June- August which amounts to

around 1100 mm (2006). Average temperatures range between 13-45°C with the lowest of 1°C for a very short span during December-January. Average relative humidity prevailing here is 20%. There are high lands in two locations and it is characterized by sandy loam soil and sparsely covered by thin vegetation of Babul, Cactus and Zherberi. No crops and vegetables are grown here as there are no water sources. The household area, agricultural fields and pasture lands fall under the medium land category which covers the maximum portion of the village.

Clayey loam and black cotton soil of the medium land are used for growing wheat, mustard, maize, ground nut, chick pea, sorghum, black gram, sugar cane, fenugreek, garlic, lentils and vegetables like tomato, cucumber, chilly, broad beans etc. Irrigation is mainly with well water and in few areas with tube well water lifted through pumps. Organised orchard of fruit plants are not grown here. Fruit plants viz. lemon, mango, ber, papaya, sehjana, aonla are grown all over. Neem, carnage, babul, eucalyptus, prosopis, bamboo and cactus are the naturally growing trees of medium land. Lucerne and Napier grass are grown for fodder purpose and some naturally occurring grasses like sudan grass, doob grass and Panicum sp. are also available. Weeds such as *Cyanodon dactylum*, *Phalaris minor*, *Solanum nigrum* are found commonly. Babul trees and zherberi are common in pasture lands.

There is a small area of low lying land covering around 12 ha and mainly used for water harvesting during monsoon months. One artificial earthen bund was erected in one side of the low land to hold the water from catchment areas. Here water remains from August to November. Naturally occurring some fishes are found during the monsoon, these are minnows, murrels, spiny eels, glass

fish, barbs etc. No pisciculture practice is performed here since water remains for 3-4 months only and the water body is not an enclosed one. When water dries up during November wheat is cultivated here. Naturally growing grasses such as sudan grass, dhoob grass are found here. Black soil is prevalent in the low land and also there are some saline soil patches in between. No distinct forest is present in the village.

Mustard is the major crop cultivated during rabi season and it covers around 94 ha. The varieties grown are Vasundhara, Pusa Jaikisan and T59 (Varuna). The next important rabi crop is wheat covering 35 ha. Wheat varieties cultivated here are Raj 3765, Raj 4037, Raj 3077 and Lok 1. The other rabi crops are barley, chickpea (variety- Dahud yellow, Pratap Channa 1), fenugreek and lucerne fodder. The predominant kharif crops are maize, ground nut, soyabean, sorghum, black gram and sesame. Maize is the main crop of kharif season cultivated in 137 ha area. Commonly grown maize varieties are Navjot, Mahi Dhawal and Mahi Kanchan. Ground nut is cultivated both in the kharif and summer seasons covering around 40 ha and 2 ha respectively. Ground nut varieties, namely TAG-24 and DH-86 are grown here.

Cows (Nimari, Nagori, Jersey cross bred, HF crossbreed, non-descript), buffalo (non-descript, upgraded stock like Surti, Murrah), sheep (non-descrip, Sonadi), goat (non-descript, Marwari, Sirohi, Jhakrana), horse (kathiawari) are the animal species reared by farmers. Poultry (Nirbhik) promoted by MPUAT and KVK, Chittorgarh is reared as backyard enterprise. Farmyard manure is heaped in one place without following proper scientific practices and then later brought to the field.

There is ample scope to improve soil fertility status using village bio-resources. Crop productivity is relatively low but the farmers are unaware of it and they are satisfied with the present yield. Moreover, adopting the basic management practices which is presently lacking in animal husbandry will help the farmers in earning higher returns. Paucity of water is one of the major drawbacks in agriculture. If met up with, vegetable cultivation and floriculture can be promoted on a large scale in the village.

4. Resource Map

Key Informants: Rizia Begum, Pema Lal, Kishan Gayari, Sohan Kumar, Champalal Jat.

Resource map was drawn after collecting information by the active participation of KIs of different age groups including female. Resource map describes regarding main crops grown in the village, trees, animals, common property resources (CPRs), types of houses, school, farm implements, luxury and communication items, social resources like women groups, self help groups (SHG), local self government etc.

Land resources: The total geographical area of the village is 412.87 ha of which residential area covers only 6.07 ha and cultivated area is around 332 ha. Among the cultivated area, irrigation facilities are available in 138.14 ha.

Crops and crop based resources: Mustard is the main crop cultivated during Rabi season and it covers around 94 ha area. On an average 17-18 qtls/ha is harvested. The next important Rabi crop is wheat covering 35 ha land with average productivity of 45-48 qtls/ha. The other Rabi crops grown are barley, chick pea, fenugreek, lucerne fodder. The predominant kharif crops are maize

cultivated in around 137 ha area with average productivity of 25-28 qtls/ha. Other kharif crops are ground nut, Soyabean, sorghum, black gram, sesame etc. Ground nut is cultivated both in the kharif and summer season covering around 40 and 2 ha, respectively. Vegetables are grown for both household consumption and selling purposes. The vegetable crops cultivated are tomato, broad beans, cucumber, chilly.

Trees: Neem, Babul, Palash, Mango, Eucalyptus, Prosopis are found all over the village. There is no forest area in the village.

Fruit plants: The commonly occurring fruit plants of the village are Lemon, Mango, Papaya, Sehjana, Aonla etc. No organized fruit cultivation is seen here.

Animal resources: The village possesses about 63 desi cows, 8 crossbred cows, 163 bullock bulls, 52 male buffaloes, 251 female buffaloes, 105 sheeps, 355 goats and 6 horses. There is complete lack of scientific management practices in animal husbandry resulting in less income. Some backyard poultry are also reared by few families and this has recently been promoted by the KVK, Chittorgarh.

Common Property Resources (CPRs): There is pasture land in three places covering 35 ha area. Other CPRs include water supply tank, Choupal made by Gram Panchayat recently as a

meeting and resting place of villagers, temple, and two separate cremation grounds for Hindus and Muslims and a water harvesting bund constructed by Panchayat.

Government Institutions: There is one middle School (up to class VII) and one Anganwadi centre located beside the main road.

Water Sources: Source of irrigation is mainly by wells. There are 26 wells from which water is drawn by pumps. Also there are other sources of irrigation, namely tube well and water from low lying area harvested by the bund during monsoon months (August to November).

Types of houses: There are two types of houses- Kuchcha and Pucca. Kuchcha houses have earthen walls with roofing made of earthen tiles and these are generally owned by poor people, whereas the pucca or concrete houses are mainly owned by the rich villagers.

Farm implements and machinery: Animal driven implements like desi plough, bullock carts are found. Side by side six tractors (owned by rich farmers), six tractor trolley, six cultivators, eight disc plough, one foot sprayer, twenty eight sprinkler system, six tillers, six mould bored ploughs, five ferti-seed drills, three thrashers, and one maize sheller are owned by the villagers. Seventeen diesel and forty five electric pump sets are used for lifting the well water for irrigation purpose.

Luxury items: The village got electricity connection in 1970. TV, refrigerators, CD players and radios are mainly owned by rich and medium farmers.

Communication items: There is one WiLL (Wireless in Local Loop) telephone connection in the village. Mobile phones have already reached many farmers. For transportation purposes they use bicycles, motorbikes apart from tractor trolleys, auto rickshaws and private buses.

Self Help Groups (SHGs): There are six women SHGs existing in the village of which three were formed by the KVK, Chittorgarh, two were by Anganwadi Centre and one newly formed by the Bio-resource Centre, Bhadsoda Sawariaji Mandir. Now all these have been adopted by the Bio-resource Centre. The SHGs mainly has taken training on stitching, handicrafts, bag making, and other drudgery reduction efforts.

Shops: There are three small shops in the village. Two small grocery shops and one cycle repairing shop meet the villagers need to some extent.

There is scope of agricultural diversification in the village, but the major constraint is irrigation. New agricultural ventures like floriculture, vegetable cultivation are to be encouraged as these may give them more income.

5.   Seasonal Calendar

This is a calendar, which indicates month wise the activities related to agriculture and livelihood, specialties, threats, abundance, and shortage with regard to agriculture in a diagrammatic way. The items to be included in seasonal analysis must be of those items, which really affect the agriculture. This explores seasonal constraints and opportunities by diagramming changes, month by month throughout the year.

PARTICULARS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CROPS												
Wheat	Weeding Irrigation	Irrigation	Harvesting							Land preparation	Sowing Irrigation	Sowing late sown wheat 2nd top dressing Irrigation
Mustard	Irrigation	Harvesting								Sowing	Weeding Irrigation	Irrigation Pesticides spray
Groundnut		Sowing of **summer** crop	Irrigation Weeding	Irrigation	Irrigation	Harvesting Sowing of *kharif* crop	weeding	Pesticides spray	Irrigation	Harvesting		
Maize						Sowing	Sowing Weeding	Weeding Pesticides spray	Harvesting			
Others				Deep ploughing FYM application	Field preparation for *kharif* crops							
LIVE STOCK												
Cattle & Buffalo	← Daily management, Marketing of milk & young/adult animals, Health care, AI, Natural matting → (Free range grazing)											
Sheep	← Daily management, Free range grazing, Marketing of wool & young/adult animals, Health care, Natural matting →											

The main activities, problems and opportunities of the village were identified by using seasonal calendar. It depicts time-to-time crop related operations being carried out in the existing farm situation. Seasonal analysis helps in identifying the period which are critical in respect of labor demand, pest and disease problems, non-availability of fodder during dry months.

Key informants: Neema Ram Jat, Amarchand, Gayari, Rama Jat, Ganga Ram Gayari

6.   Gender Disaggregated Seasonal Calendar

The field activities are being done by both men and women. There are certain activities, which are carried out exclusively by men or women. So it is important to know those specific activities with regard any particular village.

Key informants: Hajari Lal Jat, Ghasi Gayari, Shankar Lal, Heera Lal

The Information regarding participation of men and women in various farm activities was collected by discussing it with them. The collected data was consolidated and presented in the form of a table. The problems associated with it were also analyzed based on the discussion.

7.   Seasonal Analysis

To know about the problems related to crops, vegetable, and livestock a seasonal analysis is carried out. In this method, the pests and diseases affecting various crops and vegetables are documented pertaining to their months of attack. Other information like availability of labor and fodder for animals are also recorded by involving the farmers. The information collected is depicted in the form of a table.

Key informants: Bhaira Chamar, Pratap Gayari, Gokal Gayari, Bhera Jat

8. Social Map

KIs: Ratan Lal Chaudhary, Narayan Gayari, Behra Lal Jat, Ganesh Lal Gayari, Mohd. Rafeeque

A. **Caste, Community & Religion:** Majority of the families at Sohankhera village are Hindu. Muslim is minority here with 11 families. People of nine different castes of Hindu religion, namely- Gayari, Jat, Regar, Chamar, Lohar, Sain, Vaishnav, Nayak and Bheel live here. Gayari and Jat (OBC) are more in number and Jat caste members wield maximum influence. Scheduled caste (e.g. Chamar) and scheduled tribe (Bheel) with few families have low presence socially. Muslim (Mirasi) community is relatively well of compared to them.

B. **Neighbourhood:** To the north of Sohankhera village, Bhadsoda (2 km away), a very prosperous village, is situated with all the amenities. In the east, Bagund and Daulatpura, in the south, Amarpura and in the west, Sutharan ki Khera are located.

