Dryland Agriculture as source of Food Security and Livelihood Alternative.

COHESION

Contents:

Background

The 26 January 2001 earthquake, registered 7.9 on Richter scale, in the State of Gujarat caused widespread loss of life, injury, loss of shelter and assets on a massive scale. Communities that suffered 1998 cyclone and successive drought in 2000, could not withstand this disaster.

While the entire State was affected, the greatest impact was felt in the north west part of Kachchh. Assessments indicate that the worst hit Districts are Kachchh, Rajkot and Surendranagar. Having been previously hit by a cyclone in 1998, and by drought over the past few years, the communities in these areas were extremely vulnerable, coping strategies were eroded prior to the earthquake and the majority of households would require assistance in rebuilding their lives. COHESION an NGO working in disaster mitigation, felt that long-term sustainable alternatives could be explored in reviving livestock practices. AWAM an outsourcing service organization was assigned to carry out a study with the support of COHESION.

Rationale

Frequent drought i.e., 6 out of 10 years receives uncertain rain fall often destroys crops. People have developed their own coping mechanisms to face drought. They sow mixed seeds in farms to minimize crop failure risk. However, the productivity levels are generally low and there is need for studying and re-thinking innovations and new practices. This should be carried in three areas, i.e., dry land farming, irrigated farming and other cropping practices. The study should come out with findings throw light on improvements in existing practices and new alternatives that are suitable and readily adapted by people.

Objectives:

As mentioned above there is need to study and understand the existing cropping practices and systems in Rapar and Bachau prior to promoting new system and practice. By enhancing existing practices in short term, the long-term change in agriculture productivity is targeted. The study will be carry following objectives:

- To study existing dry land farming practices and input supply
- To examine monitory contribution of agriculture to household economy
- To assess the impact of disaster on agriculture on livelihoods
- To study coping mechanism of people against disasters
- To suggest livelihood coping strategies for food security

Methodology:

The study carried out in five clusters of Rapar and Bachau blocks where COHESION is actively involved. Totally 55 settlements (some revenue villages and some non-revenue villages) were covered. Stratified random sampling covered 10% of the settlements considered to carry household survey. Structurised interview schedule was administered while survey was carried in each settlement among livestock owners. Families were selected at random. Another 5 villages were covered to gain further understanding at primary level. Participatory Rural Appraisal tool were adopted in the process. Secondary level information obtained from associated institutions and earlier studies. COHESION team members also shared their insights. Household data was triangulated in PRAs and group discussions.

Sufficient data was gathered in dryland agriculture practices and changes. Household interviews and group discussion with community members was cross-verified and considered. Both dryland agriculture and seasonal irrigation input supply and returns were analysed. In addition other source of income, such as livestock, migration, sale of agri-byproducts was also analysed.

Household economics worked out by 'Sahajeevan' (NGO) was considered as base for discussing with respondents in Rapar and Bhachau. As discussed earlier, rainfall determines the household economy in Kachchh. Average productivity of farm or household under favorable rainfall pattern was considered. This refers to average productivity under normal conditions. Cropping pattern in early, delayed and timely monsoon was also considered.

Limitations:

The study is restricted to Rapar and Bhachau block of Kachchh arid region. Hence it does not represent entire district.

The information collected is based on approximation as suggested by village communities and hence does not represent accurate fughres.

Chapter-1

Executive Summary:

Rapar and Bhacahu regions are called 'Vagadh' of Kachchh. Dryland agriculture is predominant and people survived for centuries facing severe famine and disasters.
The study on dryland agriculture as source of food security and livelihood alternative has essentially focused on understanding the livelihood and natural resource system in Rapar and Bhacahu blocks of Kachchh. The interrelation between the tow generated various practices and mechanism, some of which disappeared over the years and some still in practice.

An attempt was made to understand this inter relation between drought, household economy and dryland farming. Various aspects are studied and recorded for reference purpose. Five clusters were selected for study purpose and the agriculture and allied activities studied in depth. Though families survived through several drought years, it was felt by village groups that there is increased dependency over relief measures. Traditional practices were abandoned due to insecure livelihoods and increased market exploitation. Lack of extension services and knowledge about input supply also created huge dent in the pockets of small producers.

Migration was found as easy alternative to survive and retain the cultivable land. Livestock is already subjected to market forces but farmers are conscious about their land resource. Though farmers use organic materials, its use should be maximized. Especially in irrigated crops. Similarly the efficient use of inorganic fertilizers should also be ensured. Currently in cash crops the use of inorganic pesticides and fertilizers exceeded the safety limits.

Risk and uncertainty at household level must be met by a variety of measures and institutions-in part as individual solutions, in part as collective solutions at various levels of social organization. For agro-Pastoralist and cultivators the storage of grain is often a preferred local risk aversion strategy[1] Strong village institutional arrangements in fodder, grain, livestock, milk production is desirable. In absence of such arrangements market forces are exploit small producers making them further vulnerable.

The ability to diversify assets is crucial to spreading risks and being able to withstand shocks such as those caused by drought. Poor households have fewer assets that can

[1] Cattle and cribs: Grain storage and production amongst Pastoralist in Ethiopia and Nigeria Blowfield M & Donaldson 1994 ODI.

be diversified. Small differences in land wealth could translate into major differences in effective risk exposure[2]. In periods of drought and desiccation, when key resources become depleted or scarce, the interdependence between pastoral and non-pastoral groups often becomes more pronounced.

Similarly revitalization of traditional resource management practices is need of the hour. Integrated pest and nutrient management, producer cooperatives, market support services and fodder and grain banks are most desired steps to improve livelihoods of agro-Pastoralist. Widespread efforts should be adopted to improve water resource systems, which are defunct as of now. Water management is another area of concern where micro irrigation and participatory irrigation management practices are missing.

With this one finds enormous wastage of water occur from the point of delivery to the farmer's field due to evaporation, leakages, pollution, salinity and application excess.

Though excess use of ground water, high input of fertilizers and pesticides are spotted in pockets, the trend sooner exhausts the available resources. There is need to create considerable awareness among these communities on adverse affects of excess draft of ground water.

On the other hand tank de-silting works carried out under 'relief' works or as 'food for work' programs yield little. Technical parameters, quality of work and feasibility is of less concern. The main motto here is to provide immediate relief to poor, rather improving resource systems.

The choice of agriculture technology will depend on the level of market integration and agro-ecological characteristics. Farmers' own experimentation is a central element in farmer research groups. It is not new that farmers continuously modify and develop new technologies. The most difficult task in developing a participatory research and extension system is probably changing the attitudes of researchers and extension agents. Some of the new initiatives will fail, but it is important that such failures are accepted and considered an integral part of the learning process.

There has typically been little sustained interest in drought mitigation measures on the part of either governments or donors- except in terms of improving food security. There is considerable scope for wider adoption of drought mitigation measures as well as for the incorporation of the risk of drought in economic policies and planning.

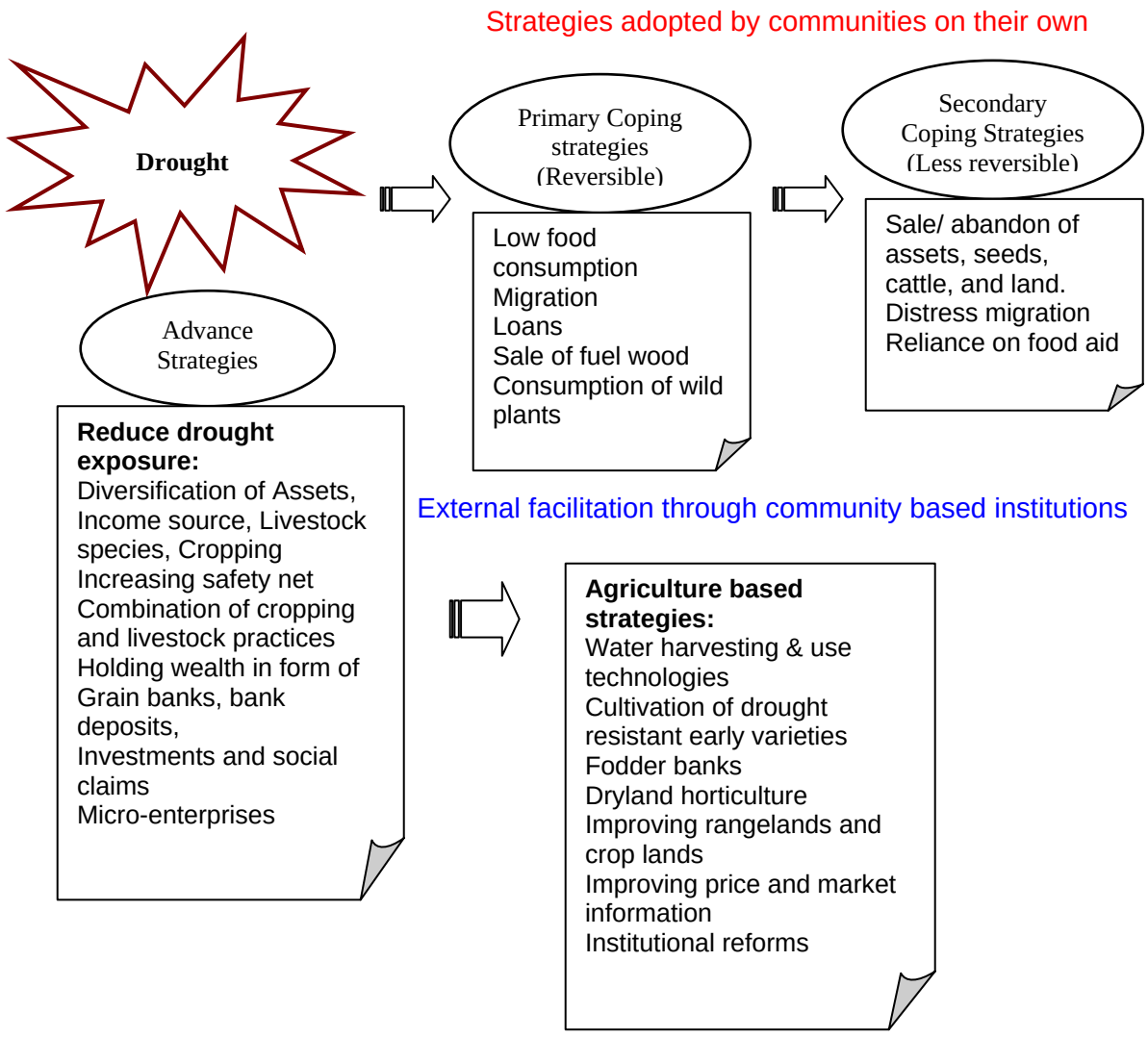
Linking drought preparedness to overall development strategies is fundamental for increasing food security in drought-prone environments. Policies need to see famine prevention, famine recovery, and improved food security under more normal circumstances as integrated elements of a strategy for food security and drought preparedness[3].

Market fluctuations in grain and livestock prices could be handled through sustained institutional intervention and linkages at local level. Improved infrastructure could influence price stabilization and emergency supplies. Gender awareness is especially

[2] Environment, technology and the social articulation of risk in west African agriculture; Carter M 1997
[3] Drought Preparedness and risk mitigation Regner etl. 1999 NLH.

important in the context of coping strategies, in order to ensure that both women's and men's strategies are strengthened[4].

Strategies and institutional interventions for food security and livelihoods[5]:



Though existing practices are most desired, there are missing links that need to be established in pre and postproduction system of agriculture. In addition retaining the importance of multiple source of income at household level, micro enterprises should be encouraged.

Recommendations:

- Agriculture extension services need to be strengthened and improved. The extension should essentially be low input variants.

[4] Ibid.
[5] Based on writings on best practices in drought coping by Ragnar Oygard, Trond Vedeld and Jens Aune.

- Market support services should be made available to small producers. Small producers could be organized in to groups. Market information should be made available and accessible to these groups. The groups could work together to enhance existing market services.
- Disaster coping /drought coping mechanisms such as fodder banks, grain banks facilitated to withstand shocks and prepare communities to mitigate impact of disaster.
- Micro enterprises should be developed around skill based and resource based activities like charcoal making, salt manufacturing, and milk collection and processing, tanning and leather based goods.
- Institutional credit should be enhanced for better linkages between the groups and existing local and lead banks.
- Safety net should be strengthened to face contingencies such as crop insurance, advance loans, support and storage services. NGOs should be mobilized to facilitate the above institutional processes.
- Traditional cropping practices should be encouraged, as they are drought resistant and low input varieties.
- Awareness should be raised on judicious use of pesticides and fertilizers.
- Ground water and surface water management practices should be strengthened and micro irrigation practices should be encouraged.
- Traditional water management practices should be revitalized to optimize water availability.
- Land productivity should be improved through farm bunding and vegetative measures. Community farming could be piloted on wastelands and grazing lands to meet village fodder requirement.
- New water harvesting structure should be constructed and old structures should be renovated
- Invasion of Prosopis Juliflora into croplands and private wastelands should be checked and removed. This could be done through group efforts as an enterprise.
- Farmers associations should be encouraged to manage agriculture input services and management of local resources like forests, pastures and wastelands.

