Mapping Trends of Climate Change and Traditional Cropping Pattern, Rajasthan

Blocks: Chaksu, Niwai, Malpura, Shahabad, Phagi

2017

A hand Aatta Chakki

Age old traditional utensils to store milk and cook

A lady husking grains

A shepherd with minimal amount of sheep in a heard

A farmer showing low ground nut produce in the farm

Centre for Community Economics and Development Consultants Society

cecoedecon

Secretary's Note

Climate change is a reality felt by all in different spectrum of life. It has become a global challenge affecting the lives of all ranging from the very tiny microorganism, flora and fauna to the human beings. The change in environment is adversely affecting the livelihood, food security, health as well as it is hampering the citizen's right to live of many small Islands Nation States.

The international development practices to curb the challenges of climate change are commendable. The initiative taken up by the global community will help us withstand against the problem with a unanimous solution. But the International development processes fail to cater at the ground level. The needs of the ground level emphasise to conserve the indigenous practices to adapt to the changing climatic conditions. Many organisations have understood the need of the hour. They have developed programs to conserve the age old sustainable food and cropping pattern.

But to the dismay in an initiative to study climate change we are depending only upon the technical know-how while missing the human touch. We fail to cater to the change caused by climate change in the life of the people. It is time when the civil society should try to develop a holistic approach in studying the effects of climate change on the social, economic and cultural structure of the society. It is evident that the gulf between the rich and poor is increasing and trend of distress migration in rural society is evitable, changing the rural social structure. Now the time has come when individual and community should be motivated to move forward and save the forest, wildlife, water and conserve the traditional practices.

This research study is an attempt to give voice to the vulnerable community and map the coping mechanism deduced by them to cater to the changing situations. It is necessary to develop people centric policies. We are hopeful that this research study will be help to the institutions, organisations and policy makers as it is an initiative to provide a platform to the vulnerable group.

We here present you the voices of farmers and vulnerable group who are affected by the Climate Change.

Sharad Joshi

Foreword

The rise in temperature is felt by all of us. We all are hit by the wrath of sun, low rainfall and short winters. The climate change is felt by all of us but it has directly hit the farmers of India. The dependency of farmers on monsoon has made them the most vulnerable group in the changing phase of time.

The knowledge of India farmers are through age old traditions passed through generations from one to next. The farmers were dependent upon their oral knowledge, local knowledge and totems but with the change in environment and infiltration of modern techniques they are forced to question their traditional knowledge. The new generation is not taking up farming as their profession.

In this study we are taking a step to map the age old traditional practices of farmers and how they have adopted to the changing climate with technology playing a major role. The study also tries to answer the questions of farmers as how climate change will affect the farming pattern of the farmers. Later, in the study we have raised some questions by the farmers and suggested some ways to come overcome the effects of climate change.

We do not wish to justify that the modern knowledge and modernisation is the reason for the ill-condition of the farmers. We suggest that the farmers should be allowed to make an informed choice from the options of farming provided to him. He should be given the choice to select the vocation of his choice rather than being forced to move out of farming due to the distressed conditions.

To complete the study, I was greatly helped by the members of Kisan Seva Samiti of all the blocks. I am great full to them and other villagers, who opened their heart to me, treated me like one of them and allowed me to peep into their lives.

I have tried my level best to present what I saw in the field, however the lapses are mine.

Zola Zareen

October 13, 2017

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"Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." –UNFCC

History of climate change

NASA suggests that the earth's climate has changed in the past. In the past 6,50,00 years there have been seven cycles of glacial advance and retreat, with the abrupt end of last ice age about 7,000 years ago marking the beginning of the modern climate era and of human civilization.

Climate change has been a topic of concern since 1824 when French physicist Joseph Fourier firstly described the earth's natural "green house". In 1938 it was suggested by Guy Callendar that the Earth's temperature has risen over previous centuries due to concentration of CO_2 in the atmosphere: The Callendar effect. In 1955 it was assumed by Gilbert Plass that temperature will raise by 3 to 4 degree Celsius. In 1958 Charles David systematically measured the atmospheric CO_2. The project- which continues even today- provides first unequivocal proof that CO_2 levels are rising.

It was in 1965 that US President's Advisory Committee panel wars warned that green house effect is a matter of concern. Later in 1972, in the first UN environment conference, climate change was registered as an issue of concern. In 1992 at the Earth summit in Rio De Janerio, government's agreed on the United Framework Convention on Climate Change. In 1997 Kyoto Potocol was agreed upon, in which developed nations pledged to reduce emissions on an average of 5%. Later in 2001, US exit the Kyoto Protocol.

The latest suggest that Paris Climate Agreement is an agreement whose language was adopted by 196 parties on December 12, 2015. The Paris Agreement has been signed within United Nations Framework Convention on Climate Change. The Paris Agreement aims to limit the increase in world temperature 2"C above pre- industrial level, lower than 1.5'C. The agreement also aims at adapting to climate change and 'foster climate resilience'. It also aims to finance with low greenhouse emission in view. The Paris Agreement starts realizing itself in the year 2020.Under the agreement, each country determines its own contribution. In fact, the contribution is called 'Nationally Determined Contribution'. International law, however, cannot force a country to fulfill

their NDC. The Paris Agreement, although ambitious, has been described as only necessary by President Obama.

"Since the dangers posed by global warming aren't tangible, immediate or visible in the course of day-to-day life – however awesome they may appear – many will sit on their hands and do nothing concrete about them. Yet waiting until they become visible and acute before being stirred to serious action will, by definition, be too late."

-Gidden's Paradox

World and climate change

Climate change has become a well-known fact in the global scenario. The world has taken up the challenge of global warming and the debate is on. The leaders are trying to accept and neglect the challenge with their vested interests. The climate change at the world is affecting the environment as well as global politics.

Climate change and Environment

A rise of eight degree Fahrenheit is not much. It is only a difference of wearing a sweater or not on an early winter morning. But for the world, the climate experts suggest that the earth temperature will rise by 8 degrees in the days to come. This will have greater consequences on the world climate, evidences of which is already visible to us.

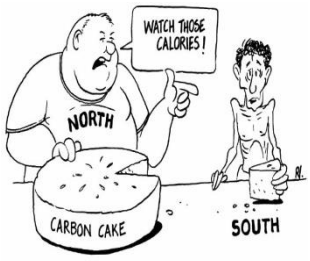
- Rise in global temperature
  The planets average temperature has risen about 2 degree Fahrenheit (1.1 degree Celsius) since the Industrial revolution (1760-1820). The rise in temperature can be contributed to large scale production of carbon dioxide by the industries.
  Meanwhile 33% of the carbon dioxide emissions end up in the ocean leading to a series of change in its chemical formulation and making it more acidic. It has resulted in depletion of sea shells, making the ocean 40% more acidic than before.

- Human life and natural habitat
  The phenomenon is affecting the agricultural practices. Where, how and when we grow crop is largely dependent on the climate. The prolonged summers and erratic rainfall is affecting the cropping pattern. The farmers are finding it difficult to cope up with the changing climatic conditions. Evidence show that trees are losing their defence mechanism due to prolonged droughts, being prone to insects and weeds.