C. **Family:** Joint families are more common with few nuclear families. Old people being family head in joint families draw respect and have their own say and tradition.

D. **Economy:** Agriculture with animal husbandry is the main source of income. More than 90% of the families depend on it for livelihood. Since draught is frequent visitor here, animal husbandry is very important. Twelve BPL families almost exclusively draw their livelihood from animal husbandry. Rich people of the village have business of agriculture implements along with large amount of land.

E. **Social Institutions:** Village temple (with limited access to lower class people) is important with the religious people of Sohenkhera. One newly constructed choupal forms the social bridge. One anganwadi centre and six SHGs (formed by KVK, Chittorgarh and Women Bio-resource Centre of MPUAT, Udaipur) have given voice to the women folk by providing training and developing entrepreneurship.

F. **Governmental Institutions:** One middle school (up to class VII) and one Anganwadi centre are the two government institutions here.

G. **Media of Communication:** Cycle, motorbike, cart and tractor (with trolley) are main mode of transportation. Few private buses operate here to go to the neighbouring places like Bhadsoda, Mandphiya. National highway 76 passes north to the village (2 km away) where good facilities of transportation exist for going to district head quarter (Chittorgarh) and Udaipur city. Mobile and land line phones are very few in number.

H. **Entertainment:** Radio and TV are popular mode of entertainment. One cinema hall at Mandphiya (5 km away) is sometime visited. No popular sports (like cricket and football) are played by the children and youth.

SOCIAL MAP
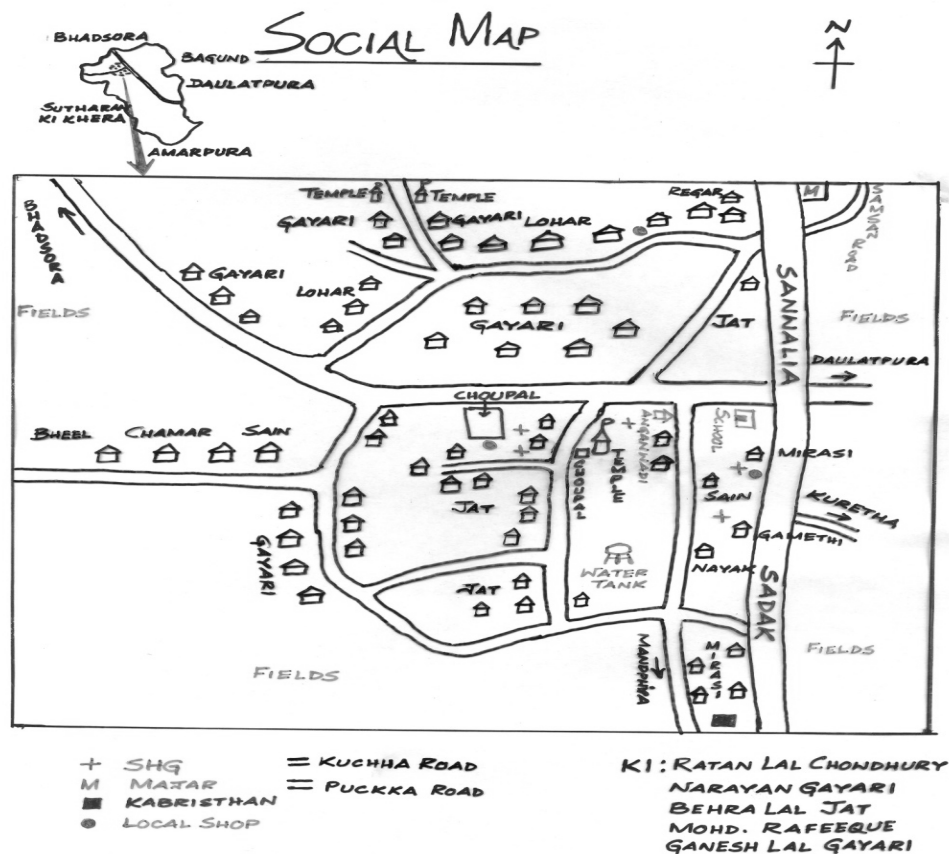
I. Educational Background: Low literacy (especially among women with just 12%), high school drop outs are serious concern and hindering the progress of the village. For quality education, they have to go to Chittorgarh (district head quarter and 35 km away) and Udaipur (88 km away).

J. Leadership Pattern: Panchayat system is fully functional here with one elected member from this village (from minority community). However, caste based leadership is more visible in daily life. One large farmer – Mr. Ratan Lal Jat draws respect and command across communities.

K. Value System: It is strong and relatively orthodox. Farmers from Jat community proudly boast that they would better die of hunger than to go for other labour work. Girls' education is not at all encouraged. Poor social status of the women in the village along with low encouragement for their education and rampant underage marriages sums up for the deplorable value system.

L. Social Cooperation: Fair degree of social cooperation exist as different communities live in perfect harmony and have unified voice to get different benefits from Governmental agencies. Accommodation of minorities by the majority in the village is praiseworthy.

M. **Status of Women and Children:** Very low level of literacy, limited exposure to outside world and superstitions make the women folk particularly vulnerable. Health care facilities are poor and at distant places. Hygiene of households is poor and practically there is no drainage system. All these factors along with malnutrition have a negative impact on average health of the children. With the formation of SHGs for women, the condition is fast changing.

N. **Social Evils:** The average age of marriage (Male 18-20 years & Female 14-15 years) is low. Reverse dowry is sometimes practiced in Jat and Gayari communities as the sex ratio is skewed against the women.

9. **Time Line**

KIs: Ratan Lal Jat, Gangaram, Bhairu Lal Jat, Ganesh Lal Gayari

Historical analyses have been found to be a good icebreaker for field exercises and include detailed accounts of the past, of how things have changed, particularly focusing on relationships and trends. These include technology histories and review, crop histories and biographies, livestock breed histories, labor availability, trees and forest histories, education change, and population change. Folklore and songs are valuable resources for exploring history.

We started our PRA exercise in the village with the time line tool. The interesting results are arranged in chronological order and presented below.

1700 AD	:	Establishment of Sohenkhera village
		(name due to goldsmith who settled here)
1955	:	Establishment of temple
1957	:	Bicycle
1960	:	Radio
1962	:	Fertilizers (Urea & SSP), fungicides, pesticides
1965	:	Bus service (Private: Udaipur to Avari Mata)
1966	:	HYVs (Wheat: Kalyan Sona, Maize: Sankar Makka)
1968-70	:	Drought
1970	:	Road, electricity
1972	:	Hand operated chaff cutter, motor pump
1975	:	Primary school
1977	:	Murrah buffalo, Sirohi goat
1980	:	Thresher (Wheat & maize)

1982	:	Hand pump, motor cycle (Rajdoot)
1990	:	Tractor (Massey Ferguson), TV
1991	:	Tractor trolley with compressor
1992	:	Jersey cow, Flour mill
1995	:	Bore well
1996	:	Water tank
1997	:	Seed drill, Power operated chaff cutter, Dish antenna, Cable TV
1998	:	Telephone (land line)
2000-04	:	Severe drought
2003	:	Mobile phone, Jeep
2004	:	Vasundhara variety of mustard, Smokeless Chulha
1980	:	Thresher (Wheat & maize)
2005	:	WLL
2006	:	Vermicompost, Auto-rickshaw & Van service,
2007	:	Biogas, Choupal

As shown in the time line, the village derived its name from the gold smiths who settled here. Surprisingly today they are not present here. This village presents a typical picture of a minority of innovative farmers introducing all the latest technologies from time to time. But all-weather roads, sanitary and drainage systems still eludes the village.

10.   Time Trend

Key informants: Sh. Ratan Lal Jat, Bhairu Lal Jat, Kalu Lal Gayari.

Time trend shows quantitative changes over the period of time and can be used for many variables of agricultural, livestock, poultry production, price, yield and area under cultivation.

Time trend for wheat and mustard production and prices

The production (Q/ha) and price (Rs/Q) of wheat is presented in the figure. There was steady increase in wheat production and its price during the last five years. During the year 2002 to 2004, the production was increasing slowly due to less availability of water and frost attack. Similar trend in term of production and price was also observed in mustard.
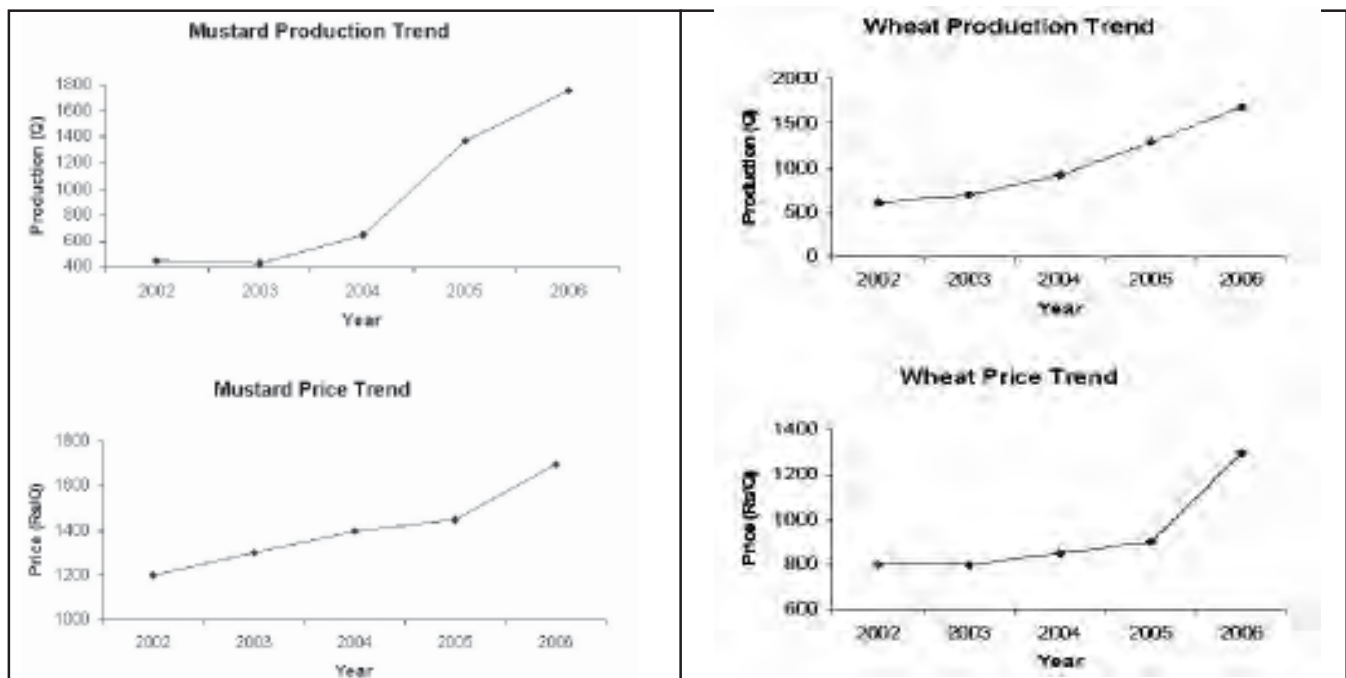
Time trend for milk and meat prices

The milk and meat price in Sohenkhera village for the last five years is presented in the figure. The trend of milk price was slightly in increasing order and similar trend was found in meat price over the years.