Chapter-2.

Status of Agriculture and allied resources[6]

Kachchh is spread over of forty five thousand sq. kilometers along 22.44' to 24.41' North Latitude and 68.09' to 71.54' East Longitude. This paper focuses geophysical characteristics of Rapar and Bhachau of Kachchh.

Land Resource

Physiographically Kachchh is divided in arid plains, rann, mud flats and coastal plains. Rann constitute of 2200000 ha -covered with salts, devoid of vegetation and seldom support livelihood. Major part of mainland Kachchh is arid plains constituting 992000 hectares, followed 960000 hectares of hills and pediments. This has led extensive drainage network with steep slops contributing to high runoff and soil erosion during monsoon. Mud Flats are spread in around 377000 hectares have shallow water table with high salinity. Banni grasslands found in this type of lands. A strip of land along the coast consists of coastal plains spread in 46,000 hectares. These physiographical units are further subdivided into seventeen 'Major Landform Resource Units' (MLRU). (CAZARI: 1996).

Resource distribution in Rapar and Bhachau[7]:

Particulars	Bhachau	Rapar	Kuchh district
Total Geographical Area	202214	302759	1957619
Net sown	111885	147702	692686
Current fallow	3263	4979	54817
Net Cultivable	115148	152681	747503
Percentage of Net Cultivable area in Geographical area	56.94	50.43	38.18
Contribution to agricultural area of District	15.40	20.43	100.00
Irrigated land in 1998 -99	15260	14775	152296
Percentage of Irrigated land in Net Cultivable area of the block	13.25	9.68	20.37
Contribution to irrigated area of District	10.02	9.70	100.00

Landforms around Rapar and Bhacahu:

Medium alluvial Plains (10.82 %)

Location: Central region in between hill ranges, Rapar Block.

Both dryland and irrigated agriculture is in practice in this part of Kachchh. It is also better endowed with surface and ground water resources. However the tendency to take

[6] Data is drawn from report "Strategy for integrated dryland agriculture and organic farming-marketing concerns in Kachchh 2002. AC Desai.

[7] Land Use Classification of Kachchh District: 1997-98
Source: District Statistical Outline, Kachchh 1998-99 & 1999-2000 pp. 30
Source: Agriculture Dept. District panchayat, Kachchh, 2001 pp 49

water intensive cash crops is leading to groundwater depletion and qualitative degradation of soil.

Fine alluvial Plains (8.87%)

Location: Southern and eastern mainland & Rapar
This region is endowed with surface water resources and saline ground water. Rainfed agriculture is practiced. Shallow soils in this unit are under permanent natural pastures. High runoff takes place due to soil texture and slops, limiting agricultural productivity. Areas adjoining the salt affected coastal alluvial plains suffer salinity ingress.

Moderate Deep & Medium coastal alluvial plains (3.18 %)

Location: Anjar to Chirai & Bhachau-Jangi-Adhoi tract
The soil in this unit is loam to sandy loam in texture and has good productivity. The surface water potential is largely untapped and hence agriculture is rainfed. Groundwater is available in small pockets where irrigated cash crop cultivation is practiced. Due to porous nature of soil groundwater is easily available and get over exploited for cash crops. However the ill effects of over-exploitation of ground water and excessive application of chemical fertilizers could be realized over a period of time. Some areas suffer wind erosion.

Raised Mud Flats (18.13 %)

Location: Banni, along border and within Rann, Allah Bundh
This is a peculiar land unit where conventional agriculture is not possible due saline-alkaline soils. Highly saline groundwater at shallow depth and water logging during monsoon due low level and poor drainage are the major problems. Though Banni grasslands are famous and controversial for its overgrazing and invasion of Gando Baval (Prosopis Juliflora) this grassland is degraded one. This has posed serious problem to the livelihoods of Maldharis (Pastoralist community in Kachchh).

Rainfall

In Kachchh, pattern, distribution of rainfall across time and space are the most crucial determinants to its productivity and livelihoods. Good rainfall not necessarily is a precondition for increased productivity. Its pattern and spread decides the crop yields, as rain fed cropping is predominant. In some years moderate rainfall turns out to be favorable that supports the traditional agriculture practices.

Important aspects of Kachchh rainfall are its pattern and distribution i.e., number of rainy days and interval between rains. Normally Kachchh gets 10 to 15 rainy days in 3 to 5 showers with uncertain time gap between subsequent showers. The rainfall distribution has a great bearing on livelihood activities like agriculture; dryland cropping, canal irrigation and livestock rearing.

The household income should be assessed on the multiple activity based production and resource productivity.[8]

Station	Normal Annual	Coefficient of Variation	Highest Annual	Lowest Annual Rainfall	Highest Rainfall in

[8] Sahajeevan.

	Average	%	Rainfall		a single day
Rapar	365.4	61.1	1139.6	16.0	353.0
Bhachau	383.0	66.1	989.0	12.0	257.0

Water Resource

Kachchh is a geo-hydrometrically isolated unit i.e., isolated watershed. The only source of water to Kachchh is the rainfall that it receives. Due to torrential rainfall (heavy rains in short time span) and steep slop over short distance, results high runoff into desert or sea.

Surface Water Resource
Kachchh is having 19 medium and 160 small dams. In reality the potential of these dams is less than half, due to poor runoff. Inadequate runoff in the catchments leads to partial filling of these dams.

Details of Medium Dams in Kachchh[9]						
Block	Number	Gross Storage (MCM)	Live Storage (MCM)	Ultimate Irrigation Potential (ha)	Irrigable Command Area ratio (Potential)	Irrigable Command Area ratio (Actual)
Rapar	2	21.72	18.5	1490	100	59
District total	19	314.1	259.92	19809		

The gross storage (GS) refer to total water storing capacity of the dam and Live Storage (LS) refers to water available for utilization. MCM refers to million cubic meters. The ultimate irrigation potential (UIP) is the land area that can actually be irrigated and Irrigable Command Area (ICA) is estimated by totaling all cultivable area to which irrigation can be given. A high UIP / ICA ratio of hundred and more indicates that the dam is capable of irrigating more area than that was anticipated at the time of its construction.

Details of Small Dams in Kachchh				
Block	Number	Gross Storage (MCM)	Live Storage (MCM)	Ultimate Irrigation Potential (ha)
Bhachau	15	26.54	23.99	2310
Rapar	17	28.6	24.9	3384
District total	160	281.8	250.7	32574

It can be observed that the dams are grossly under utilized and this is due to poor runoff. Comparative analysis of both the tables suggests that small dams cater to larger command area. Though the irrigable command area ratio is not available to small dams, their spread and coverage is grater than few medium dams. Suggesting higher viability.

[9] Details of Bhchau block and UIP/ICA rito of Kachchh are not available.

Secondly medium size dams being centrally managed, remains functionally less viable in drylands of Kachchh.

Small dams, having higher local access and control on operations, did help farmers to fetch water for irrigation. Maintenance aspects in this case also carried by active role of local farmers. For example, "----------" dam was damaged during the earthquake and not repaired even after 1 and ½ years. Where as small dams like "----------" were repaired with peoples participation and the water is used for irrigation.

Ground Water Resource
CAZARI in 1996 estimated the water loss in Kachchh at 57%. Successive water balance model prepared by GUIDE in 1999 indicated 80% loss of water resource. Following figures of Rapar and Bhachau reflects the percentage loss at more than 80% in both the blocks. This is due to various factors that we discussed earlier.

Status of Ground water in Rapar and Bhachau[10]:

Block	Development Category 1984	Development Category 1991	Development Category 1996 projected
Bhachau	White (65%)	Overexploited	Overexploited
Rapar	White (65%)	Grey (65% to 85%)	Dark (85% to 100%)

Ground water balance[11]:

Block	Total Water Resource	Surface water Storage**	Ground water Recharge	Total Water loss	Total Water Stored	Percentage of water trapped	Percentage water loss
Bhachau	762.87	29.2	37.33	696.34	66.53	8.7	91.3
Rapar	1139.93	55.35	76.42	1008.17	131.76	11.6	88.4
Total	6340.43	659.89	623	4939.63	1283.28	20.24	79.76

Agriculture:

More than two third land area of the district is barren and uncultivable. The three blocks of Rapar, Bhachau and Bhuj account for almost half of the cultivable area of the district. Evidently large chunk of land is under rain fed agriculture. However the net cropped area does not leave any clue on production. This is due to high uncertainty in rainfall and successive variations in productivity.

Particulars	Area 000'Hectares
Total Reporting Area	4565

[10] Mahajan and Bharwada 1997.
[11] Source: GUIDE 1999
**Surface water storage include that of medium and minor dams plus a 10% addition for small / micro storage small structures.

Forest and Tree corps	357
Barren & uncultivable	1707
Non agricultural Use	73
Cultural Wasteland	1664
Fallow Land	120
Net Area Sown	645
Area sown more than once	50
Gross Cropped Area	694

Source: GEC 1994

Irrigation Facility[12]

Irrigation figures are often deceptive in dryland conditions as the recharge of dams and successive evapo- transpiration losses are generally high. Considering the figures available from previous studies, it is evident that of the total irrigated area around 94% in Bhachau and 77% in Rapar is dependant on ground water. This itself is substantial enough to act on judicious use of ground water.

Description (1980-81)	Bhachau	Rapar	Kuchh	Description (1998-99)	Bhachau	Rapar	Kuchh	Description	Bhachau	Rapar	Kuchh
Total Irrigated Area (Hec.)	4093	4475	56860	Total irrigated area	15260	14775	152296	Increase in TIA %	272.83	230.17	167.84
Surface water Irrigation (Hec.)	190	1613	14518	Surface water irrigation	845	3327	22908	Increase in Surface water irrigation %	344.74	106.3	57.79
Ground water irrigation	3903	2862	42342	Ground water irrigation	14415	11448	129388	Increase in Ground water irrigation %	269.33	300.00	205.58

Livestock

In Bhachau and Rapar, the proportion of browsing animals (Sheep and Goat) is more. The increase in livestock population of these blocks is mainly contributed by browsing species. The relative proportion of bovine species (cattle and buffalo) is higher in other blocks.

Talukawise Livestock composition in 1997[13]								
Tehsil	Cattle	Percent	Buffalo	Percent	Sheep & Goat	Percent	Others	Total
Bhachau	36746	12.14	20989	6.93	239328	79.07	5612	302675
Rapar	39092	14.51	22311	8.28	203504	75.53	4545	269452
Total	374831	22.69	164928	9.98	1082746	65.55	29331	1651836

[12] Source: CAZRI 1996, GUIDE 1999 & Zillha Panchayat 2001

[13] Note: The newly formed urban Taluka of Gandhidham is excluded from discussion.
Source: Livestock Census, 1997

However due to overgrazing, recurrent draughts, increased salinity levels and invasion of Prosopis Juliflora (Gando Baval) the grassland is now in a degraded state. As a result of this degradation, the number of livestock in Banni area reduced considerably. It was 49,240 in 1982 and decreased by 47% to 26,084 in 1992. Besides Banni area, the Maldharis are facing serious livelihood problems in other areas due to degrading environment and changing socio-economic conditions.

The production capacity of common pasturelands is reducing rapidly due to overgrazing, encroachment and adverse environmental factors. Due to recurrent droughts fodder has become scares commodity. So producing own fodder under rainfed condition is a safer and cheaper alternative.
Salinity ingress:

The proportionate area affected by salinity is relatively high in Rapar. This indicates the extent of land mass getting unproductive due to poor conservation measures. Unless soil conservation and salinity control measures are not adopted, this problem is not going to reduce. Around 28% of cultivable lands are abandoned by farmers due to various reasons. Increased salinity and invasion of Prosopis is on reason for unproductively of these lands.

Salinity Ingress in Bhachau and Rapar[14]

Block	Total area sq.km	Area above 4000 TDS		Increase %	Proportion of total area
		Year 1985	Year 1995		
Bhachau	1985	613.37	805.61	31.34	40.58
Rapar	3024	1128.78	1727.40	53.03	57.12
Kachchh District	19400	4320.00	6656.49	54.09	34.31

High input corps:

About one third of Bhachau and Rapar were affected by salinity ingress in 1985 and it spread to cover about ½ of geographical area of these blocks by 1995. Majority of HEIA area has sandy-to-sandy loam soil. Incidentally resourceful farmers who are much better off than their counterpart surviving on dryland farming dominate these pockets. In dryland farming conditions of Kachchh, the use of external input are mainly restricted to seed and chemical fertilizers.

There is a need to follow “Low External Input Sustainable Agriculture (LEISA)” approach, which will ensure high long-term profitability with judicial use of external input. Collection and conservation of local drought tolerant genotypes will be of immense use specially when institute like ICRISAT with best research infrastructure is willing to collaborate. However, such practices still exist in dryland agriculture and that need to be documented and encouraged. ICRISAT, GUIDE and other institutions in collaboration with NGOs should undertake further research on these varieties and provide farmers with necessary inputs.

[14] Note: All areas are in sq. km., excludes area of Banni and Ranns
Source: GUIDE 1996

Similarly a through field study of agriculture and allied activities using Farming Systems Approach (FSA) and Household Livelihood Security (HLS) Approach will be very useful in understanding the ground realities and developing suitable interventions.