The climate change is affecting the life of the people, animal, trees and their natural habitat. The loss of life is immense and requires quick and effective redressal before the changes become irresistible.

Climate change and World Politics

The development of country requires infrastructure and energy. These factors of development are highly co-related to the level of carbon dioxide



emission. The development strategy of most of the countries relies only on over production which emits the greenhouse gases.

The climate change has become an issue of concern for all the countries. The world stand divided on the issue. On one hand, they deny accepting any such phenomenon and on the other hand the developing countries have adopted industrialisation as a process of change.

The developing countries want the developed countries to pay for the carbon emissions whereas the developed countries like US and England expect the developing countries like India to adopt sustainable development practices. The debate is still going on the climate finance. The developed countries have no consensus upon the amount of fund that shall be issued to the developing countries. The developing countries are ambiguous on the way to spend the funds in mitigation or adaptation. The second threat to the climate finance is the role of US and Trump has stated that US may walk out from the Paris Agreement.

No consensus is formed on the role and tackling strategy on climate change. The world stands divided and confused on the question which is affecting our daily lives. The tussle between the right solutions to climate change is yet to be decided.

Mother Earth: The Agreement of Cochabamba

The agreement of Cochabamba is a different perspective to see climate change. From years the capitalist system has imposed competition, progress and limitless growth. It has commoditized earth and its resources like water, air, sources of raw material, making human beings the consumers.

We require developing a harmony between nature and human beings. To cater to climate change the Mother earth should be recognised as the source of life and energy. We wish to develop a harmony and balance among all things by fulfilling the collective well-being and satisfaction of all human beings.

India and Climate Change

Today India stands on a duo, to choose for the faith of its economy. A country highly dependent upon its carbon resources and agriculture industry with a history of low per capita carbon emissions is forced to participate in the global climate change challenge. The global pressure asks for a cut down in the carbon emissions which may hamper the industrial growth of the nation as the debate continues in India and on global platforms about the role of developing nations on Climate Change.

The problem of climate change does not rest only on the shoulders of politicians or the think tank and policy makers but it is adversely affecting the society and environment. The Indian agricultural and cropping pattern is also facing the consequences of the challenges raised by climate change. The agro-economy is hard stricken by the change in the rainfall pattern, temperature change and un-precedented rainfall and drought in different parts of India. The soil fertility is also depreciating due to chemical bombarding on the crops to ensure greater yield which is eye-soothing.

Climate change and agriculture

In the era of inflow of capital, heavy market forces and industrialisation, the method of agriculture is changing. The agricultural practices are not only affected by the forces of demand but also by the forces of nature.

The natural conditions and climate has shifted in the last 27 years. It is calculated that the farm sector in Inida is in distress and several state governments have responded to the situation with loan waivers and special packages at a time when the Indian economy has slowed significantly. India has also faced deficient rainfall for two consecutive years in 2014 and 2015. According to estimates the Kharif crops is likely to decline by 2.8% this year due to uneven monsoon. The possibility of such weather is likely to continue in the years to come.

Weather does not affect the agriculture sector alone, it affects the productivity of a country. According to research the productivity starts declining after a weather shock. Countries located in areas with higher temperature will face disproportionate impact of global warming. Loss of output and lower productivity also affects capital formation, which has bearing on medium to long term growth prospects.

Climate change and Urbanisation

India is a developing country, highly dependent upon its vast natural resources and agriculture industry. The agro dependent economy is a saviour of the poor and marginalised rural population.

As the country falls in the slab of developing countries it is going through a phase of transition from agriculture to industrialisation. The market forces are changing the trends of agriculture as well as industry. Climate change is another factor which is largely affecting the agriculture practices of India. The changing pattern and inputs in the agriculture has led to high levels of migration from rural to urban areas. The farmers are facing difficult to face the market challenges. The uneven flow of income and dearth of knowledge of other skills and employment opportunities have forced them to migrate to other cities. The pattern is highly defined by the cropping output. The trends

The Effects Of Weather Shocks On Economic Activity: How Can Low-Income Countries Cope?

Emerging market economies and particularly low-income developing countries tend to have much hotter climates, and a rise in temperature significantly lowers per capita GDP growth. For the median emerging market economy, a 1°C increase from a temperature of 22°C lowers growth in the same year by 0.9 percentage point. For the median low-income developing country, with a temperature of 25°C, the effect of a 1°C increase in temperature is even larger: growth falls by 1.2 percentage points. (Fund, 2017)

also show migration of male members who flee to other cities in search of livelihood to meet the changing living standards of the family. The rural social structure is rapidly changing to meet the new demands and changing living practices of the rural society.

Demography of Rajasthan

Nearly 75 per cent of the 6.85 crore Rajasthan population resides in the rural area. Of the 3.55 crore male population 74.9% lives in rural Rajasthan and of the 3.30 Crore Female population 75.3% lives in rural area. A rise of 19% can be marked as the decadal change in the rural population whereas a comparatively high growth of 29% can be marked at the urban level.

In the rural areas 54.8% of the total worker population (2.43 Crore) are cultivators. Of the 1.36 Crore cultivator 55% is male and 45% is female cultivator. The percentage of agricultural labour amount to 19.4% (0.5 agricultural labourers. The data may show such a difference because the male migrate to cities) of total workers in which 57% are female workers to 43% male urban areas in search of better work opportunities.

	Rural		
	Total	Male	Female
Total Population	75.1%	74.9%	75.3%
Decadal change	19%		
Total Cultivators	54.8%	53.4%	56.6%
Agricultural Labour	19.4%	25.6%	14.6%

Budget Highlights: Agriculture and Allied Services

The Gross State Domestic Product of Rajasthan for 2016-17 is estimated to be Rs. 7,67,167 crore. This is 13.8% higher than the estimate for 2015-16.

In the area of rural development 60,000 artisans are proposed to be trained in 2016-17 under the Rural Non-Farm Development Agency, with allocation of 2 crore.

The average growth in Rajasthan witnessed an increase from 8.12% during 2005-10 and 9.5% during 2010-15. The agriculture growth has increased tremendously from 2.6% to 9.8%.

19.5% of Rajasthan's economy is contributed by agriculture sector and it employs second highest 44% of state's population.

Rs. 3072 crore has been allocated to the Agriculture Department in 106-17 (43% increase than the proposed expenditure in 2015-16)

Rs. 650 crore has been allocated to Rashtriya Krishi Vikas Yojna and Rs. 676 crore to the Pradhan Mantri Bima Yojana, in 2014-17.

5.52% of the total budget has been allocated to agriculture and allied services in the year 2017-18.

Water sources in Rajasthan

The rainfall behaviour in Rajasthan is very erratic and it is irregular with recurrent droughts and local floods. The agriculture production mainly depends upon South-Eastern monsoon rain. The available irrigational facilities are not evenly distributed in the state or fully dependable. The infrastructure for water conservation is also highly dependedable on the monsoon rain.

The major sources of irrigation includes well and tube wells, tank irrigation, canal irrigation. The irrigation is also supported by huge infrastructure setups like wells, ani-cuts, check dams, and dams.

VISION

To achieve such development which is socially acceptable, economically viable, environmentally sound, effective in impact and addressing the needs of the under privileged and marginalized people.