11.   Mobility map

Key informants: Sh. Ratan Lal Jat, Prithvi Raj Gayari, Md. Rafeeque.

The mobility map indicates the places to which the villagers go outside of their village for various purposes like purchasing agricultural inputs, family needs, animal husbandry needs, getting higher education, medical needs, social relations and recreation etc.

Mobility map indicates

1.   Places to which the villagers go for various purposes.

2.   Direction of the place situated.

3.   Mode of transportations.

4.   Distance of the place from the village.

5.   Cost of mobility in term of money spent etc.
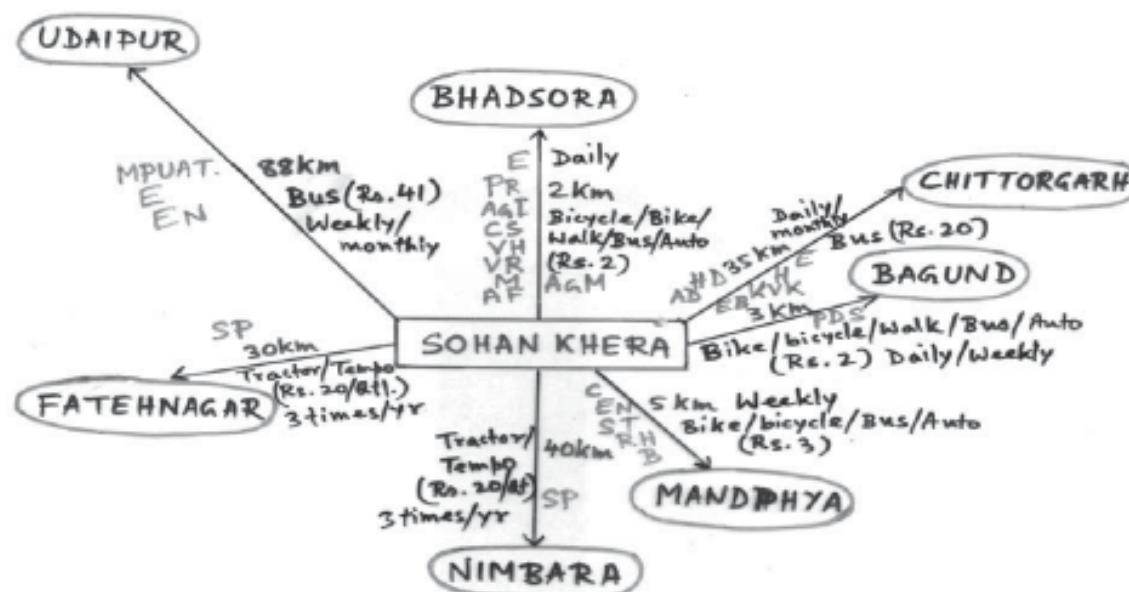
All the people of the Sohenkhera village frequently visit nearby Bhadsoda for purchasing agricultural inputs, repairing motorbike, selling milk, veterinary medicine, loan etc. They mostly go to either Fatehnagar or Nimbara for selling agriculture produces. They visit Mandphiya for availing hospital, Bank and court facilities. Chittorgarh is the district head quarter where villagers go for

higher education, contacting KVK, Horticulture dept. and other administration work purposes. Udaipur is 88 km away from the village. Villagers go to Udaipur for visiting the MPUAT regarding their agricultural problems, getting higher education and also having some entertainments.

Sl. No.	Place of travel	Dis- tance (km)	Purpose	Mode of transport	frequency of travel	Cost of traveling
1.	Bhadsoda	2	Animal feed & medi- cine, agri implements, cooperative society, milk selling, agri inputs, provisions, education, veterinary hospital, vehicle repair	Bicycle, bike, walk, bus, auto	Daily	Rs. 2
2.	Chittorgarh (Dist Hq)	35	Administration works, education, health, Horticulture Dept, KVK, Electricity Board	Bus	Daily, monthly	Rs. 20
3.	Bagund	3	Public Distribution System (Ration shop)	Bicycle, bike, walk, bus, auto	Daily, weekly	Rs. 2
4.	Mandphiya	5	Bank (LDB), entertainment (theatre), court, referral hospital, Sanwaliji temple	Bicycle, bike, bus, auto	Weekly	Rs. 3
5.	Udaipur	88	MPUAT, education, entertainment	Bus	Weekly, monthly	Rs. 41
6.	Fatehnagar	30	Selling of agri produce (Mandi)	Tractor, tempo	3 times/ year	Rs. 20/ Qntl
7.	Nimbara	40	Selling of agri produce (Mandi)	Tractor, tempo	3 times/ year	Rs. 20/ Qntl

12. Venn diagram

Key Informants: Bhansilal Lohar, Kalu Gayari, Narayan Gayari, Sholaji Regar, Devji Gayari, Chuna Gayari, Rajeswar Jat, Govind Regar, Sankar Jat, Hira Jat.

MOBILITY MAP:

UDAIPUR

BHADSORA

CHITTORGARH

MPUAT.
E
EN

88km
Bus (Rs.41)
Weekly/
monthly

E Daily
PR 2km
AgI Bicycle/Bike/
CS Walk/Bus/Auto
VH (Rs. 2)
VR
M AgM
AF

Daily/
month
Bus (Rs. 20)

BAGUND

HD 35km
AD 3km
EB KVK
PDS

SP
30km
Tractor/Tempo
(Rs. 20/all.)
3 times/yr

SOHAN KHERA

Bike/bicycle/Walk/Bus/Auto
(Rs. 2) Daily/Weekly

FATEHNAGAR

C
EN 5km Weekly
ST Bike/bicycle/Bus/Auto
RH (Rs. 3)
B

Tractor/
Tempo 40km
(Rs. 20/a)
SP
3 times/yr

MANDPHYA

NIMBARA

AD — Administration
AF — Animal Feed & Medicine
AgM — Agriculture Implements
AGI — Agri Inputs
B — Bank
C — Court
CS — Cooperative Society
E — Education
EB — Electricity Board
EN — Entertainment
H — Health
HD — Horticulture Dept.
KVK — Krishi Vigyan Kendra
M — Milk selling
MPUAT — Maharana Pratap University
of Agriculture & Technology

PR — Provisions
PDS — Public Distribution System
RH — Referral Hospital
SP — Selling of Agri Produce (Mandi)
ST — Sanwaliaji Temple
VH — Veterinary Hospital
VR — Vehicle Repair

KIs:
Ratanlal Jat
Prithviraj Gayari
Md. Rafique

Venn diagram is used for understanding institutional relationship with village and the villagers for a particular enterprise. Each circle represents individual/ institution and the size indicates the magnitude of influence.

Venn diagram is drawn to indicate the contributions of outside and inside agencies, organizations and individuals in the decision making process of the inhabitants as perceived by the villagers themselves.

Venn diagrams for two enterprises are given in next page.

i) Technology adoption for wheat

Purpose	Individual or Institution influencing
Technical information, technology diffusion, intervention, minikit distribution	MPUA&T, KVK, Chittorgarh, Ratanlal Jat (early adopter), Field Supervisor of Agriculture Dept.
Financial support (Kisan Credit Card, Short term credit)	Cooperative Society, Bhadsoda, outside money lenders, Land Development Bank, Mandphiya
Marketing	Whole sellers (75%) come at village, Mandi (25%) influences the price
Supply of inputs	Input shops and Cooperative Society at Bhadsoda

Though money lenders from outside influence much (lesser than the Cooperative Society) by extending immediate financial need for agriculture, but also take high interest on credit resulting in lesser profit to farmers. Till then, the farmers are going to them as they are getting money as per their needs in emergency. The credit procedure in Cooperative Society and Land Development Bank needs to be simplified so that the farmers can avail them as per their convenience.

ii) Dairy production

Purpose	Individual or Institution influencing
Technical information, interventions	KVK, Chittorgarh, Veterinary Officer, Bhadsoda
Treatments, animal insurance, AI	Veterinary Officer, Bhadsoda, Ganeshlal Gayari as quack in the village for treatment only
Financial help	Land Development Bank, Mandphiya for purchasing animals
Medicines	Veterinary Officer and medicine shops at Bhadsoda and Chittorgarh
Milk marketing	Hotels and sweet shops, Bhadsoda, private milk procurement firm comes at village and Private Dairies at Bhadsoda.

The villagers have good buffaloes having potential of high milk production. But due to lack of basic scientific management practices in animal husbandry, milk production in this village remains far below the expectation. There is no organized milk marketing. The cooperative dairy farming may solve the problem.

VENN DIAGRAM: DAIRY PRODUCTION

VO = Veterinary Officer
KVK = Krishi Vigyan Kendra, Chittorgarh
MS = Medicine Shop
GG = Ganeshlal Gayari
LDB = Land Development Bank
H&S = Hotels & Sweet Shops
P = Private Milk Procurement
PD = Privat Dairy

KIs:
Chuna Gayari
Rajeswar Jat
Govind Regar
Sankar Jat
Hira Jat
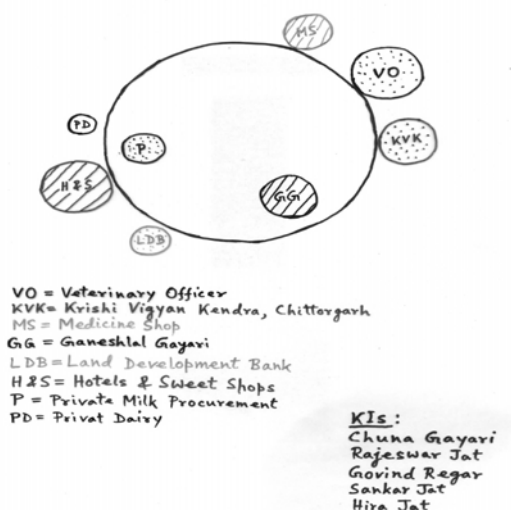
13. Wealth ranking

Wealth ranking refers to placing the people on different categories according to their own criteria. The purpose is to find out the persons of the village, who belong to the rich, middle, poor and very poor group categories as perceived by the villagers themselves. Wealth ranking is based on the assumption that the community members have a good sense about fellow villagers in their own village and are able to categorize themselves.

Agricultural development must take into account the differences in wealth among farmers in order to determine the priorities for research and to develop the interventions and technical packages that are to be adopted by the majority of the farmers.

Wealth ranking helps the extension workers, developmental staff, researchers and other concerned for rural and agricultural development to find out the inequalities and differences in wealth in every farmer and which in turn lead to overall understanding of socio-economic conditions of entire village community. This will also help in selecting the right type of beneficiaries for the various programmes. For wealth ranking of Sohenkhera village, list of all households is obtained from the village Panchayat Office, Bagund. The head of each household along with numbers of household members is written in separate small peace of card meant for wealth ranking. Four key informants (KI) viz. Shri Kalu Lal Gayari, Md. Rafeeque, Bhairu Lal Jat, Prithvi Raj Gayari who claimed to know each and every house in the village is asked separately to sort out the cards (having the name, no. of family members and household no.) into as many groups according to their own classification of different wealth classes. The criteria on which each KI was sorting the households was asked and noted separately. Each KI had full freedom to use as many numbers of categories as possible.