One option to overcome this hurdle is procuring material from present “default non-chemical using areas” are marketing it using both the “planks” used by KSM. A better alternative is to enter the “Snack Foods” market. Kachchhis and for that matter Gujarati community as a whole has got penchant for snack food. The demand for snack foods is sizable and growth rate is very high so despite entry of many players there is significant potential to earn profits
Water and agriculture:

The poor who depend upon dug wells, which dry up fast, are the first to suffer. Under such circumstances, the only way to ensure local food security and water security to meet the basic needs for drinking and cooking, is by undertaking rainwater harvesting and groundwater recharge on a large scale through the participation of the community, including especially the women and the landless. This should be possible because, unlike in regions of high rainfall, land area per head is larger in the low rainfall or drought-prone areas where 10 tiny dams with a catchment of 1 ha each can collect more water than one larger dam with a catchment of 10 ha [Agarwal 2000].

Water and crop productivity:

Ultimately, savings in irrigation water can be achieved only by raising the productivity of water, defined broadly as the volume or value of crop output per unit of water used. Definition of water productivity varies in the literature depending on how the denominator in this ratio is specified. Water released from the system is used as the denominator; water productivity becomes all-inclusive subsuming water-use-efficiency, that is, the ratio of consumptive use of water to the water released. In 99 cases of 100 in Rapar and Bhachau, the surface water productivity is extremely low. Due to poor water management practices wastage of water and over use in crops is strikingly higher. At the other extreme, when the denominator consists of water lost as evapotranspiration by plants in any particular season, then improvement in water productivity can arise basically from the improvement in yields.

Interestingly, water savings in crop production the world over in the last few decades have accrued indirectly basically from rise in crop yields and very little directly from improvement in water-use-efficiency [CGIAR 2001a].

Water management:

Water losses occur from the point of delivery from the system to the farmer’s field due to evaporation, flow of usable water to sinks, pollution, salinity and water logging. Such losses cannot eventually be recovered at the basin level or at source. These can be minimized with appropriate management practices, provided there are adequate incentives to farmers for adopting water-saving practices. Farmers are known to reallocate land and water to high value crops in response to the changing demand. As incomes rise, consumer demand shifts away from some of the water-intensive crops like rice to water-saving horticultural products. However, trade and price policies and policies on input subsidies, including on irrigation water, would determine whether farmers would be induced to switch over to water-conserving enterprises.

Public policy on water:

The state should divest itself from the tasks of managing the systems, because its failures have been conspicuous in this area, which accounts for the major opportunities available for improving water productivity [CIGAR 2001a]. Rapar and Bhachau have several medium and small dams that provide water for irrigation. Currently these systems are either centrally managed or no management practice exist. Participatory irrigation management practices (PIM) could drastically improve water use efficiency of these dams and could cover larger areas under command.

Micro-irrigation and water:

The experimental work backed by the ICAR found that 25-40 per cent saving in irrigation water could be achieved through intermittent submergence and transplanting paddy seedlings at about the time of onset of monsoon rains. Similarly, water savings of the order of 50 per cent in the case of drip irrigation and 25 per cent in the case of sprinkler irrigation can be realised [Dhawan 2001]. But, only about 1 per cent of irrigated area in the country is presently covered by drip and sprinkler methods of irrigation.

These technologies are not adopted by the farmers because water is available at a very low cost or is even free. The incentives are in fact perverse in as much as the capital cost of drip and sprinkler irrigation is prohibitively high for the Indian farmer due to various taxes and high interest rate [Dhawan 2001]. Secondly the adaptability of technology needs to be enhanced to suit dryland agriculture practices. In absence of such ventures, the technology though promising is not adopted by people.

Chapter-3

Study Findings:

Livelihoods and Migration:

Rapar and Bhachau blocks have diverse natural resource base. Livelihood strategies are diverse and depend on various resource bases. Skill based livelihood is also prominent in this region. Crafts and self-employment are visible.

Koli community dominates the social composition, followed by Patels, Rabari/Bharvad, Harijans and Rajpoots. Communities are chiefly agrarian (dryland agriculture). Families largely depend on multiple source of income having livestock and migration been the major alternatives. About 50% families depend together on agriculture, livestock and migration as source of livelihood. Only 12% families depend on occupation and about 20% also get local labor. The increase in local labor is found due to reconstruction activities in post earthquake scenario.

Respondent profile:	**Livelihood sources**
68% are Koli	92% have agriculture as one of the source of income
12% are Patel	48% are livestock keepers
8% are Harijan	52% migrate regularly for seasonal employment
12% are Other	12% have local trade/skill based livelihood
Avg. family size 8	20% fetch local labor
Children/family 3 (45%)	Non of them entirely depend on livestock

Though agriculture is predominant, it is largely rainfed except few pockets in Rapar and Bhachau. Village irrigation tanks and canals are common source of irrigation. Ramvav cluster villages have ground water source, which is over exploited. Where livestock still depend on grasslands in Banni region, where in 'Vagad' (the region around Rapar and Bhachau) the dependency shifted to crop residues. Minor forest produces are charcoal and collection of gum and pods from Prosopis Juliflora. These pods are used as cattle feed for buffalos. Firewood is also collected from both grazing land and forestland. Agriculture is dryland based and crops are traditional drought coping varieties. It is indeed a science (Agriculture) to learn from people, the practice they adopted to cope with recurring drought and survived for centuries.

Cattle are known for their performance (having capacity to plough 20 acres in a season) and buffalos are called Kundi/Sindhi known for milk yield. Sheep and goat are for wool and milk is remained for domestic consumption. Meat is not produced due to religious reasons. Fishery is negligible.

Migration practices:
About 32% families reported migrating to nearby towns like Gandhidham and other places for wage labor. Each family earns from Rs.7000 to Rs.17000 per year from migration. The average earnings per family stood at Rs. 12000 per year. Both husband and wife migrate and work at charcoal units and saltpans. Others migrate as agriculture labors in far of areas like Junagadh. Children occupy major part of migrant families. About 50% of members migrate are children migrating along with parents.

- Existing dryland farming practices

Crop production and practices:

Cultivable land:
In the study villages, it is found that the net cultivable area is about 71.5% of the total cultivable area. About 67% of total area is under dryland farming and only 4.5% is irrigated. Remaining 28.5% is categorized is unproductive wastelands. All the respondents possessed land ranging between 5 acres to 30 acres. The average land holding per family is 14 acres. Of which about 9 acres is cultivable and rest is not put for any productive purpose. Irrigated land owned by only 4 families out of 25 families.

Crop land based Demand supply gap in Year 2002*

Year 2002		**Good Year (favorable monsoon)**	
Production	Kgs	Kgs	
Avg. crop production/Acre:	188	840	Avg. crop production/Acre:
Forage prod./acre	126	560	Forage prod./acre
Average fodder requirement	19200	19200	Average fodder requirement
Average food grain requirement	6000	6000	Average food grain requirement
Average food grain yield	1545.4	6888	Average food grain yield
Average fodder yield	1030	4592	Average fodder yield
Gap in food grain supply: demand	-4455	888	Gap in food grain supply: demand
Gap in fodder supply: demand	-18170	-14608	Gap in fodder supply: demand

Cropping practices:
Cropping practices are largely traditional and rainfed. As practiced elsewhere dryland agriculture is generally drought coping and provides enough leverage to farmers to survive in high uncertainties. Natural farming is still in practice though pockets are subjected to high input agriculture.

About 81% area was sown in 2002 monsoon in all the study villages of Rapar and Bhachau. The general trend of sowing in different monsoon patterns is given in the following table.

Early Monsoon	Sorghum	Pearl Millet	Mung	Muth	Sesame	Cluster Bean	Castor	Cumin
Delayed Monsoon	Sorghum	Castor	Pearl Millet	Sesame	Cotton	Cumin		
Timely Monsoon	Pearl Millet	Sorghum	Mung	Muth	Cluster Bean	Cotton	Cumin	
Winter	Cumin	Castor	Cotton					
Summer	Vegetable	Sorghum						

Winter and summer cultivation is found in only irrigated lands that too in years when timely monsoon occurred. In early and delayed monsoon sorghum was preferred for its forage value. Substantiating the earlier studies and increased tendency to cash crops, Castor has occupied the position of Pearl Millet in delayed monsoon conditions. Pulses were generally avoided in delayed monsoon condition.

Cropping pattern largely changes due to delayed monsoon. No significant changes observed in cropping patterns in early and timely monsoon conditions. Nonetheless, predominance of cash crops is visibly high. Where Pearl Millet is perceived as major food grain, Sorghum and Cluster Bean are used for domestic consumptions as well as fodder supplement for livestock. Others such as Cumin, Sesame, Cotton, Mung, Muth and vegetables are generally sold. It is observed that in some parts of Adesar, farm families purchase Pearl Millet, where they have sown only cash crops in the farmlands.

About 84% of families produce surplus grains that they sell in markets. Sales take place only in good monsoon years. Mung and Muth are two-dryland produce that is primarily sold in markets. Followed by Sesame and Sorghum. On an average each family in a good year earns from sale of produce ranging from Rs.4000 to Rs.20000; depending on the land holding. Families also earn from sale of Sorghum steaks as forage. However, in 2002, about 52% families could not harvest even forage due to monsoon failure. On an average each family benefits 1500 kg of dry fodder per year from crops.

- Alternative dryland crops and their adaptability

Improved Crops:
Improved crop varieties are largely in Castor followed by Pearl Millet, Sorghum. The seeds are largely branded by 'Gujarat State Seed Development Corporation' and varieties produced by state agriculture university. In Bajra it is Guj.Beej-Bajra, Junagadh-1 in Pearl Millet, Junagadh-4 in Sorghum and Kalyani varieties in Cotton. Most of the farmers expressed ignorance about the brand and variety they use.

About 11% seeds sown are improved varieties and rest 89% are traditional seeds collected from previous years harvest and stored at household level. Pulses, Cumin and Cluster bean are largely traditional varieties.

Around 80% of households use cow dung as organic fertilizer. The application rate is around 573 kgs of cow dung per acre. Each family applies around 2876 kgs of cow dung. This is applied in 3 to 5 acres of land. Once in two years, the farmlands are treated with cow dung. This way the entire cultivable land is treated with cow dung. About 52% farmers applied cow dung on the fields in year 2002.

In chemical fertilizer application, DAP and Urea are the most preferred. However only 36% families used chemical fertilizers. The quantity per acre is around 21 kgs and each family on an average purchases 319 kg of chemical fertilizer per year. About 68% of farmlands are covered with chemical fertilizers.

The study found that around 24% of families apply chemical pesticides. However only 14% of the farmlands are treated with chemical pesticides. The application rate is generally high at 1.5kg per acre. Each family purchases around 3 kg of chemical pesticides that are generally applied in Cumin, Cotton and Castor crops. Pesticides also applied in on crops raised from hybrid variety seeds. In traditional crops and cropping patterns the pesticide application is almost negligible. Weedecid application is found in Adesar clusters on Cumin and cotton crops.

Most of the rainfed farming communities said that they avoid using pesticides or weedecides as the weeds are having forage value. Farmers in Rapar cluster of villages

list around 27 varieties of weeds. These weeds having local names and varied nutritional and medicinal value are considered important component of dryland agriculture. Farmers said that livestock in the 3 months of monsoon is fed by weeds. They also reported that the milk production increases during this period.

Crop Name	Sowing period	Seed variety Kg.	Organic fertilizer Kg.	Chemical fertilizer Kg	Pesticide Kg
Pearl Millet	Mid June	2-15 Gujbeej-Bajri (GSSDC) Junagadh-1	573	200-300	1.5-3.00
Castor	Mid June/ Mid July	10-150 (GSSDC)			
Cotton	Mid September	12-40 (Kalyani)			
Sorghum	Mid June	20-40 Junagadh-4			

- Irrigated farming and input supply

Input costs:

Entire agriculture input supply is currently provided by private sector operators. There are agriculture markets in Rapar, Bhacahu, Adesar, Samakhyali and other smaller towns. Farmers buy necessary inputs from these shops. The knowledge of inputs and recommendations is not visible. Farmers said that they buy from the shops on the shop owner recommendation. Farmers said that many times such inputs found spurious, especially in case of pesticides.

Each family spends Rs.2665 per acre on agriculture inputs in food grain corps. The input cost is much higher in cash crops. For cash crops the input cost raises up toRs.11000 to Rs.15000 per acre. Large chunk of it is on water costs. Cost of motor pump, diesel, pipes etc., is part of water cost. Cost of labor is also higher in cash crops towards weeding, pesticide spray and harvesting.

Crop	Per acre Cost Rs.	Organic fertilizer	Chemical fertilizer	Pesticide	Labor	Pump set	Tractor rent	Seeds	Plough Rent
Food grains	2655	216	108	250	923	125	322	535	176
Cash crop (Cumin)	11650	1000	2000	2000	2000	2500	900	1250	

It is found that farmers involved in sowing Cumin in winter use irrigation by installing motor pumps. The cost of diesel, pesticides and labor and other contingencies add up to increase overall input ratio. Though Cumin fetches good market, the high input cost creates greater risk for farmers.