CECOEDECON

The Centre for community Economics and Development Consultants Society (CECOEDECON) is one of the Rajasthan's leading civil society organizations. Its early work dates to 1981 in providing disaster relief to the flooded areas of Rajasthan. Over the years CECOEDECON has worked towards promoting inclusion, making communities resilient, empowering women, children, farmers, tribes, and other marginalised strata of the society.

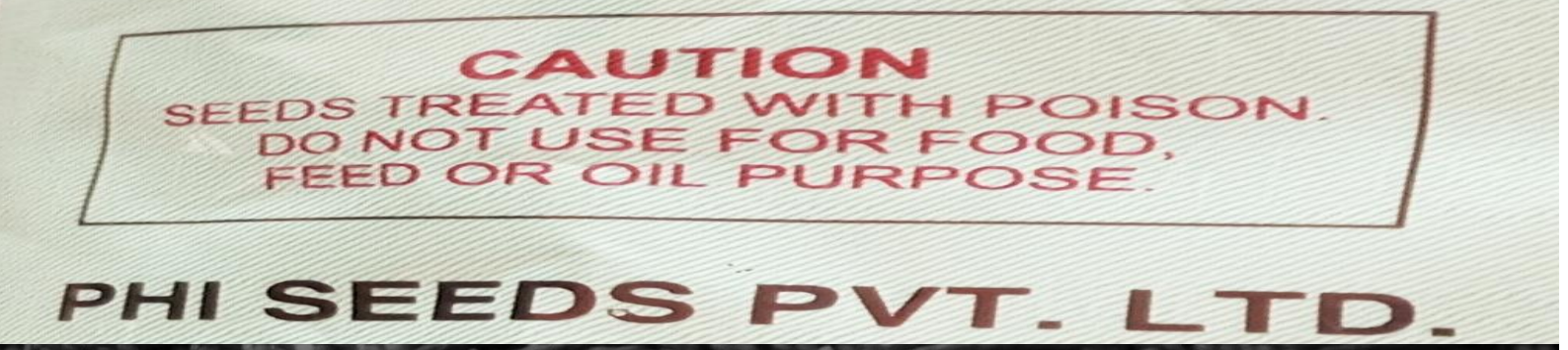
CECOEDECON works on Rights Based Approach to development, as it provides a deeper understanding of poverty and rights violation, vulnerability, constraints in realisation of rights and the decision making. With a strong background of meaningful community participation, empowerment, advocacy and imposing accountability on the duty bearers.

CECOEDECON has developed insights into the causal analysis of vulnerability, building partnership for development, strengthen community based institutions, integral gender analysis and need for maintaining multiple intervention at the local, state, national, regional and global levels.

With the aim to reach to the bottom of the pyramid Kisan Seva Samiti has been formed as an apex body by CECOEDECON.

Kisan Seva Samiti (KSS)

The CECOEDECON approach to development is inclusive. The development is difficult unless the decision and implementation is within the local community and local community based organization. To increase the reach, it



Genetically Modified Mustard: A No!!

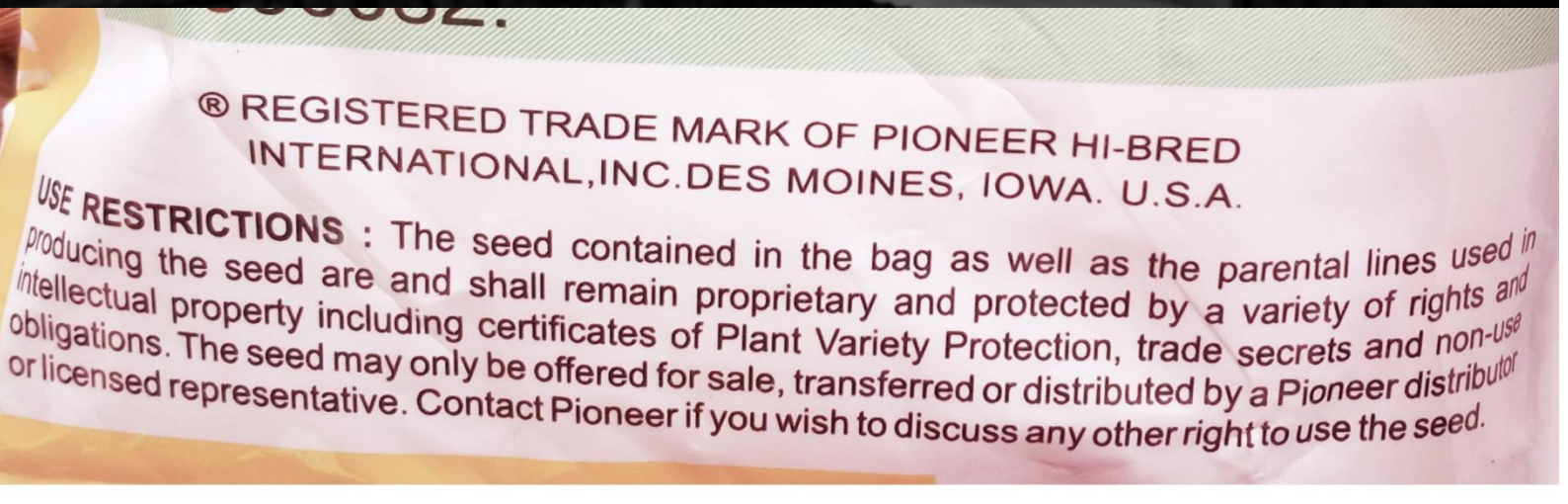
The stage was all set to take the fight to stop the Genetically modified mustard seeds under the Sarson Satyagrah to be sold in the Rajasthan's market by many organisations, farmers, consumers, scientists. CECOEDECON and its Kisan Seva Samiti played a crucial role putting the matter at the fore front.

The history of GM goes back to Bt brinjal. The GM mustard has been developed by Delhi University-based Centre for Genetic Manipulation of Crop Plants (CGMCP). If approved, it would become the first GM food crop; at present only GM cotton is al-lowed. The NDA government had promise that GM seed will not enter the market without proper scientific justifications.

A long battle was fought by the Kisan Seva Samiti to cater the challenges brought by the lobby forces of genetically modified seeds. With the efforts of civil society the fact was made clear that the Rajasthans mustard had 40 to 45 percent more oil than any other mustard seed, the highest in India.

With the efforts of the civil society and mass agitation by the farmers it was accepted by the then agriculture minister Mr. Prabhulal Saini to stop the use of GM in Rajasthan. he said, "I am not against this (GM) but farmers welfare and human beings safety is my priority. So, our CM and I have decided not to allow unless there is unanimity,". The efforts of the movement was so effective that Mr. Saini even stopped the field trial of the GM seed in three districts- Bharatpur, Alwar and Hanumangarh stating, "We have denied permission for field trials. We will not allow now because there will be a problem of pollination through bee, air or bird. We will not allow unless we ascertain the benefits,".

The Sarson Satyagrah was a lesson preached to the world by the civil society and farmer groups against the genetically modified crops. The road ahead is very difficult the farmers of Rajasthan are standing united against the market forces which are likely to increase the role of market in agriculture.



moved forward and facilitated the formation of community based organisations. One such organisation was Kisan Seva Samiti.