The categorization/classification, criteria as well wealth status of each household at Sohenkhera village according to the four KIs are given in the following table.

Categories according to KI (1): Kalu Lal Gayari

Sl. No.	Category	Criteria	Household No.
1.	Rich	Land>60 bigha Buffalo>10TV/Mobile	33, 63, 64, 94, 95, 96, 119, 120
2.	Medium	Land: 30-60 bigha Buffalo: 4-5TV/Mobile	3, 35, 37, 38, 41, 45, 48, 61, 62, 67, 68, 71, 79, 83, 103, 104, 118, 126, 127
3.	Poor	Land <30 bigha Buffalo <1-2Sheep/Goat	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 39, 40, 43, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 65, 66, 69, 70, 72, 74, 75, 76, 77, 78, 80, 81, 82, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 97, 99, 100, 101, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 121, 122, 123, 124, 125, 128, 128, 129, 131, 132, 133, 134

Categories according to KI (2): Md. Rafeeque

Sl. No.	Category	Criteria	Household No.
1.	Very rich	Land:50-70 bigha Buffalo>10tractor	3, 33, 37, 41, 48, 62, 63, 64, 67, 68, 71, 79, 94, 95, 96, 104, 119, 120
2.	Rich	Land:30-50 bigha Buffalo: 8-10	38, 45, 47,61, 62, 83, 103
3.	Medium	Land: 20-30 bigha Buffalo: 5-8 No. of house 2	7, 31, 32, 34, 35, 39, 40, 49, 58, 59, 69, 70, 61, 72, 74, 82, 88, 90, 93, 112, 116, 118, 126
4.	Poor	Land:10-20 bigha Buffalo: 2-5 Sheep/Goat	1, 2, 4, 5, 6, 9, 10, 13, 14, 22, 24, 25, 28,29, 30, 51, 54, 60, 65, 66, 75, 78, 89, 91, 92, 100, 107, 108, 109, 110, 111, 113,115, 117, 121, 122, 123, 124, 127, 128, 129, 132, 133, 134
5.	Very poor	Land <10 bigha Buffalo <2 Sheep/Goat	8, 11, 12, 15, 16, 17,18, 19, 20, 21, 23, 26, 27, 43, 50, 52, 53, 55, 56, 57, 76, 77, 80, 81, 84, 85, 86, 87, 97, 99, 101, 114, 125, 131

Wealth ranking by KI 1

Wealth ranking by KI 2

Wealth ranking by KI 3

Livelihood analysis of a very poor farmer

Categories according to KI (3): Bhairu Lal Jat

Sl. No.	Category	Criteria	Household No.
1.	Rich	Land >30 bigha Buffalo >5Tractor Tube wellBike	3, 9, 33, 37, 38, 41, 45, 47, 48, 62, 63, 64, 67, 68, 71, 79, 83, 94, 95, 96, 103, 104, 116,118, 119, 120, 122, 126
2.	Medium	Land: 20-30 bigha Buffalo: 4-5Well	7, 11, 14, 31, 32, 34, 39, 40,70, 74, 82, 88, 90 112
3.	Poor	Land: 6-20 bigha Buffalo: 2-3	1, 2, 4, 5, 6, 10, 15, 16, 17, 25, 26, 30, 49, 51, 54, 66, 69, 72, 75, 91, 92, 93, 100, 108, 109, 110, 111, 113, 115, 117, 121, 128, 132, 133, 134
4.	Very poor	Land <5 bigha Buffalo <2	8, 12, 13, 18, 19, 21, 22, 23, 24, 27, 28, 29, 35, 43, 50, 52, 53, 55, 56, 57, 58, 59, 60, 65, 77, 78, 80, 81, 84, 85, 86, 87, 97, 99, 101, 107, 114, 123, 124, 125, 127, 129, 131

Categories according to KI (4): Prithvi Raj Gayari

Sl. No.	Category	Criteria	Household No.
1.	Rich	Land >30 bighaBuffalo >5Pucca house TractorBike Gold	3 33, 48, 63, 64, 69, 94, 95, 96, 103, 118, 119, 120, 123, 126
2.	Medium	Land: 15-30 bigha Buffalo: 4-5Pucca house Bike	7, 35, 37, 38, 41, 61, 62, 67, 68, 71, 83, 91, 104, 116
3.	Poor	Land: 5-15 bigha Buffalo: 2-3Kacha house	1, 4, 6, 9, 10, 11, 15, 31, 32, 34, 39, 40, 45, 47, 48, 79, 90, 93, 100, 109, 110, 111, 112, 121, 122, 124
4.	Very poor	Land <5 bighaBuffalo <2 Kacha house	2, 5, 8, 12, 13, 14, 16, 17, 18, 19, 20, 21,22, 23, 24, 25, 26, 27, 28, 29, 30, 43,49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 65, 66, 72, 74, 75, 756, 77, 78, 80, 81, 84, 85, 86, 87, 92, 97, 99, 101, 107, 108, 113, 114, 117, 125, 127, 128, 129, 131, 132, 133, 134

Scoring of households:

Scores were given to various households according to the following formulae:

Score= n+1-Ci/nX100

Where, n= Total no. of categories made by KIs

Ci= i[th] category in which a particular household placed by the KIs

Then average wealth score for each household is calculated by the formulae:

Average wealth score = Score of KI-1+KI-2+KI-3+Ki-4/4

Since different KIs used four nos. of wealth categories,

Average no. of wealth categories= Sum of no. of categories used by each KI/Total no. of KI

Categories =3+5+4+4/4 =4

The four categories are:

1. Rich
2. Medium
3. Poor
4. Very poor

All the households at Sohenkhera village are to be categorized into these four categories. All the wealth categories should have equal interval of scores. This can be calculated as follows:

Correction factor = (Max. – Min. score)/wealth category

CF = (100 - 25.75)/4 = 18.56

100 -18.56 = 81.44

81.44 -18.56 = 62.88

62.88 -18.56 = 44.32

Thus the score ranges for different categories are as follows

Sl. No.	Category	Score range
1.	Rich	81.44 to 100
2.	Medium	62.88 to 81.44
3.	Poor	44.32 to 62.88
4.	Very poor	25.76 to 44.32

The common criteria identified for wealth ranking in Sohenkhera village

Sl. No.	Common criteria	Rich	Medium	Poor	Very poor
1.	Land owned	>30 bigha	20-30 bigha	5-20 bigha	<5 bigha
2.	Buffalo	>5	4-5	2-3	<2
3.	Sheep/Goat	-	-	5-10	<5
4.	Tractor	One	-	-	-

Based on the score range and categories, the final wealth ranking table for the village is prepared (household kept blank when could not be identified by KI).

Wealth score of house holds of Sohenkhera village

House No.	Head of house hold	KI-1	KI-2	KI-3	KI-4	Avg. Score	Wealth category
1.	Onkar Gayari	33	40	50	50	43.25	Very poor
2.	Mangu Lohar	33	40	50	25	37.00	Very poor
3.	Udailal	66	100	100	100	91.50	Rich
4.	Uda Chamar	33	40	50	50	43.25	Very poor
5.	Dhapu Gayari	33	40	50	25	37.00	Very poor
6.	Bhagwan Gayari	33	40	50	50	43.25	Very poor
7.	Nimaram Jat	33	60	75	75	60.75	Poor
8.	Sarif Mohd	33	20	25	25	25.76	Very poor
9.	Amar Chand	33	40	100	50	55.75	Poor
10.	Shankar	33	40	50	50	43.25	Very poor
11.	Nagjiram	33	20	75	50	44.50	Poor
12.	Gokul Bheel	33	20	25	25	25.76	Very poor
13.	Hakim Khan	33	40	25	25	30.75	Very poor
14.	Gangaram	33	40	75	25	43.25	Very poor
15.	Nangjiram	33	20	50	50	38.25	Very poor
16.	Mewa Regar	33	20	50	25	32.00	Very poor
17.	Bhola Regar	33	20	50	25	32.00	Very poor
18.	Chunni Bai	33	20	25	25	25.76	Very poor
19.	Lakhma Regar	33	20	25	25	25.76	Very poor
20.	Bhairulal	33	20	25	25	25.76	Very poor
21.	Bhagwan Nai	33	20	25	25	25.76	Very poor
22.	Naran Jat	33	40	25	25	30.75	Very poor
23.	Jetun Bai	33	20	25	25	25.76	Very poor
24.	Ramlal	33	40	25	25	30.75	Very poor
25.	Shankar Nayak	33	40	50	25	37.00	Very poor
26.	Rameswar Nayak	33	20	50	25	32.00	Very poor
27.	Nanda Regar	33	20	25	25	25.76	Very poor
28.	Dalla Regar	33	40	25	25	30.75	Very poor
29.	Vardhu Lohar	33	40	25	25	30.75	Very poor

House No.	Head of house hold	KI-1	KI-2	KI-3	KI-4	Avg. Score	Wealth category
30.	Amarchand Lohar	33	40	50	25	37.00	Very poor
31.	Kajor Gayari	33	60	75	50	54.50	Poor
32.	Dalla Gayari	33	60	75	50	54.50	Poor
33.	Rama Jat	100	100	100	100	100	Rich
34.	Chatra Gayari	33	60	75	50	54.50	Poor
35.	Harli Bai	66	60	25	75	56.50	Poor
36.							
37.	Gangaram Gayari	66	100	100	75	85.25	Rich
38.	Kishore Gayari	66	80	100	75	80.25	Medium
39.	Rameswar Gayari	33	60	75	50	54.50	Poor
40.	Bhera Jat	33	60	75	50	54.50	Poor
41.	Hajarilal Jat	66	100	100	75	85.25	Rich
42.							
43.	Laxmilal	33	20	25	25	25.76	Very poor
44.	Ganesh Jat						
45.	Hiralal Jat	66	80	100	50	74.00	Medium
46.	Virdhichand						
47.	Narayan Jat	33	80	100	50	65.75	Medium
48.	Shankar Jat	66	100	100	100	91.50	Rich
49.	Ghasi Gayari	33	60	50	25	42.00	Very poor
50.	Sardar Khan	33	20	25	25	25.76	Very poor
51.	Rameswarlal	33	40	50	25	37.00	Very poor
52.	Govind	33	20	25	25	25.76	Very poor
53.	Bhagchand	33	20	25	25	25.76	Very poor
54.	Kishan Gayari	33	40	50	25	37.00	Very poor
55.	Amir Khan	33	20	25	25	25.76	Very poor
56.	Sardar Khan	33	20	25	25	25.76	Very poor
57.	Aziz Khan	33	20	25	25	25.76	Very poor
58.	Shankar Gayari	33	60	50	25	41.25	Very poor
59.	Kishan	33	60	50	25	21.25	Very poor