Improper irrigation management, inequities in water distribution, spurious pesticides and weedecides and lack of awareness on fertilizer application mark the scenario of Cumin and Castor crops in Kachchh. Farm community groups said that they take the risk in the

rush to earn more than the neighbors and due to peer pressures. Farmers in Adesar 1 and 2, Balasar cluster villages reported failure of pesticides resulting in crop loss.

New crops:
Though small portion of land covered under vegetable cultivation, it is largely under irrigated farming. Ground water is the main source of irrigation. If monsoon is favorable, farmers sow Cluster bean as vegetable apart from Ladyfinger and Eggplant. About 25% of families cultivate vegetables in monsoon. It is generally practiced as mixed crop. Each family that adopted vegetables have earned up to Rs.7700 per year from vegetables. About 176 kgs of vegetables are yielded from each acre sown.

Cluster bean, Lady finger, Tomatos and other vegitables
are raised by 25% of families in monsoon.
17% of the cultivated area is adopted for vegetable
production by 25% of cultivators
Average production per acre is 174 kg./season
Horticlture plants were completely missing from cropping practices
Each family earned on an average Rs.7776 from vegetables
However the adaptation is less and scope for innovations exist.

Commercially feasible crops:
Cumin and Castor are identified as commercially most viable crops in this region. Farmers however said that Mustard is also another crop that is rarely cultivated. However, farmers acknowledged the potential. But these crops are irrigated hence only those families nearer the existing water source are cultivating these crops. There is however potential in dryland commercial crops that need to be further explored.

Horticulture practices:
Apart from vegetables there is complete absence of other horticulture varieties. This suggests greater scope for promotion of dryland horticulture varieties such as ‘Aonla’ and Custard Apple. In pockets such as Rapar, Ramvav other horticulture plants such as Mangos, Chikoo could be promoted. However such initiatives were not visible.

Scope for agri-horticulture also exists. Vegetable crops could be inter cropped with food crops or cash crops. Similarly agro-forestry could also be promoted, where cropped areas cold be inter planted with forage or small timber variety species. Silviculture models could also be developed on grazing lands and private wastelands. As significant 28% private land holding is wasted, this land could be put to use under agri-silvi-horticulture models.

Micro irrigation:
Around 84% of the respondents conveyed ignorance about micro-irrigation systems. Those who were aware about it knew through either IDE or SETU both are post earthquake initiatives. Though there is potential for micro-irrigation systems, the technology should be designed in congruence to dryland agriculture needs and practices. There is still need for considerable awareness among farmers about micro-irrigation. On the other hand irrigated lands also not equipped with micro-irrigation systems. Here there is need to create awareness and equip irrigated farmlands with micro irrigation systems to conserve water and improve agriculture productivity to controlled input supply.

- Monitory contribution of agriculture to household economy

As mentioned earlier, rainfall has significant impact on agriculture vis-a vis on household economy. Almost all families live on agriculture. No landless farmer observed among respondents. About 50% draw their livelihood from agriculture-livestock-migration. Both agriculture and livestock production depends on rainfall. Each year significant variations are observed in household economy. This is however substantiated by earnings from migration ranging from Rs.7000 to Rs.12000.

Each family stores food grains for domestic consumption to the tune of 1200 kgs/year having market value of Rs. 9600. Apart from this forage worth Rs. 7500 to Rs.32000 is obtained from crops. Cow dung worth Rs.3000 is also generated from livestock. By-products of milk also sold to the tune of Rs.9000 by families having minimum 2 milk animals. Though the statistics appear glaring, high uncertainties, exploitative money lending practices and lack of market awareness results in poor retention of earnings. Families hardly manage to retain food grains in years like 2002. Expenses are more than earnings.

Livestock:

Livestock plays a significant role in agrarian economy of Kachchh households. The composition of livestock is significantly different in those families that are dependant both on agriculture and livestock from that of families, which depend chiefly on livestock. Livestock productivity is also varied in both the communities. Average milk yields are around 4.5 liters per animal in agriculturist families where as this is around 8 liters in livestock dependant families. Similar differences exist in stock value. Following table depicts the characteristics.

Percentage	Cows	Buffalo	Cattle	Calf	Sheep	Goat
Agrarian communities	22	27	27	21	0	4
Livestock raring communities	4	40	0	10	32	4
Productivity: Agrarian communities	2-4 Liters/ animal	2-6 Liters/ animal	5-17 / Acres	Rs. 1000-1500/ animal	0	Rs.500-1000/ animal
Productivity: Livestock raring communities	4-6 Liters/ animal	6-12 Liters/ animal	0	Rs.1500-2500/ animal	4kg. Wool/ Year	Rs.1000-1500/ animal

Fodder production:

Cattle feed is obtained from crops. Families said that the degraded pasturelands and common lands resulted in increased dependency over crop residues. During monsoon green fodder obtained from Sorghum crop and rest of the period it is dry forage. Each family on an average generated 1500 kg of fodder in 2002 i.e., only 9% of the total fodder requirement. Though the potential exist for higher fodder production, the demand and supply gap is much higher. The demand is around 19 tons per family per year and the potential production from individual lands is around 8 tons. There is huge gap of about 11 tons. In good monsoon years there however be surplus of 1.3 tons of fodder.

Demand and Supply matrix:	**Kgs.**	

Supply of forage from crops in:2002	25693	
Forage demand per year	448320	
Supply demand gap in 2002.	-422627	gap
Production potential of wastelands:	303000	
Production potential of crop lands	114240	
Net productivity:	417240	
Supply gap under existing livestock size	-31080	gap
If farming is mechanised, fodder demand	321600	
Surplus	**95640**	

Compost:
The concept of compost is not visible in study villages. Farmers preferred using cow dung. Compost was not in practice. Most of the farmers expressed ignorance over such technology. Each family produced over 5 to 10 cart loads of cow dung that's being used in their own fields. Agriculturists use it in their own fields and additional requirement is supplied from livestock raring communities.
When promoted on commercial basis, compost has potential market with in Kachchh. Village groups could be promoted to take up compost and production of organic fertilizer.

- Coping mechanism of people against disasters

Multiple source of income is the most common mechanism adopted by farmers in coping with drought and other contingencies. About 80% of families have agriculture, livestock and migration as source of income in any given year. Apart allied activities in agriculture like sale of crop residues, cow dung, skill based employment are some of the commonly noticed practices to cope with drought.

Food grains are stored to face contingency for about 2 consecutive drought years. However, frequent recurrence of drought adversely impact yields and hence families migrate to survive.

Drought resistant crops:
Families by and large adopted traditional and time tested crop varieties to practice rainfed cultivation. Sorghum is rated as most desirable crop to cope against contingencies followed by Pearl Millet, Lentil. Local cotton variety is also adopted in average rainfall condition. Among cash crops Castor is predominant followed by cotton and Cumin.

Cropping Pattern:
Almost all the farmers practice mixed cropping practice that is most suitable in dryland conditions. This practice reduces crop failure and complete loss of inputs. Though farmers sow all the seeds in the same field, with varying monsoon pattern, at least 2 out of 5 crops succeed. Secondly the most practiced crop varieties are Pearl Millet-Sesame-Lentil-Muth. Some farmers also add either Cluster bean or Sorghum in Monsoon. In winter it is Cotton-Pegion Pea or Cumin. In some cases it is Sorghum and Cotton.

- Impact of disaster on agriculture economy

<u>Rainfall v/s resource status:</u>

Thus Drought does not necessarily occur only during low rainfall years. Impact of pattern is also different on dryland agriculture and animal husbandry. Greater the dependency over land resource, higher the vulnerability to drought. That is why families depend on multiple source of income as coping mechanism with in resource base and outside. Assets become liability in drought like cattle. To maximise the benefits of drought proofing there is need to target the households that are most vulnerable to drought and design strategies accordingly.

Sahjeevan (an NGO based at Bhuj) has done an in-depth analysis of rainfall pattern. It has studied impact of rainfall pattern on various livelihood activities of dependent families. It was observed that a single rainfall pattern in a given year leads to differential impact on livelihoods of people in different regions. For example, sufficient early showers and subsequent failure leads to good amount of grass production but agriculture suffers. In such year livestock rearing does not get affected much.

However, failure of early showers affects both farming and livestock rearing. Similarly sufficient early rainfall and successive rains does not affect Kharif crop or livestock much. But late season failure affects the canal-irrigated agriculture to suffer heavily. Thus livestock raring families suffer less in this situation to that of families dependent upon canal-irrigated agriculture.

100 /75/50/less that 50 percent production: 7.5 to 10 inch in a span of 60 to 80 days.

1 Shower	Sowing	20 days gap	1.5 to 2 inch rainfall	*		*
2 Shower	sprouting	20 days gap	1.5 to 2 inch rainfall	*	*	*
3 Shower	growth	20 days gap	1.5 to 2 inch rainfall	*	*	*
4 Shower	Flowring	20 days gap	1.5 to 2 inch rainfall	*	*	
5 Shower	Fruits	20 days gap	1.5 to 2 inch rainfall	*	*	
				100%	75%	50%

Less than above crop fails.

Farmers explained the phenomenon as under:

1st shower	Mid June	15 days after Jeth mas
2nd shower	Beginning of July	Beginning of Ashadh mas
3rd shower	End of July	End of Ashadh mas and beginning of Shravan mas

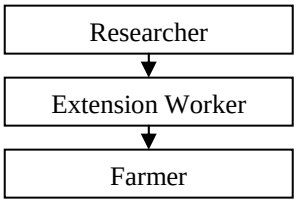
This could ensure subsistence level of production. However pattern and intensity still retains their significance.

- Institutional services:

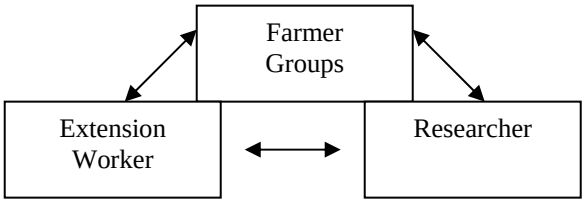
Extension:
Almost all the respondents said that they have not received any extension services in past 2 years from any public servant. They said that the village agriculture extension officer did not visit the village in last 2 years. Neither they have received any services from state agriculture promotion schemes. Several questions were put to respondents on seed supply and other input supply.

Participatory model of extension:

Diffusion Model



Participatory Model



Credit:
Credit services are largely private. Institutional support services are largely missing. Around 16% of families availed crop loans either from farmers credit cooperative societies or NGO funded schemes. There is no trace of commercial or public banking role in lending. About 50% of families lent from private moneylender at 30% to 120% interest rate. It is also found that 96% of the loans are repaid. The general tendency among farmers observed that they find the loan as burden and try to repay it at the earliest.

Crop insurance:
Crop insurance is completely missing in all the study villages. Not even single incidence crop insurance recorded among the respondents. This is a critical area of concern in social security measures adopted by state. As bank services are negligible, subsidies and other associated benefits are not reaching farmers in remote areas. In such circumstances there is need for variety of schemes that reach farmers and act as cushion to cope contingencies.

Input subsidy:
Input subsidy is completely missing in this region. All the inputs come to farmers at its maximum cost, hence increasing the risk and burden of dryland farming.

Bank loans/Assistance:
Bank loans and assistance is not visible. There is scope for greater outreach and establishment of institutional arrangements in these villages.

- <u>Soil related problems:</u>

Sheet and wind erosion is visibly high in this region. Especially the fringe areas of desert in Rapar and Bhachau are more susceptible to wind erosion. In fine alluvial plains of southern and eastern mainland of Bhachau and eastern Rapar, high runoff takes place due to soil texture and slops, limiting agricultural productivity. Areas adjoining the salt affected coastal alluvial plains suffer salinity ingress.

In a limited area of Bhachau and Rapar is loam to sandy loam in texture and has good productivity. The surface water potential is largely untapped and hence agriculture is rainfed. Groundwater is available in small pockets where irrigated cash crop cultivation is practiced. Due to porous nature of soil groundwater is easily available and get over exploited for cash crops. However the ill effects of over-exploitation of ground water and excessive application of chemical fertilizers is visibly high.

Inefficient land use:

About 28% of the private cultivable land and almost all common lands are divulged of any productivity. Except Charcoal and gum obtained from Prosopis Juliflora, no other species diversity is apparent. Around Balasar cluster, Forest department is experimenting with salt tolerant shrubs that could partially control salinity ingress through 'creeks' and further inundation. Prosopis Juliflora is considered as weed, invading productive farmlands. Invasion observed in significant proportion of private lands around Khodasar cluster. Farmers abandon these lands.

Coastal common lands are largely used as open grazing lands. These lands have greater potential if institutional arrangements could be evolved in their management. Currently the livestock use these lands as open pastures. Part of the land is under control of forest department. However, no clear demarcation observed between village common lands, forestlands and public wastelands (under the jurisdiction of district Collectorate).