With the aim to strengthen and make the farmers vocal to the civil society and government, the Community based organisations was formed. The awareness generation and capacity development of CBO's were made through in continuation of the process in PIIRD 2nd and 3rd phase. The Kisan Seva Samiti came up as one such initiative to raise the voice of farmers.

KSS were formed at Chaksu-Phagi, Malpura, Newai and Shahabad block. The amalgamation of these blocks ensured representation of SC, ST and women. Later with the formation of KSS at block level a need was felt to create a statutory body to function at the state level.

Kisan Seva Samiti Mahasangh was formed as a state level federation of Kisan Seva Samities. The KKSM has helped the farmers to raise their unheard voice at government platforms to make notable changes in the agriculture policies.

CECOEDECON with Farmers facing the challenge of Climate Change.

CECOEDECON has stood with the community for last 30 years hand in hand with the changing time and inflow of technology in farming. It has witnessed the transition from traditional labour intensive farming techniques to machine based farming methods. In the course of time we have been with the farmers to help them cope up with the challenges of new era like Climate Change. In the long run the farmers raised the issue of changing climatic conditions, which came up as a debatable issue in the community. CECOEDECON understood the gravity of the problem and took steps to raise the voice against it. Soon it was decided that saving Mother Earth will be an integral part of agenda. To help the farmers we raise the issues like:

- Efforts taken to save traditional practices
- Capacity building
- Advocacy on rights based approach
- Multi stakeholder approach
- Raised the voice at national and regional level

One such revolutionary step taken by the Kisan Seva Samiti has fought is against the genetically modified mustard crop. The steps taken by KSS and other allied civil society forced the government of Rajasthan to take steps to stop the entry of GM mustard seeds into the state.

Area of Intervention

The Kisan Seva Samiti has been functional in five blocks of Rajasthan. The study has been conducted in these Tehsils of Rajasthan. The demographic outline of the tehsils gives a better understanding of the area.

	Chaksu	Niwai	Malpura	Shahabad	Phagi
No of Gram Panchayat	35	41	37	27	30
Villages	287	209	160	236	172
Total Population	190202	208022	211614	142061	191126
Male	51.94%	49.96%	51.28%	51.89%	51.92%
Female	48.06%	50.04%	48.72%	48.11%	48.08%
Cultivators	46226	48688	40874	22656	38492
Male	51.40%	55.40%	60.92%	66.14%	58.53%
Female	48.60%	44.67%	39.08%	33.86%	41.47%
Main Workers	71218	73422	71891	42369	66509
Agricultural Labourers of Main Workers	4.69%	7.02%	15.98%	26.68%	10.02%
Male	3.74%	4.73%	12.19%	22.85%	8.07%
Female	6.17%	10.66%	22.75%	34.05%	13.70%

Agricultural Labourers of Main Workers are between 5 and 10.02 percent in Chaksu, Niwai and Phagi. Agricultural Labourers of Main Workers are 15.98 percent and 26.68 percent in Malpura and Shahabad respectively.

Among all five areas Chaksu, Niwai, Malpura, Shahabad and Phagi a greater percentage of women participate as Agricultural Labourers of Main Workers as compared to men.

In Malpura and Shahabad there are a greater percentage of women as Agricultural Labourers of Main Workers (22.75% and 34.05% respectively) than in Chaksu, Niwai and Phagi.

The trends are evident that there is a large rural community which is pursuing agriculture and-or allied agriculture practices. We as an organisation have stood aside with the farmer community in order to achieve greater output in agriculture. Our approach also includes providing help to the marginalised through policy advocacy and infrastructure development.

Traditional Practices

Fig 1 Traditional Bullock Cart

India and Indians take pride in their age old tradition which dates back to 8000 BC. The tradition of agriculture can be traced from the establishment of human civilization. It is evidenced that agriculture, husbandry and storage has been introduced in the Neolithic age. The agricultural practices have come a long way since then, witnessing major changes in the era of change. Later the most innovative and technologically sound early civilizations of the world, The Indus Valley Civilization have evidence of domestication of animals, irrigation facility, and storage of grains, drainage system and artificial reservoir. The Mughal era witnessed the inflow of cash crops like cotton, indigo and opium.

A major breakthrough in the agriculture can be traced in the British era. Agriculture was commercialised during this period. A market for irrigation was developed and the market forces of demand and supply for cash crops played a major role in the pricing of commodities. In the independent India agriculture was given utmost importance in the five years plan. The government ensured land reforms, land development, mechanisation, electrification, use of chemical-fertilizer and introduced 'package approach' for agriculture. The green revolution, white revolution, blue revolution is child of Package approach.

The trends of agriculture greatly changed after the opening up of economy in 1990. The market forces started to define the selection of crop by the farmer and it diversified. A new middle class emerged which had different taste and preferences. The consumption of cereals declined and more fruits, vegetables and dairy products became a part of the food basket. Later in 1997 with the changing climate and inflow of technology the agricultural practices changed in sync with the market demands.

It is also found that climate change has played a very big role in the change in the farming practices. The farmers are losing the age old traditional knowledge of agriculture and adopting to the new age technological interventions. The farmers of India are highly dependent on monsoon but from the past few years India has witnessed scanty rainfall.

We through this study are taking a step to map the traditional practices of agriculture in 5 tehsils of Rajasthan and how they have shaped after the evident effect of climate change. The farmers have unfolded the practices which are documented as oral history. Many farmers are believer that the age old practices were better than the new practices which are less labour intensive. Many are in favour of organic farming which provides self-sufficiency in grains and livelihood throughout the year.

Traditional practices of agriculture in Rajasthan

The change is inevitable but sometimes the traditions play a vital role in saving the disasters from change. The traditional practices have saved the farmers from the erratic seasonal disturbances since time immemorial.

Ploughing Knowledge

Ox Plough field holds more water

The field plough by ox carves a zig-zag structure in the soil which helps in more water retention through evaporation as it exposes less surface area to the sun. whereas, ploughing with tractors plough the field horizontally parallel, exposing more surface area to the sun leading to less moisture in the soil.

The first step to agriculture is ploughing. Ploughing is the step for preparation to loosen the soil to sow seeds or plant saplings.

Traditionally, the fields were ploughed using ox and plough. Ploughing the fields with plough was a highly labour intensive job employing minimum 2 young people. It also raised the number of livestock that a family holds. After ploughing of the soil, manure was dumped in the soil to ensure fertility of the soil. Later, after the first rain seeds were sown in the land.
The depth of the soil was determined according to the requirement of the soil, previous crop and duration of rainfall expected. Each household held at least a pair of Ox. It was very dubious that a landowning family lacks Ox in the livestock. The Ox was also used in oil mills and irrigation systems. Replacing that with machines has added an additional cost to agriculture.

In the modern times, ploughing of fields is conducted using machines such as tractors with an external plough attached to it. This has reduced the time taken to plough the field.
The depth of the soil can be mechanically defined. It is very unlikely that every household owns a tractor of its own. Hiring a tractor for a day amounts to Rs. 300 to 400 per day, employing only one member of the family.