House No.	Head of house hold	KI-1	KI-2	KI-3	KI-4	Avg. Score	Wealth category
60.	Narayan Nai	33	40	50	25	37.00	Very poor
61.	Heera	66	60	-	75	67.00	Medium
62.	Bhairu	66	100	100	75	85.25	Rich
63.	Harlal Jat	100	100	100	100	100	Rich
64.	Bhagwan Jat	100	100	100	100	100	Rich
65.	Badridas	33	40	25	25	30.75	Very poor
66.	Shankardas	33	40	50	25	37.00	Very poor
67.	Gopu Jat	66	100	100	75	85.25	Rich
68.	Gokal Gayari	66	100	100	75	85.25	Rich
69.	Navanram	33	60	50	100	60.75	Poor
70.	Mangilal	33	60	75	-	56.00	Poor
71.	Gangaram Jat	66	100	100	75	85.25	Rich
72.	Udailai Gayari	33	60	50	25	42.00	Very poor
73.							
74.	Bhaira Chamar	33	60	75	25	48.25	Poor
75.	Madhu Lohar	33	40	50	25	37.00	Very poor
76.	Appar Khan	33	20	-	25	26.00	Very poor
77.	Nola Regar	33	20	25	25	25.76	Very poor
78.	Shankarlal Gayari	33	40	25	25	30.75	Very poor
79.	Narayan Gayari	66	100	100	50	79.00	Medium
80.	Kashiram	33	20	25	25	25.76	Very poor
81.	Bhagwan Bheel	33	20	25	25	25.76	Very poor
82.	Pratap Gayari	33	60	75	-	56.00	Poor
83.	Bhairalal Gayari	66	80	100	75	80.25	Medium
84.	Bhanwar Khan	33	20	25	25	25.76	Very poor
85.	Muneer Khan	33	20	25	25	25.76	Very poor
86.	Naranilal Bheel	33	20	25	25	25.76	Very poor
87.	Bhagawandas Bheel	33	20	25	25	25.76	Very poor
88.	Ganeshlal	33	60	75	50	54.50	Poor
89.	Mohan	33	40	-	-	36.50	Very poor

House No.	Head of house hold	KI-1	KI-2	KI-3	KI-4	Avg. Score	Wealth category
90.	Prithviraj Gayari	33	60	75	50	54.50	Poor
91.	Jeetmal	33	40	50	75	49.50	Poor
92.	Bhairu Nayak	33	40	50	25	37.00	Very poor
93.	Ramu Jat	33	60	50	50	48.25	Poor
94.	Bhaira Jat	100	100	100	100	100	Rich
95.	Shyani Bai	100	100	100	100	100	Rich
96.	Shankarsingh	100	100	100	100	100	Rich
97.	Rais Mohd	33	20	25	25	25.76	Very poor
98.	Madanlal Gayari						
99.	Ramjan Khan	33	20	25	25	25.76	Very poor
100.	Ratanlal Gayari	33	40	50	50	43.25	Very poor
101.	Dalchand Nai	33	20	25	25	25.76	Very poor
102.	Rama Jat						
103.	Shankarlal	66	80	100	100	86.50	Rich
104.	Rameswar Jat	66	100	100	75	85.25	Rich
105.	Dalla Jat						
106.	Roduram Gayari						
107.	Gangaram Lohar	33	40	25	25	30.75	Very poor
108.	Onkarlal	33	40	50	25	37.00	Very poor
109.	Laluram	33	40	50	50	43.25	Very poor
110.	Roda Gayari	33	40	50	50	43.25	Very poor
111.	Narayan	33	40	50	50	43.25	Very poor
112.	Chuna Gayari	33	60	75	50	54.50	Poor
113.	Mangilal Gayari	33	40	50	25	37.00	Very poor
114.	Basir Khan	33	20	25	25	25.76	Very poor
115.	Bhairulal Gayari	33	40	50	-	30.75	Very poor
116.	Narayan Gayari	33	60	100	75	67.00	Medium
117.	Champalal Gayari	33	40	50	25	37.00	Very poor
118.	Sabairam	66	60	100	100	81.50	Rich
119.	Ratanlal Jat	100	100	100	100	100	Rich

House No.	Head of house hold	KI-1	KI-2	KI-3	KI-4	Avg. Score	Wealth category
120.	Lachhiram Jat	100	100	100	100	100	Rich
121.	Bhagwan	33	40	50	50	43.25	Very poor
122.	Amarchand	33	40	100	50	55.75	Poor
123.	Kaluram	33	40	25	100	49.50	Poor
124.	Sadhu	33	40	25	50	37.00	Very poor
125.	Bhera Nayak	33	20	25	25	25.76	Very poor
126.	Amarchand	66	60	100	100	81.50	Rich
127.	Shankar	66	40	25	25	39.00	Very poor
128.	Lakhma Gayari	33	40	50	25	37.00	Very poor
129.	Champalal Jat	33	40	25	25	30.75	Very poor
130.	Omkar						
131.	Shambudas	33	20	25	25	25.76	Very poor
132.	Rama Gayari	33	40	50	25	37.00	Very poor
133.	Naran Gayari	33	40	50	25	37.00	Very poor
134.	Lalu Gayari	33	40	50	25	37.00	Very poor

Wealth category of Sohenkhera village, District Chittorgarh in Rajasthan

Sl. No.	Category	Number of families	Percentage
1.	Rich	20	16.13
2.	Medium	7	5.64
3.	Poor	20	16.13
4.	Very poor	77	**62.10**

15.   Livelihood Analysis

Livelihood analysis refers to find out the degrees to which the pattern of life differs from one social class to another social class in term of size of family, size of landholding, type of house, implements, annual income, source of income, expenditure pattern, crisis management pattern, indebtedness etc. The livelihood analysis at Sohenkhera village was carried out after completion of wealth ranking. One representative villager from each of the wealth category (Rich, Medium, Poor and Very poor) was selected randomly.

The data on relevant information were collected from each of the categorized farmer which is explained in detail.

Variables	Rich (Ratan Lal Jat)	Medium (Pema Lal Gayari)	Poor (Ganeshlal Gayari)	Very Poor (Ganga Lohar)
Type of house	Pucca	Kuchcha	Kuchcha	Mud made
Family size	5	5	2	7
Men	2	2	1	3
Women	2	1	1	3
Children	1	2	-	1
Land holding	37 bigha	25 bigha	12 bigha	4 bigha
Nature of farming	Mixed	Mixed	Mixed	Mixed
Livestock: Buffalo Cow Sheep/goat	12 - -	4 1 -	3 - 5	1 1 2
Income source	Agriculture-50%, Business- 50%	Agriculture- 91%, Livestock- 9%	Agriculture- 97%, Ghee selling- 3%	Agriculture- 43%, Blacksmith- 43%, Credit- 14%
Expenditure	Agriculture- 30%, food- 20%, celebration- 20%, health- 5%, savings- 25%	Agriculture- 45%, food- 36%, clothes- 9%, education- 3%, livestock- 3%, health- 2%, savings- 2%	Agriculture- 33%, food- 17%, celebration- 14%, livestock- 16%, transport- 3%, health- 3%, savings- 15%	Agriculture- 15%, food- 70%, clothes- 15%

Among the four wealth categories, there is a clear cut indication in the type of house owned by the villagers. Rich category people have pucca houses and medium and poor category people of the village live in Kuchcha houses, whereas, very poor category people live in mud made houses. There is no marked difference in family size of rich, medium and poor category but slightly big family

was observed in very poor category people. Rich category invariably has more than 30 bigha land and more than 5 buffaloes, while many of the very poor category villagers have land size less than 5 bigha with less than two buffaloes. Regarding source of income, rich category villager has another source of income other than agriculture, while medium and poor category villagers are totally dependent on agriculture along with very poor families in the village (especially in Lohar community having 43% income from blacksmith works). There are almost uniform expenditure patterns among the different groups with slight difference. Poor category people spend more on food and clothing due to their bigger family size and less in entertainment and there is no way of saving in very poor category. All rich category people go for saving as LIC etc. and very poor category people borrow money from local money lenders for crisis management.

16. Bio-resources Flow Diagram

Bio-resource flow diagram reflects the inflow and outflow of farm products and its byproducts from and to the household. It explains the interrelationship between different farm enterprises that enables holistic planning for development of farm household.

Key informant: Bhairon Lal Jat

A typical village household was selected for this purpose. Based on the discussion with farmer's information regarding bio-resource flow from farm to household and vice versa was collected. During the study, all bio resources such as agricultural and animal produces as well as their by products and wastes were taken into consideration for the diagram construction. In addition, possible bio-resource interventions were also indicated in the diagram for efficient use of bio resources.

The key informant had agriculture components such as wheat, mustard, chick pea, maize, groundnut, papaya, aonla, ber and lemon and animal components cow, buffalo, bullock, goat and sheep on his farm.

Existing flow:

The farmer utilizes the wheat and maize fodder as feed for cow and buffalo. The mustard fodder is used for fuel purposes in the house. The husk of chickpea was fed to goats. The grains of wheat, mustard, chickpea, maize and groundnut are used in house & remaining sold in the market. The animals are fed the grasses from the pasture land. The dung of cow and buffalo are used as manure in the field and as fuel in the house.

Proposed flow:

Many of the animal and plant components were not recycled properly, so the key informant was given with the new bio resource flow. The proposed flow included utilization of crop residues, cow & buffalo dung and kitchen wastes and suggested to prepare the vermicompost and biogas. The dung & dry fodder can be used for the preparation of vermicompost. From the dung he can make biogas and from biogas, gas can be used in the cooking & slurry either for the preparation of vermicompost or as manure directly in the field. He can use kitchen wastes for the preparation of vermicompost that is an important organic fertilizer in the fields.

7.   Indigenous Technical Knowledge (ITK)

Key informants: Ganesh Gayari, Pema Lal, Prithvi Raj and Kishan Lal Gayari

Indigenous technical knowledge (ITK) is the information gained over a period of time and passed on from generation to generation by word of mouth. ITK is the sum total of knowledge and practices which are based on peoples accumulated experiences in dealing with situation and problems in various aspects of life. Such knowledge and practices are special to a particular culture.

ITK on Agriculture

Sl. No.	Practice	Purpose
1.	Neem leaves in granary	To control insects & pests
2.	Ash of cow dung in granary	To control insects & pests
3.	Ash of cow dung	To control chilli powdery mildew
4.	Ash of cow dung	To control insects in garlic field
5.	*Aloe vera* + cactus	As fencing around the fields

ITK on Animal Husbandry

Sl. No.	Practice	Purpose
1.	Feeding of excreta of pigeon	To cows to bring in heat
2.	Feeding of machis kept in roti	To buffaloes to bring in heat
3.	Butter milk applied to eyes	To stop excess tears in animals
4.	Red hot iron	Put in joints of dislocated limbs of cattle
5.	Feeding of neem leaves to new born calves	To control worms
6.	Feeding of mustard oil+hing+ water in the ratio1:1:1	To cattle in indigestion condition

ITK on Human

S. No.	Practice	Purpose
1.	Bark of Neem	Healing of wounds in Human beings
2.	Fig latex	To control skin dieses
3.	Saratha juice	To control menstrual problems in ladies

18.   Technology Map

The technology map depicts the technologies related to agriculture and allied sectors that are found in villages as well as technology adoption behaviour of farmers that indicates the technologies that are adopted, rejected, discontinued and reinvented for different crops, domestic animal and fish.

Technology behaviour includes the process of

1.   **Adoption:** It refers to use of technology by an individual for more than once. There are two types of adoption, namely active and passive adoption.

2.   **Over adoption:** It refers to continued adoption of a technology by an individual when experts feel that he or she should have rejected it.