Perennial weeds
Perennial weeds in common lands are Prosopis Juliflora. In crop lands there are 27 varieties reported by farmers. These weeds are used as forage for livestock in monsoon. The weeds grow even during the shortfall of monsoon and hence having great value in the farming practices. Though cash crops find the weeds as unwanted competitors, farmers allow their growth in food grain corps. They also act and compensatory vegetation to divert pests from attacking crops. Hence in dryland conditions weeds have grater value to agriculture economy. Farmers encouraging weeds, spend less on pesticides and fertilizers.

Baledo, Deglo, Gendio, chario, Chakerdi, hamrahat, are some of the weeds locally named are common in cumin crop as reported in Adesar cluster. In Ramvav cluster the weeds used as forage are diverse and have differential forage value. Bhediya, Kuri, Dhelo, Udhari, Dhaman, Dabhdo, Roidi, Veladi, Dhari, Lambhdi, Karjino, Chadhario, Vakerio, Kantiyo, Bhaji, Pakadi, Satedi, Gintula, Labh, Kamoli, Magera are some of the prominent varieties. Each one has it role in forage supplementation. Farming community in this cluster averse to using pesticides and said that they would prefer natural remedies to crop protection.

Soil born pests/diseases and measures:

Khapedi, Melo, Garal, Chasiya, Eed, are some of the commonly Soil born pests and diseases are common in hybrid corps and cash crops as reported. The intensity is negligible in traditional crops. In Rapar and Khodasar cluster of villages farming community reported that they avoid pesticide spray on pests and insects as the weeds and crops are used as forage for livestock. Some of the weeds also used as part of integrated pest management practices. Though traditional, such practices are part of natural pest control mechanisms.

Quite contrary to this practice, pests are prominent in cash crops like Cumin and Cotton where pesticide spray is rampant. However such practices are in pockets and farm communities also reported pesticide resistant tendencies. In Adesar cluster, farmers reported ignorance on knowledge of safe use and disposal of pesticides. Farmers are not even aware of adverse impact of pesticides on human environment. Among

pesticides, monochrotophos, diamoniumphosphate, BHC, and other weedicides and sulfer are widely used. Each family spends on an average Rs.2000 per acre on pesticides and weedicides in cumin cultivation.

There is need for integrated pest management practices. The existing traditional knowledge need to be documented and further promoted systematically. This will encourage judicious use of pesticides in cash crops and avoidance of direct contact and related hazards.

Micronutrient deficiency:

Though the micro nutrient levels in different soil types are not tested, a generic observation and discussion with farmers suggest balance in micro nutrient levels in rainfed farming. Salinity ingress and increased florid levels of ground water used for irrigation is affecting the micro nutrient levels of soils in irrigated areas. Increased water availability for irrigation would definitely impact nutrient levels of soil.

Traditional agriculture practices also contributed to maintenance of micronutrients. Mixed cropping, applications of organic matters, limited use of chemical fertilizers in rainfed crops are contributory factors.

Farm communities reported that no guidance was available to them on recommended levels of application. Farmers expressed complete ignorance on micronutrients and their role in crop production.

Salinity/Alkalinity:
Salinity ingress is one of the major problem in coastal mud flats and alluvial plains in Rapar and Bhachau. Where as over extraction of ground water contributing to inland salinity; it is coastal salinity ingress in coastal alluvial plains and adjoining areas of Rann. In absence of proper measures to check salinity ingress, such as coastal bunds, vegetation development and runoff control increased land mass is subjected to soil degradation. Following table depicts the percentage area affected by salinity.

Croplands are increasingly abandoned due to increased salinity-alkalinity. Around 28% of cultivable lands are abandoned as private wastelands. This phenomenon is observed in all the coastal villages. Proper land treatment measures such as farm bunding, farm ponds and rill control measures could help reduce salinity problem. Salt tolerant species should also be promoted in these regions to reduce top soil runoff and increase organic matter in soils.

Integrated coastal zone management practices could help reduce the salinity ingress and problems associated with salinity.

Water logging:
Water logging is observed in Balaser cluster and parts of Khodasar clusters. This is largely due to inundation occurs during high tides. The problem increases over the time if not checked in early stages. The inundation grabs increased landmass and increases salinity of adjoining lands. Formation of creeks is advanced stage of inundation where the current in high tide generally uproots vegetative measures adopted at this stage.

Hence preventive measures should be adopted. Promotion of Mangroves, salt tolerant species like Tamerix, Atriplex and other varieties are some of the common approaches found in western India.

The exact area is subjected under inundation is not measured. But as reported, such areas are either under the jurisdiction of forest department or they are common lands of the village. As mentioned earlier when unchecked, this problem could spread to cultivable lands adjoining the waterlogged areas.

- Productivity of wasteland

Productivity of wastelands are almost negligible as discussed earlier. In several studies it is reported that the common lands are subjected to severe erosion and invasion of weeds in Kachchh. In Rapar and Bhacahu, the common lands are largely open grazing lands.

Grass production in common lands is not reported in any of the clusters. As they are used as open grazing the production of grass is almost negligible. It is reported that around 8 months in a year common lands are open for free grazing. Though grass availability restricted to 1-2 months during monsoon.

No trees were found in wastelands. It was reported that communities have abandoned the management practices of wastelands or grazing lands for long. Increased pressure on livelihood forced families to survive on migration and wage labor. With this farmers periodically abandoned the livestock at Panjrapols. Hence the associated resource system was also neglected. Over the years it has degraded.

Absence of traditional management practices is not cause but symptom that denotes breakdown in livelihood support systems. Hence new resource management systems and livelihood opportunities could only help rejuvenate the traditional resource management practices. Techno economic options suggested in the report could well be adopted to rejuvenate the wastelands, that have large potential to meet fodder and fuel demand of households.

- Technological options for production problems:

In terms of technological options, farmers expressed awareness in certain areas of farm production. Use of tractors, motor pumps and other agriculture implements suggest the presence of such tools and their usage. However, knowledge, access, equity concerns and viability of technologies need to be demonstrated. Adoption rates are higher when technology transfer is carried out systematically. For example, farmers from Adesar, who visited other regions, have expressed enthusiasm in adopting new cropping practices.

Major adaptation of improved varieties is in Castor followed by Bajra & Sorghum	
Percentage application of hybrid seeds/improved seeds:	11
Percentage use of traditional seed varieties:	89
Cotton, Pearl Millet, Sroghum, and Castor are prominenet improve varieties	
Pulses, Cumin and Clusterbean are traditional varieties in general.	

Hybrid seeds adopted by farmers need to be provided back stopping support to manage production in systematic way. In absence of institutional support services farmers are left at the mercy of traders in input supply materials. Similarly farmers have enormous understanding in rainfed cultivation. Their knowledge needs to be documented and transferred to generations in scientific way. Currently this knowledge is spread across farming communities across 'Vagadh' region.

Excess application of pesticides, fertilizers and in appropriate use of water in cumin and castor crops should be checked and farmers should be made aware about their ill effects.

Similarly, the traditional practice of abandoning livestock during summers also need to be checked through appropriate institutional arrangements.

Integrated nutrient management practices need to be encouraged in cash cropped areas. The problem may not be severe in rainfed cropping. Similarly about 42% of farmlands are not treated with organic matter. Compost could be encouraged to generate organic fertilizer that is having potential to increase crop productivity by 30%. This could be well applied in cash crops sown in winters. Compost could also avoid spread of Prosopis Juliflora in cultivable lands.

Cropping systems:
The existing cropping systems are practiced world over in dryland farming. Such practices help farmers cope contingencies and provide enough leverage to take the shock. Mixed cropping of cereals, pulses and cash crops is the best choice that farmer's adoption traditionally. Change in such practices should be carefully considered of their social and economic value to household. Mono, row inter, multiple, mixed, inter, sequential, ratoon, relay-cropping practices were also observed in winter sowing.

In cash crops a 3 year rotation period observed to avoid weeds. One year out of every 4 years is not sown.

Vegetation in cultivable lands
Vegetation in cultivable areas is almost negligible. Farmlands are totally sown by crops. Agro forestry or farm forestry practices are not visible. Though there is scope for farm silvipasture and other models of horticulture, it is not visible in any of the clusters. Promotion of 'aonla' and other drought resistant horticulture varieties, forage tree species like neem, acacia, cazurina could be promoted in both the blocks. Though the recommendation varies from cluster to cluster, based on soil types and pH.

Agro forestry models should be encouraged as windbreakers in parts of Rapar and Bhachau. Plantation along the farm bunds would encourage additional vegetation growth that could be part of integrated pest management practices. Such measures being new to the region, greater emphasis should be laid on promoting vegetation in crop lands through nurseries, plantation incentives and awareness programs.

Mulching surface or residual, vertical, polythene, pebble, dust
Mulching though an important component of dryland agriculture, it is not visible and neither practiced in the region. Measure to conserve soil moisture is generally low. There is need for awareness among farming community on benefits of mulching and different forms of mulching.

- Micro Enterprises:

Charcoal Making:
Though Prosopis Juliflora invaded common lands and private lands, it is providing huge employment to families in Rapar and Bhachau. Prosopis in forestlands is generally auctioned for removal and charcoal sprouted around such pockets. Enterprising families took up charcoal making in village common lands and private lands around Ramvav cluster in Rapar and Samakhyali.

Charcoal making based on Prosopis obtained from forestlands is totally controlled by existing players. Established relations already exist between the contractors and local forest guards. It is difficult to venture here, unless a working relationship established with forest department.

There is also need for change in policy directives on Prosopis harvesting. Village forest committees could be encouraged to harvest the Prosopis from the adjacent forestlands and establish charcoal units. However, such initiatives would materialize only through intense advocacy at State Level JFM Committee or with divisional forest office.
Hence encouraging village enterprise around charcoal making is essentially around common lands and private wastelands. There is greater scope for such micro-enterprises, as market exists in Kachchh and adjoining districts for charcoal. Many families' poses skills in charcoal making and this potential could be explored.

Salt industry:
About 50% of the families from Rapar and Bhachau migrate and work in saltpans in Kachchh. These families pose skills in salt production. Vast stretches of saline lands that are suitable for salt production exist both in Rapar and Bhacahu. These families work as wage laborers in the saltpans, they earn around Rs.5000 per person per year. High levels of insecurity, exploitation and affect on children's education are reported during the study.

Though there is potential for salt production on cooperative basis, lack of seed money and working capital restrained entrepreneurs in this segment. Saltpan workers could be organized and producer cooperatives could be encouraged. The demand for salt is much higher than the production as per recent surveys conducted by the industry. Hence markets are not an issue.

Community groups especially among Koli community expressed strong desire in self-initiatives in Adesar and Balasar clusters. Salt producer associations could provide necessary support and guidance in this venture.

Fodder Banks:
Fodder banks are most desirable ventures at village level. Recurrence of drought, demand-supply gap in fodder and absence of institutional arrangements strongly suggests for such interventions. Either micro-enterprises or service oriented village institutions could come up to manage fodder supply with in village.

These institutions as suggested, could be service oriented and act as facilitators in fodder collection, storage and distribution. In some village clusters such experiments have already initiated but they need proper guidance. Fodder storage technologies

though exist; they need to be fine tuned to take care of storage losses and maintenance issues.

Fodder banks when promoted on large scale, could act as buffers to meet contingencies in drought periods and avoid exploitative phenomenon of 'panjrapol' trend. Fodder banks need initial seed money and working capital to establish storage systems and meet recurring costs. Once the operation starts, it is self-generating.

Alternatively, institutional linkages could be established between agriculturists and livestock raring communities for supply of crop residues. Such linkages could act as 'equity check' to ensure fair markets in fodder supply and demand. Currently no such arrangements exist with in villages. Individual families exchange forage stocks as per demand in crisis period. As families not prepared to face contingencies, they often land up in paying higher prices for the forage in open market.

Grain Banks:
Though families store food grains at household level to meet contingencies like recurrent drought over 4 to 5 years, the storage systems are not sufficient enough to store for years together. Neither the production levels in any period are so high that families could store for years. Hence alternative mechanisms should be evolved to meet food shortage. Currently the families depend on local traders for supply of food grains in drought and other disasters. The grain supplied on credit to families during contingencies costs higher than the grain sold by farmers during harvest. The price differences are market driven and exploit poor farmers. Hence there is need for such arrangement where farmers could stock the surplus grain each year and increase their stock balance irrespective of good or bad year.

Such practices are prevalent in many part of the state and could be adopted. There are two ways of promoting grain banks. One is to store the grain with in the village and make it available to families when required. Village communities themselves with necessary technical, managerial support would manage the local grain bank and financial assistance could be provided at initial stages.

Alternative mechanism could be to sign agreement with local trader to stock the grain in market at an agreed market value. Such stocks are recorded on individuals account and would be accessible whenever required. Thus avoid local storage hassles and reduce the risk of theft or other accidents. Village committees on behalf of individual members could manage such arrangements.

Both the alternatives are tested and in practice in various states. The village institutions could be evolved as producer cooperatives or groups.

- Postproduction:

No postproduction support systems exist in villages. Most of the tools used are during the production stage. Right from processing to storage and transportation is carried in unfavorable conditions. Most of the villages are hamlets and transpiration facility is a major problem.