Fig 2 Ironsmith in a village

The rise in temperature and less rainfall has forced the farmers to plough the fields multiple times. The erratic rainfall is a reason for less moisture in the soil. Usually, the Kharif requires only one ploughing if the rain is on time. Now, with erratic rain pattern, the farmers are forced to plough the soil twice. The farmers have also come up with the fact that soil is losing its natural moisture due to very high temperature.
The change in climate like erratic rain and rise in temperature is adding a cost of input for the farmers as ploughing 1 Hectare of land requires expenditure of Rs. 350.

Fig 3 Tractor Repair Shop

The wrath of high temperature has forced the farmer to double the input cost at the beginning of the agriculture process.

Seeding

Seed Barter

Years back, the farmers used to exchange seeds for seeds.
If a farmer wishes to buy seeds then he has to pay 1.25 times seeds in the next season as an exchange price.

Seed is the basic and most vital input of agriculture. Without high quality seed, other input and better technologies remain worthless. Good quality seeds along with recommended amount of input provide uniform and rapid germination and subsequently a good crop harvest.

The age old farmers knew that seeds are the most vital for the next crop. They believed in storing the best quality of seeds for future needs. They have also developed a mechanism to exchange seeds of high quality through barter system.
The traditional farmers also understood the importance of insects like earth worms in the process of increasing the fertility of the soil, ants and bees in pollination and other friendly insects (Mitra Keet). The insects formed a part of the farm ecology and played an inevitable role.

In the modern times the farmers are highly dependent upon market for seed accumulation. They have lost the practise of storing the seeds and saving it for the next crop season. The dramatic shift is attributed to the government policies and infiltration of market forces into the agro-market. Also, it is evident that seeds stored from the current crop fail to grown in the next season due to environmental and/or genetic reasons. The crop germination is also stunted or production is low due to non-availability of friendly humid or hot environment.
Secondly, insecticide is used in large quantity to save the crops from insects. Cases of misuse and overuse of insecticides is visible. The loss of mitra keet is both due the use of insecticides as well as rise in temperature.

To obtain high quality seeds, they have to pass through a couple of stages from timely sowing, timely flowering, right pollination, seed maturation, timely harvest, seed processing, timely harvest, seed processing, transportation and storage. Rise in temperature has increased the seed dormancy.
The Kharif crop is likely to be more affected by the environmental vulnerabilities due to extreme weather conditions, early or late onset of monsoon and change in humidity. The farmers also told that the Rabi crop is relatively more risky due to shortened crop growth period and increased terminal heat and water stress.
The sudden rise in temperature and change in fall in the rainfall has led to extinction of many micro-organism and mitra keet which help to keep the soil fertile. The farmers are forced to shift the seeding period as an adaptive mitigation strategy. Some farmers have also dropped few crops.

Fig 4 A modern seed storgae strcucture

Weeding

Kaachri, a weed or crop

Kaachri is a fruit, popular in Rajasthan and an integral part of food. Kaachri grows as a weed in the farms and does not require much input. The farmers usually leave it in the farm during Nirai.

If, a farmer put herbicides in the field there are many chances that, we will kill the Kachri, bringing a drastic change in the food basket of people.

The process of weeding includes the step of plucking out of unwanted plants from the crop. It involves selection of the weed from the crop.

Our traditional farmers believed in the importance of weeding, *Nirai-Gudai* of the field. They do Nirai, plucking of unwanted small plants form the crop. This includes small shrubs and herbs which adversely affect the fertility of the soil. Judicious picking of weeds ensures the soil fertility and also adds to the food basket of the farmers.
Gudai helps in providing more oxygen to soil and recharging the water holding capacity of the soil.

In today's time farmers have taken up the practice of putting herbicide in the farms which kills all the good and bad weeds from the crop. The process of Gudai has almost come to end with farmers depending more and more upon pesticides.

High temperature and less rainfall are bliss for weeds. This environment will lead to a competition between weed and crop production leading to a misbalance in the eco-system. Incidence of rise in the number the Amarbel can be marked as the starting but more evidences are required to furnish the relation between climate change and weeds.

Amarbel

Fields of Rijga (green fodder) were hit by Amarbel. The farmer had to change to other crop due to wrath of Amarbel. It took him 5 to 6 years to completely get rid of it.

Irrigation

Shepherds water..

The water was easily available to shepherds. They used to dig near a water source and clean water was available to drink.

Watering the plants is a must for the growth of crops. Traditionally, the fields were irrigated using Rahat, Laav-charas and other local methods of irrigation. They also channelized the lake water to their farm. They also ensured that the water flows from small lakes to larger lakes which can be stored for future use.

Currently, the government has taken over the irrigation and construction of water sources. Huge dams, ani cuts and reservoir has been built by the villagers under the schemes like MNREGA. Even then the situation is bad. The villages lack drinking water and most of the water facilities have dried. The villagers told that they do not have enough water to sustain for two more months if there is no adequate rainfall.

Climate change has largely affected the irrigation system of agriculture. The agriculture of India is highly dependent on monsoon and climate change has resulted in low and erratic rainfall. With dearth of water, the crops are suffering. The productivity of the crops has fallen down.
Secondly, the acid rain is inversely affecting the crops. The acid rain is also responsible for polluting the water sources hence adversely affecting the flora, fauna and the livestock.

Storage

Storage of crop and products can be dated long back. Hoarding of coins and farm products have been found in age old ancient civilizations. The farmers have been storing their seeds and valuables from a long time.

Traditionally, farmers had three major ways of storing their crops and saving them from the attack of pest, rain and insects.
Grain hoarding: The farmers used to create a pit in the inner part of the house. It was bedded with dried Neem leaves and ash. The best quality seeds of wheat, jowar and bajra were stored in these pits. Farmers told that the seeds sustained for 2 to 3 years as they resisted insect attack with the help of antibiotic properties of Neem.
Obari: Obari was a structure constructed to store the seeds. Each household has its Obari. It was a small hut like construction, constructed on four pillars (Paga) with mud walls. The mud walls was constructed using black soil (Kaali mitti, collected from the lake banks) and wheat husk (Toodi). A 2 inch wall was constructed with a small gate at the centre of the Obari. It almost took 15 to 20 days for the women of the family to construct an Obari. It was a women oriented job.