3.   **Discontinuance:** It refers to decision to reject a technology after having previously adopted it. There are three types of discontinuance, namely replacement, disenchantment and forced discontinuance.

4.   **Reinvention:** It refers to the degree to which a technology is changed or modified by the user in the process of adoption.

5.   **Rejection:** It is of two types, namely active and passive rejection. Active rejection consists of considering adoption of technology (including even its trial) but then deciding not to adopt it. Passive rejection refers to the decision of not considering the technology at all from the moment of its hearing.

Technology map is one of the most important maps in PRA exercises necessary for preparing any research programme or extension programme. This gives a clue to the researcher about the type of technologies that should be developed in the technology development projects so that it will have better adoption rate.

Technology Map (Crop & Farm Power Machinery)

Sl. No.	Technology		Decision Behaviour	Reason
1.	Wheat	Raj 3765	Active adoption	High yield, more income, disease resistant
		Raj 3077	Active adoption	High yield
		Raj 4037	Active adoption	High yield, chapatti taste good
		Lok 1	Over adoption & Rejection	Moderate yield, good fodder yield
		Raj 1482	Replacement discontinuance	Low yield, less profit, susceptible to pest & diseases
		Raj 1485	Replacement discontinuance	Low yield, less profit
		Raj 1555	Replacement discontinuance	Low yield, chapatti taste poor
2.	Barley	RD 137	Active adoption	High yield, nematode resistant
		RD 2035	Active adoption	High yield, nematode resistant
		RD 103	Replacement discontinuance	Low yield
		RD 2552	Replacement discontinuance	Low yield
3.	Maize	Navjot	Active adoption	Hybrid, high yield
		Mahi Dhawal	Replacement discontinuance & over adoption.	Low yield
		Mahi Kanchan	Replacement discontinuance & over adoption.	Low yield

Sl. No.	Technology		Decision Behaviour	Reason
4.	Mustard	Bio 902	Active adoption resistant	High yield, disease
		Vasundhara	Active adoption	High yield
		T 59 (Varuna) discontinuance & over adoption.	Replacement	Low yield
		Pusa Bold	Replacement discontinuance & over adoption.	Low yield
		RH 30	Disenchantment discontinuance	Low yield
		RH 7	Disenchantment discontinuance	Low yield
5.	Chick Pea	Dahud Yellow	Active adoption yield, wilt resistant	High
		Pratap Channa	Passive adoption	Low yield
		C 235	Replacement discontinuance	Late variety, grows long
6.	Groundnut	TAG 24	Active adoption yield, disease resistant	High
		GG 2	Replacement discontinuance	Low yield
	DH 86	Replacement discontinuance	Low yield	
7.	Fertilizers & Chemicals	DAP, SSP, Urea, Endosulphan,	Active adoption yield, local availability, Furadon)	More protection against diseases
8.	Tractor	Massey Fergueson	Active adoption	Better & easy cultivation of land, labour saving

Sl. No.	Technology	Decision Behaviour	Reason
9.	FYM	Active adoption of soil, low cost, easy availability	Increased fertility
10.	Vermi compost ——	Yet to be assessed	
11.	Biogas Plant ——	——	Yet to be assessed

KIs: Bhairon Lal Jat, Narayan Gayari, Pema Lal, Mohd. Rafeeque, Kalu Lal

Technology Map (Animal Husbandry)

Sl No.	Technology	Decision Behaviour	Reason
1.	Crossbred (& upgraded) buffalo with Murrah breed	Passive adoption	More milk yield, 100% conception with AI, high fodder requirement, low fat%
	Native (with some Surti breed inheritance)	Over-adoption	Moderate milk yield, low fodder requirement, high fat%, milk taste good
2.	Crossbred cow (with HF & Jersey breed)	Passive adoption	High milk yield, high fodder requirement, limited pasture, low fat%
	Nagori bullock (or native upgraded with Nagori breed)	Active adoption	Very good for ploughing, hardy, disease resistant
3.	Sirohi Goat (Pure bred & crossbred)	Active adoption	Faster growth, more income, more milk yield, low production & labour cost, disease resistant
4.	Poultry (Nirbhik)	Active adoption	Low input, backyard farming, more egg production, cost effectiveness, disease tolerance
5.	Vaccination against FMD & HS	Active adoption	Low cost, easy availability, protection against disease, easy access to veterinarian
6.	Artificial Insemination	Passive adoption	High conception rate in buffalo, insufficient number of servicing male animal in village

KIs: Shankar Lal, Onkar Lal, Mangilal Gayari, Basir Khan, Bhairu Lal Gayari

19.   Matrix Ranking

Matrix ranking is used for learning about local people's categories, criteria, choices, and priorities. Matrix scoring takes criteria for the rows in a matrix and items for columns, and people complete the boxes row by row. The items may be ordered for each of the criteria (e.g., for six trees, indicate from best to worst for fuel wood, fodder, erosion control, and fruit supply); or participants may put stones, seeds, or berries into piles for relative scoring.

For the present study, the popular wheat varieties in the village were ranked based on the yield, price in market, taste of roti, grain quality, pest and disease resistance and fodder quality (criteria given by the farmers). The results show that Raj 3765 is the most preferred wheat variety based on these parameters. Next to that, the choice varieties are Raj 3765, Raj 3077 and Lok1. For taste of roti, Raj 4037 is preferred and for fodder purpose Lok 1 is grown.

On the same line, different crossbred species reared by the farmers were ranked based on production, milk price (based on fat %), taste, low reproductive problem, low disease incidence, low fodder requirement, natural service/ AI access and low cost of procurement of animals. Crossbred Goat (SirohiXLocal/Jhakrana/Marwari) is the most preferred species followed by crossbred buffalo (MurrahXLocal/Surti) and crossbred cow (Jersey/HFX Local/Nimari).

Farmers' reaction during matrix ranking

Crowd watching matrix ranking

Snow ball technique going on

Ranking of problems

20. Consequence Diagram

Consequence diagram of technology is a tool to assess the impact caused by any technology in terms of changes that occurs to an individual or society as a result of adoption or rejection. It helps to predict the consequence of similar technology so that positive consequences could be promoted and negative consequences could be minimized. It is also useful for developing the strategies how to reduce the negative effects of the technologies being used. Wheat is one of the most important rabi crops for Sohenkhera village as it meets their household consumption as well as contributes income and profit. The wheat variety Raj 3765 is the most widely accepted and extensively cultivated here. Its positive and negative consequences as felt by the farmers are shown below. Buffalo is the most commonly reared animal for milk production purpose. Murrah crossbred of buffalo is an important animal resource of this village. Its positive and negative impacts as realized by the farmers are also depicted below.

Technology: Wheat variety - Raj 3765

Low pest and disease incidence

Good grain quality

Good price in market

(+) High production/yield

Raj 3765

(–) Shedding of grains when harvesting is delayed

Needs more irrigation

KIs : Devji Gayari, Sholaji Regar, Champa Lal Jat.

Technology: Crossbred Murrah buffalo

100% conception with AI

More milk production (with better feed)

More lactation period

High reproductive performance

(+) Gives more manure

Crossbred Murrah

(–) Disease prone

More feed cost (more feed needed)

Low fat% in milk

KIs : Rodi Lalji Gayari, Mohd. Rafeeque, Geheri Lal Gayari

21.   Problem Identification

The problem identification exercise is done to address the following aspects:

1.   to identify the real problems faced by farmers

2.   to undertake research projects addressing the identified farmer problems

3.   to target the available and new technologies towards the problems

4.   to identify the various research, development and extension gaps and

5.   to refine, transfer and develop appropriate technologies.

It goes on parallel to the conduct of other PRA tools since it involves the snowball technique of moving from one farmer to other over a period of time. We used the snowball technique and elucidated ranking from 30 farmers on the various problems affecting agriculture and animal husbandry as listed by them.

During the process the farmers identified 16 problems affecting agriculture and animal husbandry. The problems are listed down as follows:

1.   CROP LOSS DUE TO FROST (WHEAT, MUSTARD AND CHICK PEA)

2.   INADEQUACY OF IRRIGATION WATER

3.   INFERIOR SEED QUALITY

4.   WATER SALINITY

5.   NON AVAILABILITY OF LABOUR

6.   UNEVEN FARM LANDS

7.   FOOT AND MOUTH DISEASE IN CATTLE

8.   DIARRHEA IN CATTLE

9.   TERMITE ATTACK IN FIELD

10.   RAT ATTACK

11.   LOW AVAILABILITY OF FODDER

12.   PEST ATTACK IN FODDER

13.   LACK OF IMPROVED FODDER VARIETIES

14.   DIARRHEA IN SHEEP

15.   LODGING IN CEREALS

16.   ELECTRICITY PROBLEM

The problems were subjected to ranking by the farmers. A maximum of up to 10 ranks were given by the farmers. The problem ranking matrix is given below.

Ranks / Problems	1	2	3	4	5	6	7	8	9	10
Crop loss due to frost	23	5	2	-	-	-	-	-	-	-
Inadequacy of irrigation water	4	7	6	6	5	1	-	-	-	-
Inferior quality of seed	-	7	10	4	5	3	-	-	-	-
Poor quality of irrigation water	-	-	-	2	-	-	-	-	-	-
Non availability of labour	-	-	2	10	4	2	6	2	2	-
Uneven farm lands	-	-	-	-	2	-	-	-	-	-
Economic loss due to										
FMD in cattle -	-	3	2	6	13	2	-	-	-	
Diarrhea in cattle	-	-	-	1	-	-	2	1	-	-
Termite attack in field	-	2	1	2	7	3	9	3	1	-
Rat attack in field	2	-	-	1	-	5	-	3	-	2
Low availability of fodder	-	-	-	-	-	-	1	1	9	5
Pest attack in fodder	-	-	-	-	-	-	4	5	4	-
Non cultivation of improved fodder varieties	-	-	-	-	-	-	-	2	2	11
Diarrhea in sheep	-	-	-	-	-	2	-	-	1	-
Lodging in cereals	1	5	4	1	1	-	1	-	-	1
Inadequate electricity supply	-	2	2	-	1	-	1	4	-	1

The above listed problems were then categorized by us in to researchable problems, development problem and extension problems. Later based on the above rankings, the RBQs (Rank Based Quotients) were calculated for each of the problems by using the formula:

$$RBQ = \frac{\sum f_i (n+1-i) \times 100}{n \times N}$$

Where,

f_i =   frequency (No:of farmers reporting that particular problem)

n   =   number of rank (rank given by farmer)

N   =   No:of farmers (30)

i   =   concerned ranks (1-10)

Later the VBI (Value Based Index) of the researchable problems were also calculated using the formula:

VBI = RBQ X total economic loss (average loss experienced x area under the crop(s) / no:of animals).

The categorization along with RBQ and VBI values are given below.

| Problem category	RBQ	VBI
Research Gaps		
Crop loss due to frost (Wheat, Mustard and Chick pea)	**98.06**	**198392**
Economic loss due to FMD	63.10	686
Extension Gaps	**RBQ**	**VBI**
Diarrhea in cattle	8.73	
Termite attack in field	76.85	
Rat attack in field	30.34	
Low availability of fodder	27.49	
Pest attack in fodder	25.61	
Non cultivation of improved fodder varieties	24.37	
Diarrhea in sheep	7.28	
Lodging in cereals	33.68	
Development Gaps	**RBQ**	**VBI**
Inadequate electricity supply	34.28	
Inadequacy of irrigation water	93.65	
Inferior seed quality	68.82	
Non availability of labour	67.07	
Uneven farm lands	25.00	
Poor irrigation water quality	5.41	

Based on the above calculation it was concluded that crop loss due to frost in wheat, mustard and chick pea during rabi season was the top most researchable problem in the village.