Sales practices

Traders from nearby towns regularly buy the produce at existing market rates. The fluctuation in prices is such that when farmer sells the produce, rates are at their lowest. Farmers are compelled to sell the produce as the resources get exhausted by that time. Traders generally lend to farmers for purchase of inputs at interest rates varying from 24% to 120%. Later the amount is deducted from the sales price of the commodity. Farmers generally get exploited in this vicious circle of credit and repayment that encircles unfavorably.

Storage
Storage systems are household based and have the potential to store up to 2 to 3 years. But the farmers generally sell the produce to meet daily needs and contingencies. Food grains are generally stored to meet contingencies up to 2 years. But that depends on crop productivity. Sharing of food grain between families also exist. This sharing is done on actual quantity basis. No interest or additional repayments entertained.

Transportation
As mentioned earlier, transportation is one of the issues in many hamlets. Road networks still not exist in these hamlets. Especially the problem is more in Adesar and Balasar cluster villages.

Market Support Services:

Trade liberalisation in developing countries locks producers – many of whom already live below the poverty line – into competition with subsidised imports which drive down local prices. Recent fluctuation in wool prices is one such example, where australian wool has reduced the market value of locally produced wool in Kachchh. Agriculture is too important a sector for poverty reduction and environmental sustainability to leave its development to market forces.

Developing-country governments should devise and implement pro-poor agricultural trade and rural development policies which promote food security and sustainable livelihoods, in consultation with all stakeholders, including civil society organisations.

Collective marketing
Collective marketing practices are not found among the respondents. Traders either visit the villages during the harvest or farmers sell the produce to traders in local towns. Due to this their bargaining power gets reduced. Scope exists to explore collective marketing facilities in agriculture produce and market cooperatives. Few villages reported that some of the families are members in agriculture producer cooperatives. But their percentage is negligible.

Farmers are not aware of the benefit of collective marketing and different avenues of collective marketing. Farming communities expressing willingness to be part of such initiatives.

Market information
Market information is limited with farmers. They largely depend on local traders and middlemen for prices. Sale of produce largely depends on hypothetical information obtained from unreliable sources. Generally local traders engineer such information. Though farmers complain about practices, as reported they never took proactive step to collect market details. Support services are required in this area where farmers are

provided with market trends, price fluctuations, potential new markets, trade related agreements, interim loans and other support services.

Intellectual Property and Farmers Rights

There is considerble amount of market forces that are constantly applied on farm inputs. Farmers are subjected to adopt hybrid varieties where they does not have sufficient control over the seed. Traditional dryland crop varieties that have drought coping characteristics need to be protected and encouraged. The latest Farmers Bill passed in the Parliament has approved the sui generis system, which calls for exclusive marketing rights for the breeder of seeds, i.e, the farmers themselves. However such seed varieties are vanishing from the field due to introduction of hybrid varieties.

Similarly different varieties of weeds that have differential forage value to farmers in drylands need to be listed and documented. Measures should be adopted to protect such species and encourage farmers to carry integrated pest management practices.

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Appendix:

Demographic profile of respondents:

R.no	Clustername	Village name	Community	Family members	Men	Women	Children
AD101	Adesar-1	Mandavyavandh	Koli	9	3	3	3
AD102	Adesar-1	Mandavyavandh	Koli	9	3	3	3
AD103	Adesar-1	Mandavyavandh	Koli	11	2	2	7
AD104	Adesar-1	Mandavyavandh	Koli	10	3	3	4
AD105	Adesar-1	Mandavyavandh	Koli	11	2	2	7
				50	13	13	24
AD206	Adesar-2	Nagtar	Koli	7	1	1	5
AD207	Adesar-2	Nagtar	Koli	3	2	1	0
AD208	Adesar-2	Nagtar	Koli	10	4	3	3
AD209	Adesar-2	Nagtar	Koli				
AD210	Adesar-2	Nagtar	Koli	5	3	2	0
				25	10	7	8
RV11	Ramvav	Karuvandh	Koli	8	1	2	5
RV12	Ramvav	Karuvandh	Koli	7	3	2	2
RV13	Ramvav	Karuvandh	Koli	7	2	2	3
RV14	Ramvav	Karuvandh	Koli	6	3	2	1
RV15	Ramvav	Karuvandh	Koli	11	1	3	7
				39	10	11	18
RP16	Rapar	Khodasar	Koli	5	1	1	3
RP17	Rapar	Khodasar	Bharvad	8	1	2	5
RP18	Rapar	Khodasar	Harijan	7	1	1	5
RP19	Rapar	Khodasar	Koli	9	2	1	6
RP20	Rapar	Khodasar	Harijan	5	3	2	0
				34	8	7	19
BL21	Balasar	Desalpara	Mahraj	8	3	4	1
BL22	Balasar	Desalpara	Vanand	6	2	1	3
BL23	Balasar	Desalpara	Chowdhri	7	1	2	4
BL24	Balasar	Desalpara	Patel	4	1	2	1
BL25	Balasar	Desalpara	Patel	8	2	2	4
				33	9	11	13
GT	5	5		181	50	49	82

Source of income

Clustername	Agriculture	Livestock	Migration	Business	Local labor
Adesar-1	1	1	1	0	0
Adesar-1	1	1	1		
Adesar-1	1	1	1	0	0
Adesar-1	1	1	1		
Adesar-1	1	1	1		
	5	5	5	0	0
Adesar-2	1	0	1	0	0
Adesar-2	1	0	0	0	0
Adesar-2	0	0		1	0
Adesar-2	1	1	0	0	0
Adesar-2	1	1	0	0	0
	4	2	1	1	0
Ramvav	1	1	1	0	1
Ramvav	1	0	1	0	0
Ramvav	1	1	1	0	0
Ramvav	1	1			1
Ramvav	1	1	0	0	0
	5	4	3	0	2
Rapar	0	0	1	0	0
Rapar	1	1	1	0	0
Rapar	1	0	1	0	0
Rapar	1	0	0	0	0
Rapar	1	0	1	0	0
	4	1	4	0	0
Balasar	1	0	0	0	1
Balasar	1	0	0	1	1
Balasar	1	0	0	0	1
Balasar	1	0	0	1	0
Balasar	1	0	0	0	0
	5	0	0	2	3
5	23	12	13	3	5
	92%	48%	52%	12%	20%

Respondent profile:

68% are Koli

12% are Patel

8% are Harijan

12% are Other

Livelihood sources

92% have agriculture as one of the source of income

48% are livestock keepers

52% migrate regularly for seasonal employment

12% have local trade/skill based

livelihood

Avg. family size 8

20% fetch local labor

Children/family 3 (45%)

Non of them entirely depend on livestock

Land resource (acres)

R.no.	Total private land	Irrigated land	Dryland	Waste land
AD101	10	2	6	2
AD102	22	0	17	5
AD103	15	0	10	5
AD104	20	0	15	5
AD105	22	0	12	10
	89	2	60	27
AD206	10	0	9	1
AD207	9	5	2	2
AD208	8	3	5	0
AD209	13	6	7	0
AD210	20	0	15	5
	60	14	38	8
RV11	18	0	5	13
RV12	11	0	5	6
RV13	17	0	5	12
RV14	25	0	5	20
RV15	20	0	5	15
	91	0	25	66
RP16	3.5	0	3.5	0
RP17	5	0	5	0
RP18	15	0	15	0
RP19	30	0	30	0
RP20	5	0	5	0
	58.5	0	58.5	0
BL21	7	0	7	0
BL22	10	0	10	0
BL23	17	0	17	0
BL24	15	0	15	0
BL25	5	0	5	0
	54	0	54	0
GT	352.5	16	235.5	101
		4.50%	67%	28.50%

Net cultivable area: 251.5 71.35%

Dry land agriculture practices

R.no.	Early monsoon corps									Dealyed monsoon crops								
	BA	JU	MG	MT	GU	KA	ZI	TI	ER	BA	JU	MG	MT	GU	KA	ZI	TI	ER
AD101	1	1	1								1				1	1	1	1
AD102	1	1	1	1				1			1				1	1		1
AD103	1	1	1	1	1						1				1	1		1
AD104	1	1	1	1	1		1	1	1		1					1		1
AD105	1	1	1	1	1					1	1				1	1		
	5	5	5	4	3		1	2	1	1	5				4	5	1	4
AD206	1	1		1				1		1	1	1	1				1	
AD207	1	1			1					1	1			1				
AD208	1	1			1			1		1	1			1			1	
AD209	1	1						1		1	1	1	1				1	
AD210	1	1								1	1	1		1			1	
	5	5	0	1	2		0	3	0	5	5				0	0	4	0
RV11		1	1	1	1			1	1		1							1
RV12		1	1	1	1			1	1		1							
RV13		1	1	0	1	0	0	1	1		1							1
RV14		1	1	1	1	0	0	1	0				1					
RV15		1	1	1	1			1					1					
	0	5	5	4	5		0	5	3	0	3				0	0	0	2
RP16	1	1	1								1				1			1
RP17	1		1	1							1							
RP18	1	1	1	1		1			1		1			1				1
RP19	1	1	1	1	1			1			1				1			
RP20	1		1	1				1		1	1	1	1				1	
	5	3	5	4	1		0	2	1	1	5				2	0	1	2
BL21	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL22	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL23	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL24	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL25	1	1	1	0	1			1		0	0	0	0	0	0	0	0	0
	5	5	5	4	5		0	5	0	0	0				0	0	0	0
GT	**20**	**23**	**20**	**17**	**16**	**0**	**1**	**17**	**5**	**7**	**18**	**0**	**0**	**0**	**6**	**5**	**6**	**8**

Cereal Crops

BA:Bajra/Pearl Millet
JU:Juvar/Sorghum
MG:Mung/Black gram

Cash crops

KA:Kapas/Cotton
ZI:Zira/Cumine (water intensive)
TI:Tal/Seasm

MT:Muth/ ER:Erenda/Castor
GU:Guvar/Clusterbean (vegetable/forage) VEG:Vegitables
OTH:Others/Isabgol (medicinal) (water intensive)

Mixed cropping is predominant. Clusterbean is used both as cattle feed and vegetable. Varieties differ. Clusterbean, Sorghum, Bajra, Seasm and Cotton still have traditional seed varients but need to be preserved.

Dry land agriculture practices

R.no.		Timely monsoon crops								Winter crops				Summer crops				
	BA	JU	MG	MT	GU	KA	ZI	TI	ER	KA	Zir	ER	OTH	KA	Zir	ER	Ju	Veg
AD101	1	1	1	1	1	1	1	1	1	1	1	1		0	0	0		0
AD102	1	1	1	1	1	1	1	1	1	1	1	1		0	0	0		0
AD103	1	1	1	1	1	1	1	1	1	1	1	1		0	0	0		0
AD104	1	1	1	1	1	1	1	1	1		1	1		0	0	0		0
AD105	1	1	1	1	1	1	1	0	1	1	1	1		0	0	0		0
	5	5	5	5	5	5	5	4	5	4	5	5		0	0	0		0
AD206	1	1	1	1	1	1		1		1				0	0	0		0
AD207	1	1	1	1	1						1						1	
AD208	1	1			1			1				1	1					1
AD209	1	1	1	1				1			1							1
AD210	1	1	1		1			1			1							
	5	5	4	3	4	1	0	4	0	1	3	1	1	0	0	0	1	2
RV11	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
RV12	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
RV13	1	1	1		1	0	0	1	1	0	0	0	0	0	0	0	0	0
RV14	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
RV15	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
	5	5	5	4	5	0	0	5	4	0	0	0		0	0	0		0
RP16	1		1		1					0	0	0	0	0	0	0	0	0
RP17	1	1	1	1						0	0	0	0	0	0	0	0	0
RP18	1	1	1	1	1					0								
RP19	1		1	1					1	0								
RP20	1		1	1		1		1	1	0								
	5	2	5	4	2	1	0	1	2	0	0	0		0	0	0		0
BL21	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL22	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL23	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL24	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
BL25	1	1	1	1	1			1		0	0	0	0	0	0	0	0	0
	5	5	5	5	5	0	0	5	0	0	0	0		0	0	0		0
GT	**25**	**22**	**24**	**21**	**21**	**7**	**5**			**5**	**8**	**6**	**1**	**0**	**0**	**0**	**1**	**2**

Cereal Crops	**Cash crops**

BA:Bajra/Pearl Millet JU:Juvar/Sorghum MG:Mung/Black gram MT:Muth/ GU:Guvar/Clusterbean (vegetable/forage) Winter crops are both irrigated/non-irrigated.	KA:Kapas/Cotton ZI:Zira/Cumine TI:Tal/Seasm ER:Erenda/Castor VEG:Vegitables OTH:Others/Isabgol (medicinal) Zira, Isabgul and Castor are irrigated