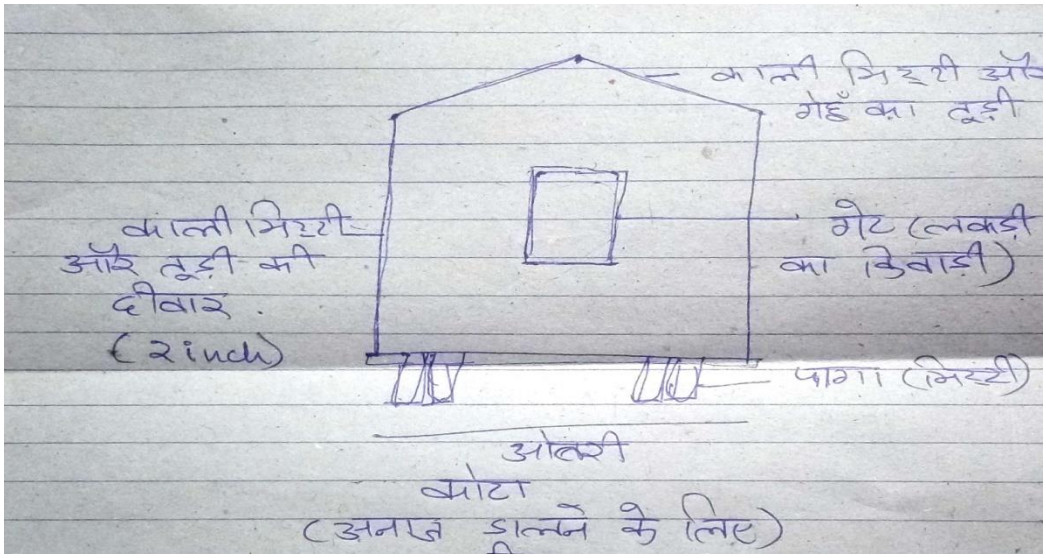
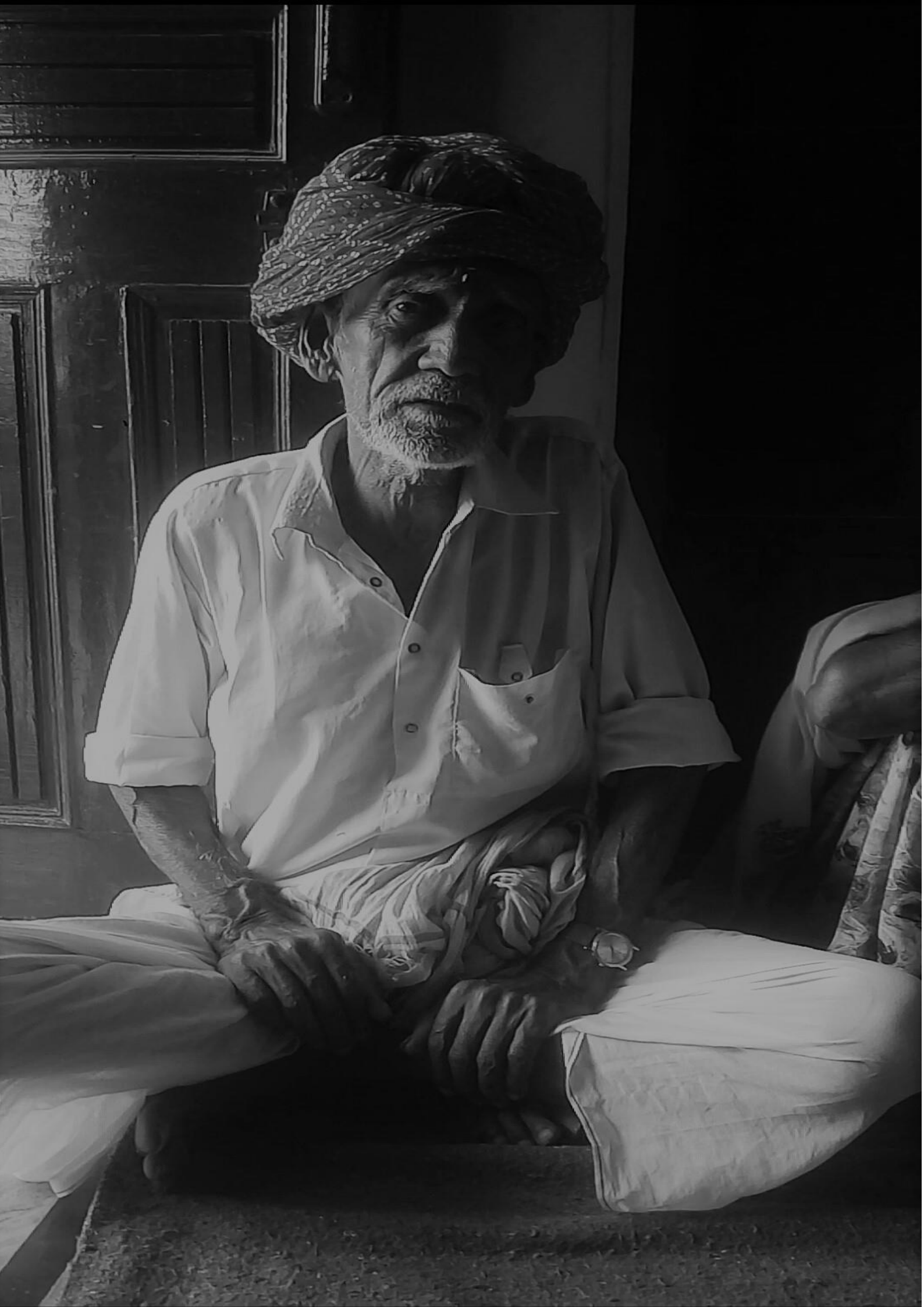


Fig 5 A sketch of Obari, drawn by a farmer



Hanging on the ceiling: the seeds of maize and vegetables like onion, garlic etc were hanged to the ceiling of the outer chamber of the house. The selected stubs of maize (Sitta) were hung on the ceiling to dry and later it was consumed as seeds for the next season.
The farmers also told that the mixture of dried neem leaves, ash and Obari helped them save the seeds of Chana from pests (Beedna).

The advancement of technology has brought in changes in the storage mechanism of seeds. With market forces and government initiatives, the farmers are highly dependent on buying seeds from the market. The seed procurement in the modern times is through:
Gram Panchayat: seeds are distributed by the gram panchayat under the policies like seed minikit. These seeds are a promise to high yield. The seeds are distributed by the gram sevaks.
Buy from market: Most of the farmers in the hope to have high yield have become highly dependent on the market. The lack of information about the quality of seed has put the farmers in a gullible situation. They are forced to believe on the information provided by the shopkeeper as they have no knowledge base of the new variety.
No barter of seeds: with the monetary transactions dominating the society, the farmers have refused to barter the seeds as it was done in the earlier ages.
The major drawback of new seeds is that they do not ripe in the next season and hence the farmer is forced to buy seeds every year, adding to input cost.


Fig 6 Farmer showing fruits from the seed distribution

Understanding the situation of the farmers, CECOEDECON has also distributed fruit bearing plants to the farmers. The farmers have sown the plants in their land to get maximum benefit. Some plants were distributed among the panchayat to be sown in the villages.

With the changing practices, climate change as put a more adverse effect to the quality of seeds. The seeds have lost their nutritional value and taste. The traditional seeds are unable to cope with the sudden change in temperature. A more scientific study is required to unfold the genetic changes in the seeds.


Fig 7 Community tree plantation

The wrath of climate change has affected the marginal and large farmers equally. The traditional practices have changed which could have helped the farmers to deal with the climate extremes. The loss of seed species which may cater to the weather extremes is a huge challenge for the farmers. Many farmers are taking a turn around to the traditional age old practices of farming but it is a long way to go. With the market intervention, change in values and climate change posing a threat to farmers they have adopted to

the situation by swiftly changing their cropping management, water management and livelihood.

The following chapter is an effort to understand the coping mechanism adapted by the farmers to cope the climate change.

Coping Mechanism

An over whelming majority of rural households in India work on farms-agriculture. Income from this activity constitutes the lion's share of total household income. In spite of this the agriculture of India is largely rain-fed making it vulnerable to climate change and weather irregularities.