22.   Problem Tree (Causal Diagram)

After identifying the top most researchable problem in the village, the problem tree consisting the logical reasoning of the causal factors has to be drawn for it. The top most researchable problem identified was crop loss due to frost attack. This had created a huge quantum of loss in the village during the drought years from 2000 to 2006 but was left unrecognized by the line departments and research agencies as a major threat to crop production. During the initial triangulation it was written off entirely by the officials of line departments and university but later after several rounds of triangulation at different levels, it was proved without doubt that the temperatures in the month of January was dipping to near 0 degrees and this had caused frost attack in the location. Farmers tried to manage frost with indigenous methods but in vain.

During the drawing of problem tree farmers were again consulted and the possible reasons according to the perception of the KIs were also discussed. The scientists at district head quarters (KVK Chittorgarh) and FET center actively participated in the discussion. The field supervisor and members of nearby villages also gave their opinions regarding the issue and the problem tree drawn later considering all the view points. The problem tree came up as shown below:

Inability to judge frost onset by the farmers, poor frost management practices, failure to provide crop saving irrigation and cultivation of frost susceptible crop varieties were found to be the four major reasons for crop loss due to frost.
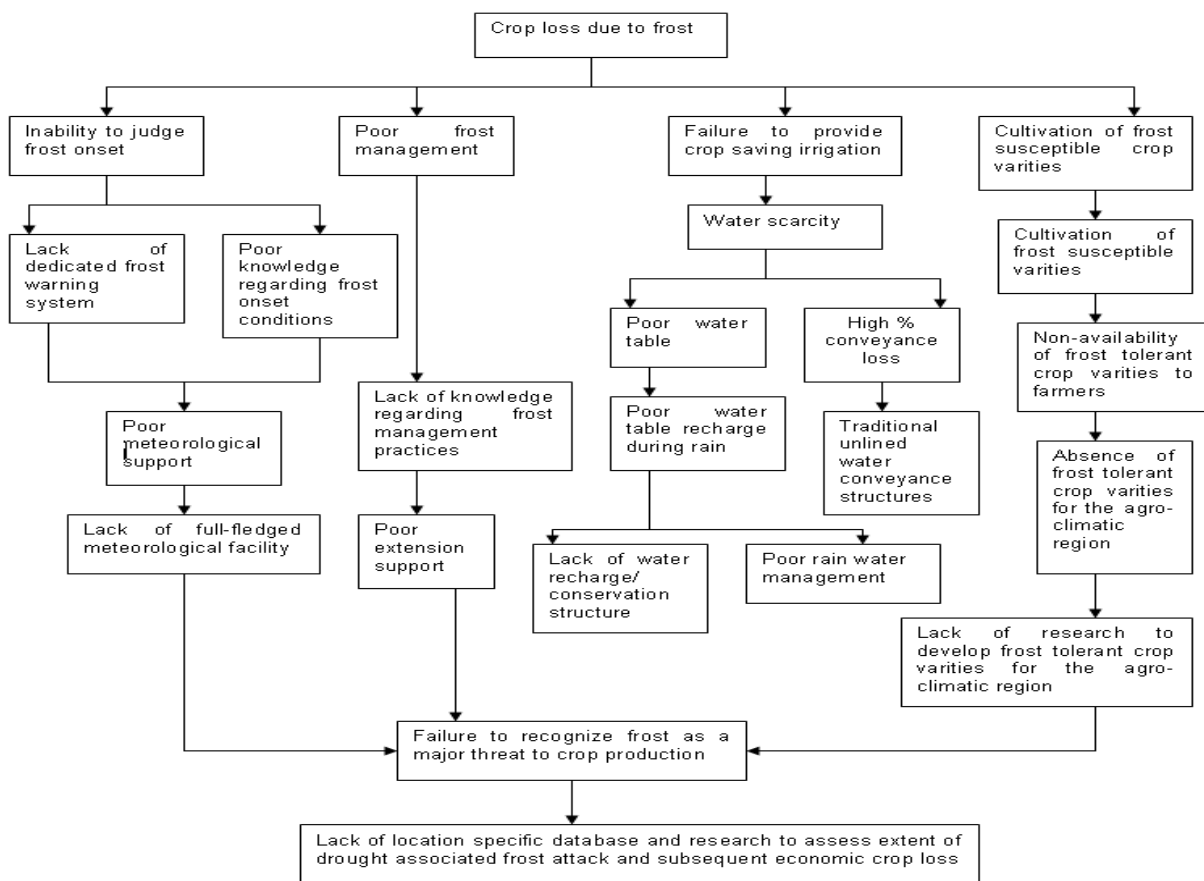
In case of inability to judge frost onset, poor knowledge regarding frost onset conditions and lack of dedicated frost warning system were the second level factors leading to it. Poor meteorological support to farmers during frost onset conditions due to lack of full fledged meteorological facility at district head quarters were the third and fourth level reasons behind this.

Poor frost management by farmers was due to lack of knowledge regarding frost management practices. This was due to the fact that the extension system failed to deliver information about the already available frost management practices like smoking and spraying of sulphuric acid and DMSO.

Failure to provide crop saving irrigation before the onset of frost has cost the farmers dearly. This was mainly due to the factor that frost occurred mostly during drought years and water scarcity was severe during drought years. This situation was aggravated by the poor water table level in the village and high percentage of conveyance losses. Poor water table was due to the poor water table recharge during rainy periods which in turn was caused by the lack of water recharge and conservation structures in the village and due to poor rainwater management. The high percentage of conveyance losses was due to traditional unlined water conveyance existing in the village.

Cultivation of frost susceptible crop varieties was the fourth reason and was directly due to the fact that there are no frost tolerant crop varieties developed for the region as such due to the lack of location specific research to develop frost tolerant crop varieties.

It was also found out that the underlying root cause for the reasons and sub reasons mentioned above are due to the failure to recognize frost as a major threat to crop production by research and line departments. This was again due to the fact that there was a total absence of location specific database and research to assess the extent of frost attack and the subsequent economic loss to farmers over the years.

23. Solution Tree

The solution tree for the problem of crop loss due to frost attack was also developed by later in consultation with the KIs and other villagers. For all the four first line problems identified in the problem tree the solution lied in addressing the root cause first. i.e. the creation of location specific database and research to assess the extent of frost attack and resultant crop loss. This will in turn lead to recognition of frost as a major threat to crop production in the area and as a researchable issue.

Establishment of full fledged meteorological facility at the district H.Q. level will help in assured meteorological support to farmers during frost onset conditions. This will help the establishment of a dedicated frost warning system and better farmer awareness regarding frost onset conditions. Both this will ultimately enable farmers to judge the onset of frost by themselves and thereby preventing the crop loss due to frost.

Better extension support to make available already existing frost management practices to farmers through training programmes at KVK will lead to capacity building of farmers and in turn will create awareness among farmers regarding frost management practices. This in turn will lead to adoption of frost management practices by farmers thus preventing crop loss.

In case of failure to assure the crop saving irrigation before frost attack, creation of water conservation structures in the village across the slope along with water recharge pits is a must. This will result in better water table recharge during rains and higher water table thus resulting in assured water supply during drought years. This will make sure that farmers have enough water for giving the life saving irrigation during the onset of frost.

Preventing economic loss due to frost
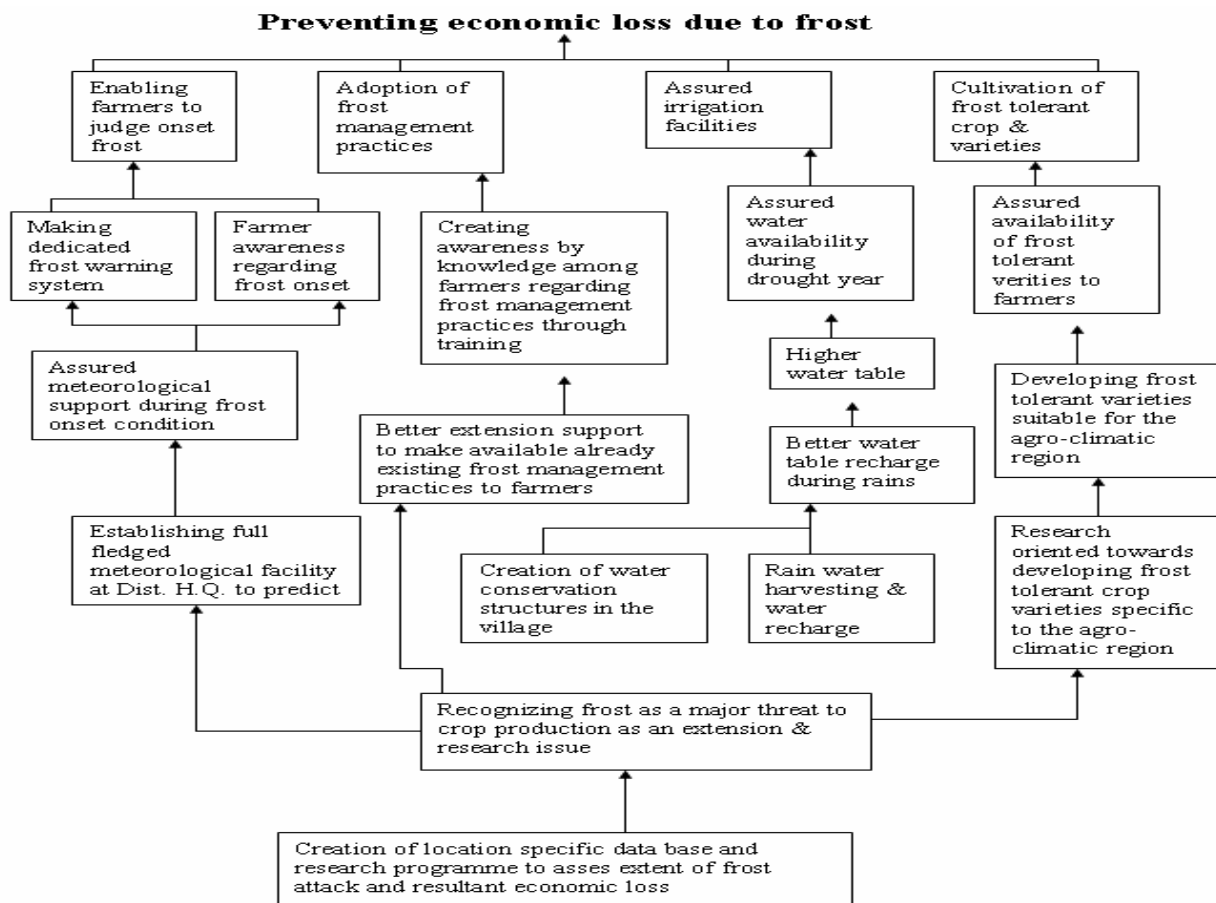
Regarding the research component in frost management, there are no frost tolerant varieties of any crops available for the farmers. Recognizing frost as a major thereat to crop production is a must towards developing research projects oriented towards developing frost tolerant crop varieties specific to the agro climatic region. This will help in development and extension of such varieties to the farmers. Assuring availability of frost tolerant varieties is the only ultimate solution to save farmers from crop loss due to drought associated frost.