Details of production and sale

R.no.	Seed sowing				Kg.						Sowing	Total land
	BA	JU	MG	MT	GU	KA	ZI	TI	ER	Veg	Kgs	sown (Ac)
AD101	4	80	2	0	16	40	12	2	2		158	8
AD102	12	225	9	75	0	150	150	11	180		812	15
AD103	8	250	8	20	30	100	80	0	120		616	10
AD104	15	375	15	60	60		120	8	150		803	15
AD105	9	240	9	60	60	120	120	0	180		798	12
	48	1170	43	215	166	410	482	21	632		3187	60
AD206	10	5	5	10		40		3			73	9
AD207	7	45	5	2	40		10	3			112	6
AD208	6	40		4	50			3	2	1	105	7
AD209	7	50	3	2			5	5			72	8
AD210	8	30	5		30		50	4			127	10
	38	170	18	18	120	40	65	18	2		489	40
RV11	5	6	5	3	4	0	0	5	2		30	5
RV12	5	8	3	6	10			5	2		39	5
RV13	5	4	5	0	10	0	0	6	2		32	5
RV14	5	5	4	6	10	0	0	8	2		40	5
RV15	5	8	5	4	10	0	0	6	2		40	5
	25	31	22	19	44	0	0	30	10		181	25
RP16	5	10	0	0	12	3			10		40	3.5
RP17	3	20	10	10							43	5
RP18	5	10	4	2		20			10		51	5
RP19	10	40	12	12	20	40	0	2	10		146	7
RP20	10	0	5	5	0	20	0	2	5		47	5
	33	80	31	29	32	83	0	4	35		327	25.5
BL21	6	6	2	2	7			2			25	7
BL22	5	20	4		10			4			43	10
BL23	10	40	4	4	15			7			80	17
BL24	15	20	5	5	5			5			55	15
BL25	10	20			5						35	5
	46	106	15	11	42	0	0	18	0		238	54
GT	190	1557	129	292	404	533	547	91	679		4422	204.5

Per acre sowing: 21.6 Kgs

Percentage cultivable area sown: 81.3

Details of production and sale

R.no	Total land	Production in (Munn) i.e., 40kg=1munn										Total Pro
	sown (Ac)	BA	JU	MG	MT	GU	KA	ZI	TI	ER	Vg	Kg.
AD101	8	1	0	1	0	2	1	0	0	0		200
AD102	15	5	0	2	2	0	4	3	2	4		880
AD103	10	4	2	1	1	2	4	6	0	4		960
AD104	15	2	2	1	1	1			1			320
AD105	12	7	3	3	3	3	5	7	0	6		1480
	60	19	7	8	7	8	14	16	3	14		3840
AD206	9	8	0	3	2		5					720
AD207	6	6	0	12.5	3	9	0	18	5	0		2120
AD208	7	5	0	0	3	8			5	20	13	2160
AD209	8	10	0	8	0	0	0	11	15	0	0	1760
AD210	10							5				200
	40	29	0	23.5	8	17	5	34	25	20		6440
RV11	5	15	0	10	5	10			4	8	0	2080
RV12	5	15	0	10	5	10			10	8		2320
RV13	5	15	0	10	0	10			10	8	0	2120
RV14	5	15	10	10	5	10			10	8	0	2720
RV15	5	15	10	10	5	10			10	8	0	2720
	25	75	20	50	20	50	0	0	44	40		11960
RP16	3.5	18	5	2	0	10	20			12		2660
RP17	5	12	0	5	5							880
RP18	5	20	10	5	5		20			5		2600
RP19	7	13	10	2	2	10	20	0	6	10	0	2900
RP20	5	10	0	2.5	2.5	0	23	0	2.5	12.5		2100
	25.5	72	25	16.5	15	20	83	0	8.5	39.5		11140
BL21	7	7	2	1	1	4	0	0	6	0		840
BL22	10	8	4	2		5			6			1000
BL23	17	10	5	2	2	10			9			1520
BL24	15	11	6	2	2	5			6			1280
BL25	5	6	4			3						520
	54	42	21	7	5	27	0	0	27	0		5160
GT	204.5	237	73	105	55	122	102	50	108	114		38540

Crop land based Demand supply gap in Year 2002*

Year 2002		**Good Year (favorable monsoon)**	
Production	Kgs	Kgs	
Avg. crop production/Acre:	188	840	Avg. crop production/Acre:
Forage prod./acre	126	560	Forage prod./acre
Average fodder requirement	19200	19200	Average fodder requirement
Average food grain requirement	6000	6000	Average food grain requirement
Average food grain yield	1545.4	6888	Average food grain yield
Average fodder yield	1030	4592	Average fodder yield
Gap in food grain supply: demand	-4455	888	Gap in food grain supply: demand
Gap in fodder supply: demand	-18170	-14608	Gap in fodder supply: demand

Livestock details

R.no.	Stock							Total	Milk/lts/day	Plough
	Cows	Buffalos	Bullock	Calf	Sheep	Goat	Camel	stock	production	Acres
AD101	1	1	0	2	0	0	0	4	8	0
AD102	0	0	2	0	0	1	0	3	1	0
AD103	1	0	2	1	0	0	0	4	8	0
AD104	1	1	2	2	0	0	0	6	8	0
AD105	1	1	2	2	0	0	0	6	12	0
	4	3	8	7	0	1	0	23	37	0
AD206	0	0	0	0	0	0	0	0	0	0
AD207	0	0	0	0	0	0	0	0	0	0
AD208	2	1	2	1	0	0	0	6	6	6
AD209	0	2	2	0	0	0	0	4	8	13
AD210	1	1	3	1	0	0	0	6	11	10
	3	4	7	2	0	0	0	16	25	29
RV11	2	2	0	2	0	0	0	6	20	0
RV12	1	2	2	1	0	0	0	6	22	5
RV13	0	0	2	1	0	0	0	3	0	5
RV14	1	5	2	1	0	0	0	9	26	5
RV15	0	5	2	0	0	0	0	7	20	5
	4	14	8	5	0	0	0	31	88	20
RP16	0	0	0	0	0	0	0	0	0	0
RP17	2	1	0	2	0	0	0	5	8	0
RP18	0	0	0	0	0	0	0	0	0	0
RP19	0	0	0	0	0	0	0	0	0	0
RP20	1	0	0	2	0	1	0	4	4	
	3	1	0	4	0	1	0	9	12	0
BL21	2	0	0	1	0	0	0	3	8	0
BL22	1	0	1	0	0	0	0	2	4	10
BL23	1	1	2	1	0	0	0	5	12	17
BL24	3	3	0	0	0	0	0	6	24	15
BL25	0	0	0	0	0	2	0	2	2	0
	7	4	3	2	0	2	0	18	50	42
GT	**21**	**26**	**26**	**20**	**0**	**4**	**0**	**97**	**212**	**91**
Percentage	22	27	27	21		4		100%	4.51	

Livestock details of agriculturists:

Average milk production/family:		12.5 lts		Big ruminants	96%
Average milk production/stock:		4.5lts		Small ruminants	4%
Percentage land ploughing by Bullocks:		44%		Milk yielding stock	50%
Percentage families not having big ruminents		20			
Demand and Supply matrix:		**Kgs.**			
Supply of forage from crops in:2002		25693			
Forage demand per year		448320			
Supply demand gap in 2002.		-422627	gap		
Production potential of wastelands:		303000			
Production potential of crop lands	Agicluture	114240			
Net productivity:		417240			
Supply gap under existing livestock size		-31080	gap		
If farming is mechanised, fodder demand		321600			
	Surplus	**95640**			

Income from migration:

R.no.	Migratory family m.	Members			No.of months	Place of migration	Income Rs.
		Men	Women	Children			
AD101	0	0	0	0	0	0	0
AD102	0	0	0	0	0	0	0
AD103	0	0	0	0	0	0	0
AD104	0	0	0	0	0	0	0
AD105	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
AD206	7	1	1	5	8	Bhachau	14080
AD207	0	0	0	0	0	0	0
AD208	0	0	0	0	0	0	0
AD209	0	0	0	0	0	0	0
AD210	0	0	0	0	0	0	0
	7	1	1	5	8	0	14080
RV11	3	1	1	1	6	Chobari	10560
RV12	4	3	1	0	4	Bhachau	14080
RV13	5	1	1	3	4	Chobari	7040
RV14	3	1	1	1	4	Chobari	10000
RV15	11	1	3	7	4	Chobari	15000
	26	7	7	12	22	0	56680
RP16	5	1	1	3	8	Gandhidham	10000
RP17	0	0	0	0	0	0	0
RP18	0	0	0	0	0	0	0
RP19	0	0	0	0	0	0	0
RP20	5	3	2	0	4	Gandhidham	17600
	10	4	3	3	12	0	27600
BL21	0	0	0	0	0	0	0
BL22	0	0	0	0	0	0	0
BL23	0	0	0	0	0	0	0
BL24	0	0	0	0	0	0	0
BL25	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
GT	**43**	**12**	**11**	**20**	**5.25**	**0**	**98360**
						32	12295

Percentage population depend on migration:	23.76
Percentage population of children in migrants:	46
Percentage families migrate for subsistance:	32
Average income earned/ year.	Rs.12300

Improved Cropping

R.no.	Name of hybrid crops	Crops		Kg.							
		BA	JU	MG	MT	GU	KA	ZI	ER	TI	Total
AD101	Gurubin/Bajri	4									4
AD102	Bajri/Mung	12		9							21
AD103	Bajri/Mung	8		8							16
AD104	Gurubin/Bajri; Castor	15							150		165
AD105	Bajri/Mung/Tal	9		9							18
		48	0	26	0	0	0	0	150	0	224
AD206	Gujbij- Bajri	10									10
AD207	Gujbij- Bajri	6									6
AD208	Gujbij- Bajri	6									6
AD209	Gujbij- Bajri and Tal	7								5	12
AD210	Junagadh-1(Bajri)	8									8
		37	0	0	0	0	0	0	0	5	37
RV11	0	0	0	0	0	0	0	0	0	0	0
RV12	0	0	0	0	0	0	0	0	0	0	0
RV13	0	0	0	0	0	0	0	0	0	0	0
RV14	0	0	0	0	0	0	0	0	0	0	0
RV15	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0
RP16	Gujbij- Bajri, juvar	2	20								22
RP17	Gujbij- Bajri, Juvar	3	20								23
RP18	Kalyani-Cotton					20	12		10		42
RP19	Junagadh-4-Juvar	10	40				40		10		100
RP20		5									5
		20	80	0	0	20	52	0	20	0	192
BL21		0	0	0	0	0	0	0	0	0	0
BL22		5								4	9
BL23		10								5	15
BL24		10		8						4	22
BL25		0	0	0	0	0	0	0	0	0	0
		25	0	8	0	0	0	0	0	13	33
GT	0	130	80	34	0	20	52	0	170	18	486

Major adaptation of improved varieties is in Castor followed by Bajra & Sorghum

Percentage application of hybrid seeds/improved seeds: 11
Percentage use of traditional seed varieties: 89
Cotton, Pearl Millet, Sroghum, and Castor are prominenet improve varieties
Pulses, Cumin and Clusterbean are traditional varieties in general.

Application of Fertilisers and Pesticides

R.no.	Organic	Chemical.F (Kg.)		Acres	Pesticide	Weedicide	Acres
	Fertiliser Kg	DAP	URIA				
AD101	3200	0	0	8	0	0	2
AD102	1200	0	0	15	0	0	
AD103	3200			10			
AD104	1200	0	0	15	0.25		2
AD105	2500	250	250	10		2	2
	11300	250	250	58	0.25	2	6
AD206	2500	0	0	6	0	0	0
AD207	5320	250	50	7	0.5	0	6
AD208	6400	200	50	8	4	0	3
AD209	3000	300	100	5	8	0	6
AD210	5000	200	120	7	4	0	7
	22220	950	320	33	16.5	0	22
RV11	2500	0	0	0		0	0
RV12	2000	0	0	0	0	0	0
RV13	2000	0	0	0	0	0	0
RV14	2000	0	0	0	0	0	0
RV15	2000	0	0	0	0	0	0
	10500	0	0	0	0	0	0
RP16	2500	0	0	0	0	0	0
RP17	5000	50	50	5	0	0	0
RP18	3000	0	0	0	0	0	0
RP19	1500	0	0	0	0	0	0
RP20	1500	0	0	0	0	0	0
	13500	50	50	5	0	0	0
BL21	0	0	0	0	0	0	0
BL22	0	250	50	10	0	0	0
BL23	0	250	250	17	0	0	0
BL24	0	100	100	15	0	0	0
BL25	0	0	0	0	0	0	0
	0	600	400	42	0	0	0
GT	57520	1850	1020	138	16.75	2	28

Input supply analysis	**Kilo grams**	**Percentage**
Application of organic matter at household level	2876	
Application of organic matter per acre:	573	
Percentage of farmland covered:		52
Percentage of families use organic matter in crops		80
Application of inorganic fertiliser at household level	319	
Application of inorganic fertiliser per acre:	21	
Percentage of farmland covered:		68
Percentage of families use inorganic fertiliser		36
Application of pesticides at household level	3	
Application of pesticides per acre:	1.5	
Percentage of farmland covered:		14
Percentage of families use pesticides in crops		24