The farmers have changed with the changing times. They have been open in adapting new practices. They have also come up with a coping mechanism to face the major challenges which are posed in the current time. In the rural society family labour is an important source of household income. The advent of modern techniques felicitated by climate change leading to high cost of input and low crop output has forced the farmers to device a change mechanism.

They have brought in rudimentary changes in the crop management, water management and livelihood. Here is an understanding of the coping mechanism devised by the farmers from years of learning in the new era.

Crop Management

- **Seed selection**
- **Increase in cash crop**
- **Change in the crop pattern**

Water Management

- **Change in irrigational practices**
- **Policy intervention**
- **Infrastructure developments**

Livelihood

- **Seasonal migration and change in skill sets**
- **Livestock**
- **Alternate livelihood**

Crop Management

Climate change has affected the primary requirement of agriculture, the seed. The farmers have failed to fight climate change and hence have modulated the way for selection of seed. They are not only guided by the market forces but they are forced to select seeds which are less water intensive. A desire to have less water intensive crops has also resulted in farmers turning to cash crops and changing the crop pattern resultantly.

Seed selection

Wheat (Gehu)

Dhaule Gehu: Requires 5 times irrigation.
Kata Gehu: Fails to germinate if does not get enough water. Requires water rich soil.

Farmers are making an informed choice by cropping seeds which are less water intensive. They are buying High yielding variety of seeds which require less water. But HYV seeds require timely extra inputs like fertilizers, insecticides and herbicides, with water at defined intervals. The seeds will perform satisfactory if all the inputs are provided at the right time in required amount.

Farmers have also turned to Sankar beej (cross pollinated wheat seeds). The Sanakar beej has proved to be the lifeline of wheat farmers. These seeds require less water input than other traditional wheat seeds.

The high dependency of farmers on market for seeds and its allied inputs adds to the input cost of agriculture. The farmers are losing their rich seed heritage and traditional seeds which were also resistant to weather shocks with no additional chemical inputs.

Increase in cash crop

The farmers have also commercialized the crops. They are growing crops to earn profits from the crops. Farmers are turning towards growing more and more wheat and mustard as they give high returns. They are abstaining from growing crops like urad, gwar, til as they have a longer ripping period and require more water.

Change in the crop pattern

It is stated that due to prolonged summers the Rabi crop is likely to suffer. To face the challenge of prolonged heat, less and erratic rainfall farmers have changed the crop pattern as well as stopped growing certain crops which are vulnerable to climate.

Kharif crops: Few years before the farmers used to grown crops like Mize, Bajra, Jwar (Sorghum), Til (Sesame), or groundnut. Today, the farmers are forced to grow only Miaze, Bjara and Jowar. As, Til and Groundnut are water intensive crops, farmers are hesitant to grow these as they are assured of

losses. To the dismay most of the farmers are growing Jowar as animal fodder.

Rabi crops (Barani Kheti): Chana (Chickpea), Jau, mustard, Wheat and Taramira include the rabi crops. Now farmers are growing only mustard and wheat in the Rabi season.

Vegetables: Vegetables like carrot, beans, Kair-Sanagri, brinjals, Kachri etc were grown by the farmers. Also, local berries and fruits like *Kacha Patada, Babool ki Phali* etc were part of the dietary habit. Now farmers have stopped growing vegetables due to unavailability of water. Today they are also depending on the market to buy vegetables for daily needs.

The cropping pattern of the farmers have changed from the years of less and erratic rainfall and prolonged summers. Their dependency on market from the initial stage of farming is attributed to the need of less water intensive seeds due to climate change.

Water Management

Irrigation is the necessity to farming. In the years of less rainfall and intense heat, water management becomes a must for the people. The farmers are highly dependent upon the government for water management but they are also taking small initiatives to conserve water and make judicial use.

Change in Irrigational Practices

Fig 8 A dried pond

Almost all the farmers have stopped using age old irrigational techniques. Now they are depending on tube wells and wells. Since these water resources are not timely charged the farmers are forced to call for tankers of water to fulfil the water demands for irrigation.

Common property sources have dried down due to intense heat. Availability of clean drinking water has become difficult and farmers have become dependent on either government water supply or private water tank suppliers.

Policy intervention

Rajasthan has developed its, Rajasthan State Water Policy, 2010. The policy functions from the perspective of Integrated Water Resource Management approach with a bottom up approach. The new policy addresses the issues like water supply and development, irrigation, water conservation, environmental management, water pricing, capacity building etc to cater to

problems like the growing imbalance between demand and supply, inequality in access to water, lack of ownership among stakeholders.

Infrastructure developments

Shram Daan

Beforehand of MNREGA and other polices construction of artificial irrigational structures were conducted by the rural population.

One member of each family used to contribute her one day of labour to dig a 10X10 land to create an artificial pond. This practise was commonly known as Shram Daan

Bisalpur dam is just one in the list of dams constructed on rivers to provide water to the farmers. Building a dam is a large process and requires government intervention. But the farmers have built anicuts to channelize and store the water. They have also built artificial lakes to store water for future needs. Unfortunately, the farmer community has built enough infrastructures to harvest water but there is death of rain.

Farmers have also adopted practices like irrigational sprinkler. These sprinklers ensure maximum utilisation of water and even irrigation to the crop. A major drawback of sprinkler is its electricity consumption. This has added to the cost of farming.

Water is the source of life and the farmers are trying to manage and find alternate sources to harvest water for future uses. The government interventions are also a helping hand in the changing scenario where water has become a commodity.

Livelihood

Livelihood is not only an answer to the basic needs of *Roti, Kapra and Makaan* (food, clothing and shelter) but a lot more. They have to secure their income, and ensure sustainable income. With the change in climate and less dependency on farm crop, rural population has found different ways to face the challenge.

Seasonal Migration and change in Skill Sets

Years back the mothers were reluctant to send their child to *Pardes* (out station) to seek employment. But with the onset of climate change and fall in agro income, the youth is forced to migrate to nearby places. The nearby agro industries provide ample opportunities to unskilled seasonal labourers. The story of Shankar is an example of seasonal migration.

The change in the skill sets of the villagers with new vocations has also provided them with the opportunity to work in nearby towns and cities under a contractor as masons, electricians, plumbers etc.

Fig 9 A hybrid cow

Livestock

With the fall in income from climate change farmers are turning to poultry and dairy in the villages. Dairy products and milk has become a cash earning process for the rural population. The shift from farming to dairy is a blessing

for the farmers but the output from livestock is also affected by change in temperature.