Problem Tree (Animal Husbandry)

Foot and mouth disease (FMD) is a chronic problem at the village- Sohenkhera. Almost every year, dairy farmers of the village incur huge economic losses due to it because of high mortality, morbidity, loss of/ reduced production, reduced draft power and treatment cost. All these factors can be grouped in to three major factors-

A.   Mortality & morbidity

B.   Production loss

C.   Reduced draft power

A.   **Mortality & morbidity:** High degree of mortality (up to 20%) and morbidity (up to 100%) is due to different factors. Susceptibility of the animal is one important factor as it is found more in crossbred cattle and buffalo. Low vaccination coverage is another important factor. This is because of low awareness about vaccination, lack of follow up vaccination (booster dose administration, half yearly/ annual vaccination) as well as failure to vaccinate the animals at right time so that they have sufficient antibody titer at the onset of monsoon (May-June) as the disease is most prevalent during this time. Migration of animal is another important factor as the disease spreads with the selling of the 'carrier' and purchasing animal from enzootic area. The disease is found more in poorly managed animals. Poor management at Sohenkhera is very evident. There is very poor health and hygienic conditions, low availability of potable water, practically no stall feeding, no chaffing of fodder and high worm load.

B.   **Production loss:** As a result of FMD, the cow either completely stops producing milk or gives little milk. Presence of blood flakes and pus makes it unfit for human consumption. Moreover because of high bacterial presence, keeping quality of milk goes down.

C.   **Reduced draft power:** At Sohenkhera, almost all dairy farmers keep at least a pair of bullock for ploughing purpose which saves them from high cost of fossil fuel. Nagori bullock available in this region is world famous for draft power. Bullock affected with FMD becomes less heat and work tolerant and easily becomes fatigued because of different physiological (primarily endocrinal) problems. These associated factors are due to 'sequel' and the bullock becomes 'panters'.

Solution Tree (Animal Husbandry)

Economic gain due to low incidence/absence of FMD is possible by appropriate interventions. They are discussed in three broad categories.

A.   **Low mortality and morbidity:** it is possible by evolving resistant stock, total vaccination, low spread of disease and better management practices. Disease resistant stocks can be made by marker assisted selection (MAS) for which we have to identify suitable molecular markers for FMD. Prevalence of the disease can easily be brought down by complete vaccination coverage for which extension support to create awareness is required. Vaccination at the onset of monsoon, proper booster dosing and regular annual or half yearly vaccination may ensure protection against this disease. Legal measures in the form of restriction on selling and purchasing of animals from the affected area will help in low spread of the disease. Better management practices have no alternate to reduce the incidence. It includes providing stall (manger feeding), providing potable water, sufficient supply of green fodder, providing concentrates and supplement and restricted grazing during monsoon as the worm load of the pasture (specially flukes) is very high which reduces the animal vitality in this region.

B. **Production gain:** This is possible by slaughtering the critically affected (or sending them to Gaushalas/Gausadan) and providing healthy nutrition to the survivors and healthy stock.
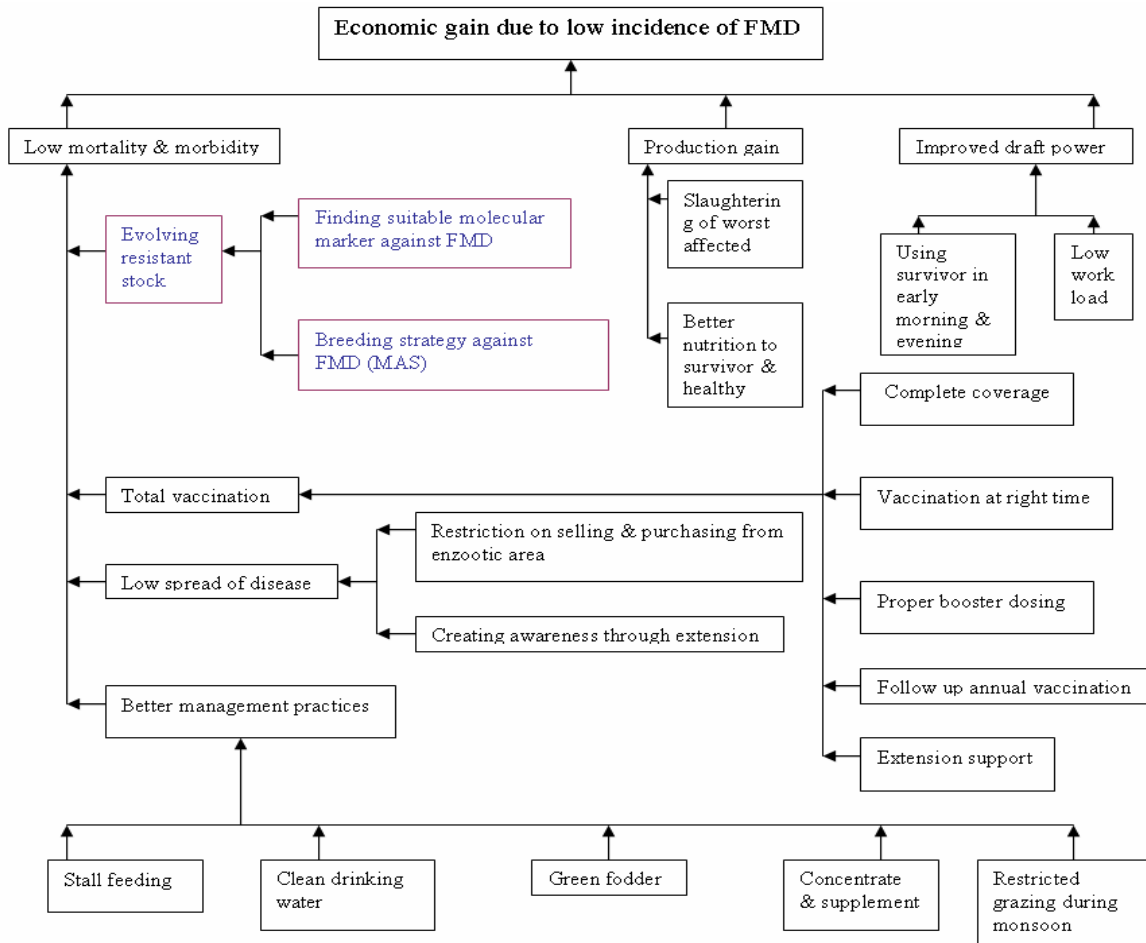
C. **Improved draft power:** Since the survived bullock becomes 'panters' their reduced draft power can be effectively used during early morning or late afternoon hours as well as reduced load to carry out agricultural works.

24. Village seminar feedback

A village seminar was held on 06-04-2007 at the Charbhuja temple premises in the village. Nearly sixty farmers were present in the seminar along with Prof. S.L. Mehta, Vice Chancellor, MPUAT, Dr. V.N. Joshi, Director, DEE, MPUAT, Dr. Tyagi, I/C, KVK, Chittorgarh and all the faculty members of the KVK. Problems identified by the farmers during FET were discussed elaborately. Suggestions and necessary corrective measures that need to be taken to overcome those problems were presented by the scientist probationers. Main researchable problem in agriculture (crop loss due to frost) that came out by snowball technique for problem identification was totally ruled out by the experts present there. Problem of FMD in animal husbandry was triangulated. The meeting could not be made an informal one where the farmers would feel totally free to express their views. Hence, the problem of frost was not ruled out.

25.   Action Plan

Based on the problem and solution tree it was noticed that the top most researchable problem of crop loss due to frost comes no way under the purview of three scientists in the multidisciplinary group. Hence the Agricultural entomology, aquaculture and animal genetics and breeding scientists have prepared their individual action plans in relation to the other problems faced by the villagers in agriculture and animal husbandry. The individual action plans are detailed below.

Who	What	When	Where	How	Cost	Outcome
Scientist, Agricultural Extension.	Development of dedicated frost warning system and farmer capacity building towards sustainable frost management	2007-2010	KVKs, Meteorological stations, MPUAT & Villages under arid sub humid agro climatic region	1. Creation of location specific data base regarding extent of crop loss due to drought associated frost attack. 2.Strengthening and linking of meteorological facilities at district headquarters with KVKs and mass media for forecast of frost onset 3. Creation of village level "frost management committees" and training of member farmers regarding frost onset conditions and management practices.	50 lacs .	1. Enables quantitative measurement of frost associated crop losses. 2. A dedicated frost warning system put in place for the benefit of farmers. 3. Sustainable frost management and prevention of crop loss and building up of social capital in villages through creation of village level "frost management committees".
Scientist, Aquaculture	Production of carp advanced fingerlings – a technology for seasonal water bodies of Chittorgarh district of Rajasthan	2007-2008	Sohenkhera village	Field experiment with three different stocking densities of IMC in duplicate replications.	3 lacs	Optimum utilization of available seasonal water bodies

Agronomist	Development of suitable Agro-technique to mitigate the frost in arid sub-humid regions of Chittorgarh	Sohenkhera village of district Chittorgarh	2007-08 to 2010	Conduction of field trials on wheat & mustard, frost resistant varieties and atmospheric & soil moisture levels. Analysis of growth and yield parameters of wheat & mustard accoratments.	3.5 lacs	Increased crop production, productivity and income
Scientist, Animal Genetics & Breeding	Molecular Characterization and Association Studies of Immune Response (Ir) genes against Foot & Mouth Disease (FMD) in Cattle & BuffaloIt includes two steps-1. Molecular characterization of genes known to control immune response (Ir) against FMD in cattle & buffalo 2.Identification of suitable markers against FMD & its association	1. Village (Bloods ample+ records)+ Institute 2. institute	1.May, 2007-Feb, 2008 2.Mar, 2008-Aug,2008	1. Cloning & characterization of cDNA of Ir genes 2. Identification of polymorphism of genomic DNA of the Ir genes 3. Identification of suitable molecular marker against FMD 4. Association of the markers with FMD susceptibility/ association	15 lacs	Database of Ir genes against FMD. Identification of molecular markers for FMDFuture marker assisted selection

Who	What	When	Where	How	Cost	Outcome
Scientist, Entomology	Development of termite resistant Variety of wheat crop	Identifying the reasons for termite attack Finding out the suitable management practices Varietal screening of wheat varieties. Identify a variety/ entry of wheat resistant termite for irrigated and unirrigated area.	2007-2010	Collection of wheat varieties, screening of wheat varieties for resistance against termite, Collection of data and analysis, propagation () up to F6 of varieties/ entries resistant to termite, final selection of wheat varieties/ entries in accordance to farmers' preferences.	3.5 lacs	Development of termite resistant wheat varieties

"*Go and meet your people, live and stay with them, love them, work with them. Begin with what they have, plan and develop from what they know, and in the end, when the work is over, they will say:*

"*We did it ourselves*"

(from the poem "the essence of participation" by Chinese philosopher Lau Tse)

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