Dryland agriculture-Input supply and costs

R.no.	Organic Fertilizer		Chmeical Fertilizer		Pesticide/weedicides			Labor cost	Pump set hire	Tractor	Seed cost	Bullock
	Acres	Rs.	Kg.	Rs.	Rs	Rs.	Acres	Rs.	Rs.	rent Rs.	Rs.	Cost .Rs.
AD101	2		500	0	0	0	0	0	0	800	1000	1500
AD102	1		750	0	0	0	0	0	0	3000	1500	0
AD103	2		500	0						2000	1000	0
AD104	3		0	0	150	0	4	0	0	3000	1500	0
AD105	10		500	1750		150	2	5000	0	2000	2000	0
	18	0	2250	1750	150	150	6	5000	0	10800	7000	1500
AD206	8	2500	0	0	0	0	0	1000	0	4000	2500	0
AD207	8	2500	350	1200	1500		6	1000	0	3000	3000	0
AD208	8	2000	400	1250	1600	0	3	1500	800	9000	3000	0
AD209	6	3000	250	1320	1700	0	6	1900	800	9000	3000	0
AD210	10	2500	350	1800	1900	0	7	1600	400	4000	5000	0
	40	12500	1350	5570	6700	0	22	7000	2000	29000	16500	0
RV11	5	2500	0	0	0	0	0	0	0	300	0	200
RV12	5	2000	0	0	0	0	0	0	0	300	0	200
RV13	5	2000	0	0	0	0	0	0	0	300	0	200
RV14	5	2000	0	0	0	0	0	0	0	300	0	200
RV15	5	2000	0	0	0	0	0	0	0	300	0	200
	25	10500	0	0	0	0	0	0	0	1500	0	1000
RP16	3.5	0	0	0	0	0	0	400	0	2000	800	1000
RP17	5	0	500	695	0	0	0	0	0	3000	0	1300
RP18	5	0	0	0	0	0	0	1000	0	2000	1200	1200
RP19	7	0	0	0	0	0	0	5000	0	4000	0	500
RP20	3	0	0	0	0	0	0	4000	0	4000	1200	800
	23.5	0	500	695	0	0	0	10400	0	15000	3200	4800
BL21	0	0	0	0	0	0	0	0	0	500	2000	0
BL22	0	0	300	2000	0	0	0	2000	0	3000	2500	0
BL23	0	0	500	4000	0	0	0	2000	0	2500	4000	0
BL24	0	0	200	860	0	0	0	0	0	3000	1500	0
BL25	0	0	0	0	0	0	0	0	0	500	220	1500
	0	0	1000	6860	0	0	0	4000	0	9500	10220	1500
GT	**106.5**	**23000**	**5100**	**14875**	**6850**	**150**	**28**	**26400**	**2000**	**65800**	**36920**	**8800**

Cost analysis of dryland agriculture inputs at household level and acreage*.

	Family	Acre
Value of organic fertiliser applied by each family:	2300	
Value of organic fertliser applied per acre:		216
Cost of inorganic fertilizers applied by each family	1240	
Cost of inorganic fertilizer applied per acre		108
Cost of inorganic pesticides applied by each family:	1142	
Cost of inorganic persiticides applied per acre		250
cost of labor per family in agriculture:	2200	
Cost of labor per acre per family:		923
Cost of hiring/purchase of pumpsets per family:	660	
Cost of hiring/purchase of pumpsets per acre		125
Cost of Tractors rented per family	2632	
Cost of tractors rented per acre		322
Cost of seeds per family:	2051	
Cost of seeds per acre:		535
Value/cost of ploughing by bullocks per family:	733	
Value/cost of ploughing by bullocks per acre:		176
Agriculture input cost per family in Rapar/Bhachau	12958	
Agriculture input cost per acre in Rapar/Bhachau		2655

* Costs are worked out for cereal and pulses under rainfed conditions.
Cost of pumpsets is considered under critical irrigation.

Application of Compost

R.no.	Compost	Annual production	Cow dung Sold Rs.	Used in agriculture	Earnings/ Rs.
AD101	0	0	0	3200	0
AD102	0	0	0	1200	0
AD103	0	0	0	3200	0
AD104	0	0	0	1200	0
AD105	0	0	0	2500	0
	0	0	0	11300	0
AD206	0	0	0	2500	0
AD207	0	0	0	5320	0
AD208	0	0	0	6400	0
AD209	0	0	0	3000	0
AD210	0	0	0	5000	0
	0	0	0	22220	0
RV11	0	0	0	2500	0
RV12	0	0	0	2000	0
RV13	0	0	0	2000	0
RV14	0	0	0	2000	0
RV15	0	0	0	2000	0
	0	0	0	10500	0
RP16	0	0	0	2500	0
RP17	0	0	0	5000	0
RP18	0	0	0	3000	0
RP19	0	0	0	1500	0
RP20	0	0	0	1500	0
	0	0	0	13500	0
BL21	0	0	0	0	0
BL22	0	0	0	0	0
BL23	0	0	0	0	0
BL24	0	0	0	0	0
BL25	0	0	0	0	0
	0	0	0	0	0
GT	0	0	0	57520	0

Compost is not at all existing
Cow dung is directly applied.
75% families use cow dung as organic matter in farms.
2876 Kg of cowdung is applied by each family.

Crops survive in uncertainities Rating.

R. no.	Food grains and traditional crops									Commercial crops			
	BA	JU	MG	MT	GU	KA	ZI	Tu	ER	KA	ER	ZI	OT
AD101		1								1	1	1	
AD102		1	1	1				1		1	1	1	
AD103		1				1				1	3	2	
AD104		1								1	3	2	
AD105		1				1				2	3		1
	0	5	1	1	0	2	0	1	0	6	11	6	1
AD206	1	1	1							1			
AD207	1	1										1	
AD208	1	1										1	
AD209	1	1										1	
AD210	1	1								1		1	
	5	5	1	0	0	0	0	0	0	2	0	4	0
RV11	0	0	0	0	0	0	0	0	0	0	0	0	0
RV12	0	0	0	0	0	0	0	0	0	0	0	0	0
RV13	0	0	0	0	0	0	0	0	0	0	0	0	0
RV14	0	0	0	0	0	0	0	0	0	0	0	0	0
RV15	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
RP16		1				1			1	1	1		
RP17		1											
RP18		1			1					1	1		
RP19		1								1	1		
RP20		1								1	1		
	0	5	0	0	1	1	0	0	1	4	4	0	0
BL21	0	0	0	0	0	0	0	0	0	0	0	0	0
BL22	0	0	0	0	0	0	0	0	0	0	0	0	0
BL23	0	0	0	0	0	0	0	0	0	0	0	0	0
BL24	1	1	1							0	0	0	0
BL25	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	1	1	0	0	0	0	0	0	0	0	0	0
GT	6	16	3	1	1	3	0	1	1	12	15	10	1

Sorghum is considered as drought coping variety followed by Peral Millet

Lentil and Cotton.

Castor is considered as drought coping variety in commercial crops followed by Cotton and Cumin.

Monsoon crops are mixed crops where as winter crops are monocrops.

3 to 5 seed variants are used in mixed cropping

Horticulture crops

R.no.	Vegetable seed sowing				Season	Acres	Cropping type	Yield Kg.	Horticulture plants	Earnings Rs.
	Gu	Bhi	Tom	Oth						
AD101	1	0	0	0	Monsoon	8	Monsoon	60	0	0
AD102	0	0	0	0	0	0	0	0	0	0
AD103	0	0	0	0	0	0	0	0	0	0
AD104	1				Monsoon	15	Monsoon	900	0	0
AD105	1	1	1	1	Monsoon	10	Monsoon	400	0	0
	3	1	1	1	0	33	0	1360	0	0
AD206	0	0	0	0		0	0	0	0	0
AD207	0	0	0	0	0	0	0	0	0	0
AD208	1	1		1	Summer	1	Monsoon	3200	0	32000
AD209	1	1	1	1	Winter	1	Monsoon	1520	0	6880
AD210	0	0	0	0	0	0	0	0	0	0
	2	2	1	2	0	2	0	4720	0	38880
RV11	0	0	0	0	0	0	0	0	0	0
RV12	0	0	0	0	0	0	0	0	0	0
RV13	0	0	0	0	0	0	0	0	0	0
RV14	0	0	0	0	0	0	0	0	0	0
RV15	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
RP16	0	0	0	0	0	0	0	0	0	0
RP17	0	0	0	0	0	0	0	0	0	0
RP18	0	0	0	0	0	0	0	0	0	0
RP19	0	0	0	0	0	0	0	0	0	0
RP20	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
BL21	0	0	0	0	0	0	0	0	0	0
BL22	0	0	0	0	0	0	0	0	0	0
BL23	0	0	0	0	0	0	0	0	0	0
BL24	0	0	0	0	0	0	0	0	0	0
BL25	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
GT	5	3	2	3	0	35	0	6080	0	38880

Cluster bean, Lady finger, Tomatos and other vegitables
are raised by 25% of families in monsoon.
17% of the cultivated area is adopted for vegetable
production by 25% of cultivators
Average production per acre is 174 kg./season
Horticlture plants were completely missing from cropping practices
Each family earned on an average Rs.7776 from vegetables
However the adaptation is less and scope for innovations exist.

Micro-irrigation

R.no	Aware of Micro-irrigation		Area covered acres	Source of information	Openion
	Yes	No			
AD101		1			0
AD102		1			0
AD103		1			0
AD104		1			0
AD105		1			0
	0	5	0		0
AD206	1		0	IDE	Saves water
AD207		1	0		0
AD208	1		0.5	IDE	Saves water
AD209	1		0	Setu	Saves water
AD210	1		0	Setu	Saves water
	4	1	0.5		0
RV11	0	1	0		0
RV12	0	1	0		0
RV13	0	1	0		0
RV14	0	1	0		0
RV15	0	1	0		0
	0	5	0		0
RP16	0	1	0		0
RP17	0	1	0		0
RP18	0	1	0		0
RP19	0	1	0		0
RP20	0	1	0		0
	0	5	0		0
BL21	0	1	0		0
BL22	0	1	0		0
BL23	0	1	0		0
BL24	0	1	0		0
BL25	0	1	0		0
	0	5	0		0
GT	**4**	**21**	**0.5**		**4**

84% unaware of micro irrigation systems or any kind of new technologies
Negligible area covered under micro-irrigation

Institutional services

R.no	Credit society	Credit amount Rs.	Agriculture Loan Rs.	Subsidy Rs.	Bank Loan Rs.	Private Lneding Rs.	Debt Rs.
AD101	APCCSoc.	2200	0	0	0	5000	3000
AD102	0	0	0	0	0	0	0
AD103	0	0	0	0	0	0	0
AD104	0	0	0	0	0	0	0
AD105	APCCSoc.	3000	0	0	0	0	0
		5200	0	0	0	5000	3000
AD206	0	0	0	0	0	0	0
AD207	0	0	0	0	0	0	0
AD208	0	0	0	0	0	0	0
AD209	0	0	0	0	0	0	0
AD210	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
RV11	0	0	0	0	0	0	0
RV12	0	0	0	0	0	0	0
RV13	0	0	0	0	0	0	0
RV14	0	0	0	0	0	0	0
RV15	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
RP16	COHESION	500		250	0	0	0
RP17	APCCSoc.	10000	0	0	0	10000	0
RP18	0	0	0	0	0	0	0
RP19	0	0	0	0	0	0	0
RP20	0	0	0	0	0	0	0
	0	10500	0	250	0	10000	0
BL21	0	0	0	0	0	0	0
BL22	0	0	0	0	0	0	0
BL23	0	0	0	0	0	0	0
BL24	Gopalak Seva CO.SO.	0	0	0	0	0	0
BL25	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
GT	0	15700	0	250	0	15000	3000

Only 16% could have access to credit facilities either from ACCSoc. Or NGOs.

50% of credit needs are met by private lenders
Most of the farmers clear debts: 96%
Banking sector has no trace of evidance in lending among respondents.

Preconditions for change

					Preference for services	
R.no.	Farm bunding	Farm ponds	Gully plugs	Land leveling	New agri tools	Others
AD101	1	1		1	1	
AD102	1	1				
AD103	1					
AD104	1					
AD105	1	1	1	1	1	
	5	3	1	2	2	
AD206	0	0	0	0	0	
AD207	0	0	0	0	0	
AD208	0	0	0	0	0	Commercial crops
AD209	0	0	0	0	0	
AD210	0	0	0	0	0	
	0	0	0	0	0	
RV11	1	1				Check dams needed
RV12	1	1				Check dams needed
RV13	1	1				Check dams needed
RV14	1	1				Check dams needed
RV15	1	1				Check dams needed
	5	5	0	0	0	
RP16	1	1		1		Wells, agriculture, LS
RP17	1	1		1	1	
RP18	1	1		1		Improved seed supply
RP19	1					Improved seed supply
RP20	1					improved seed and
	5	3	0	3	1	Tractor
BL21	0	0	0	0	0	
BL22	0	0	0	0	0	
BL23	0	0	0	0	0	
BL24	0	0	0	0	0	
BL25	0	0	0	0	0	
	0	0	0	0	0	
GT	15	11	1	5	3	

Need expressed for farm bunding followed by farm ponds
Clear indication for land rehabilitation activities and water supply.