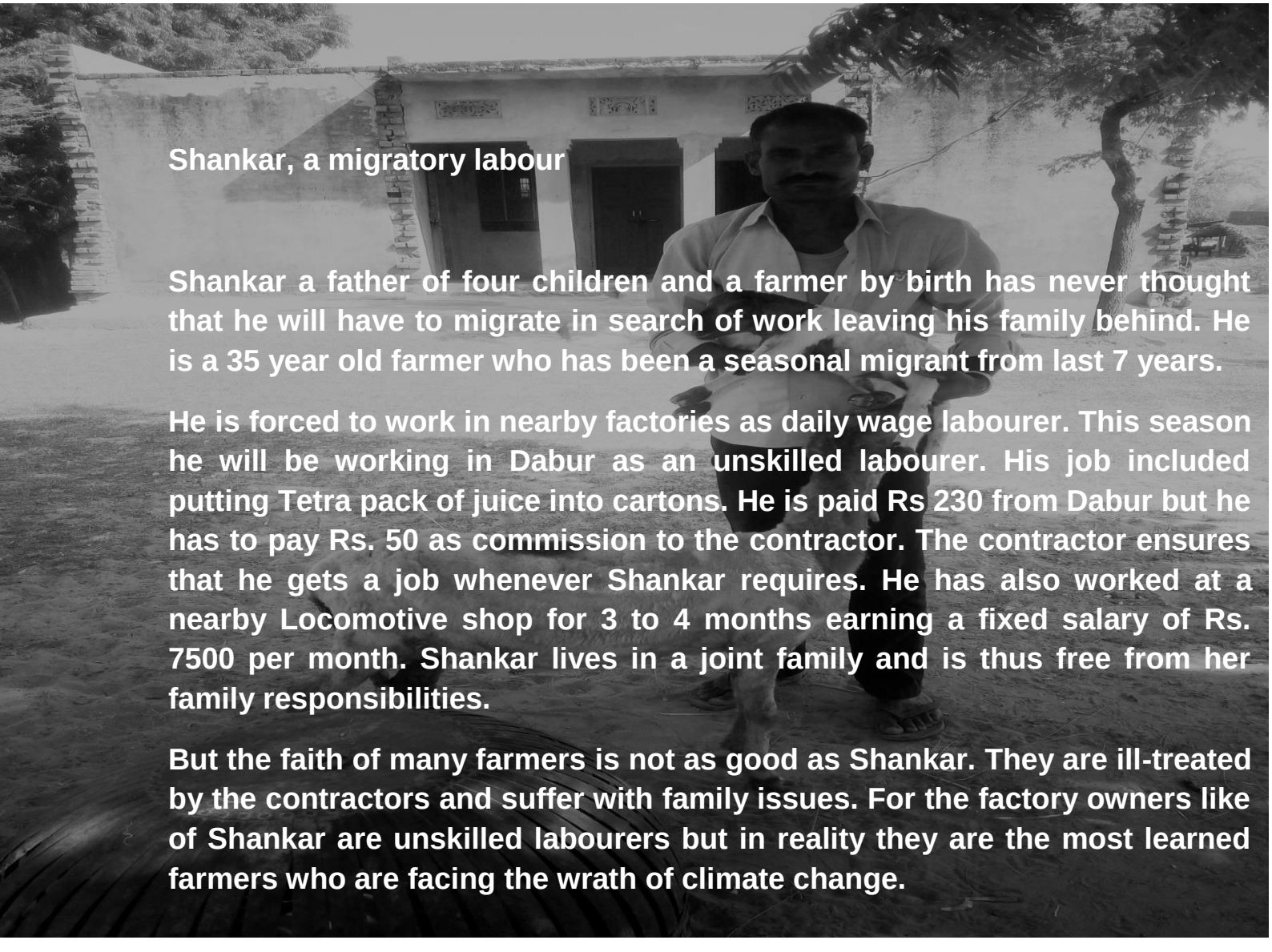
Alternate Livelihood

With greater intervention the farmers told that since the farming is giving less output, most of the large land holding farmers have quit farming. Majority of such farmers have sold all their lands to settle in towns by ensuring high returns to the sum through different financial management schemes.

Few farmers have set small scale packaging industries in the villages. Such farmers are usually lending their land to other land less farmers in return of some percentage of crop and/or cash.

Fig 10 A customised motorcycle to transport milk

The changing climate has not only affected the farmers but it has also affected the rural social structure by bringing a change in the role of women in the absence of young male members of the family. The rural occupational setup has changed as migration and new vocational skills have been introduced. The dependency of farmers on dairy is a sign of their prosperity but the dairy productivity is also hit by rise in temperature.



Shankar, a migratory labour

Shankar a father of four children and a farmer by birth has never thought that he will have to migrate in search of work leaving his family behind. He is a 35 year old farmer who has been a seasonal migrant from last 7 years.

He is forced to work in nearby factories as daily wage labourer. This season he will be working in Dabur as an unskilled labourer. His job included putting Tetra pack of juice into cartons. He is paid Rs 230 from Dabur but he has to pay Rs. 50 as commission to the contractor. The contractor ensures that he gets a job whenever Shankar requires. He has also worked at a nearby Locomotive shop for 3 to 4 months earning a fixed salary of Rs. 7500 per month. Shankar lives in a joint family and is thus free from her family responsibilities.

But the faith of many farmers is not as good as Shankar. They are ill-treated by the contractors and suffer with family issues. For the factory owners like of Shankar are unskilled labourers but in reality they are the most learned farmers who are facing the wrath of climate change.

Effect of changing Practices

The change can be mapped in a small period of time but effect of a process can be mapped in the long term only. It's been many years that climate change has hit Indian weather and society as at a whole. It has affected the social structure of rural India. The changes can be mapped in the role of women, change in the life of youth, livestock. It has also affected the traditional food basket of rural India.

Change in the life of women

Fig 11 An old women husking seeds

Women have been the most vulnerable to adjust in all situations. With the adversity of climate change resulting in migration of male workers to places, have changed the role of women in the society. They have become the power centre of the family as they take major financial and family decisions. It has empowered the women to take a stand for themselves.

On the other hand, the work load of the women has increased tremendously as the work in rural society has been categorically defined between men and women. Now women are facing challenges to do all the farm related activities, livestock activities by themselves.

A young girl in a village

The life of an urban adolescent girl revolves around her friends and tech-gadgets, with her parents worried about her future. In the rural space the life is quite different.

Ridhi, one of a twin, is a 14 year old chirpy girl studying in the village school in class 10. She is a regular student and regularly goes to school. On return from school she has a daily routine unlike many of us. She walks half a km with her mother to fetch litres of water. Thereafter, she helps in her mother in daily chores and helps her feed the fodder to the cattle. Her day come to an end at around 7:00 pm when she eats her dinner and goes to bed at 8.30 after completing her homework.

Her weekends are marked by taking the cattle to the grasslands. She takes care of one cow, 4 buffaloes and 40 sheep. She aspires to do a job in the future and wishes to settle in an urban city.

Adaptation of new vocational practices

The farmers have asserted the fact that farming is no longer a profitable venture. The youth have turned away from farming. They are picking new vocational courses in Plumbing, electrical, carpentering and other ICT courses offered by the government. They believe in managing a livelihood which has low risk and higher output. They are migrating to towns and cities in search of job.

The skilled youth is able to find work in factories and small scale industries through contractors at a commission shared with him. The farmer turned into unskilled labour has trouble finding job but he is able to make through with the help of contractors at factories at menial wages.

A new set of young farmers have also emerged in the rural society who wish to take up the family farming by adding new methods and technologies. They believe in following the market trend. One set of such farmers believe to bring back organic farming back into practice while another set believes to adding value to farming. The value addition could be enhanced by adding allied farming activities like bee keeping, poultry, setting small industry etc. to add value to farming.

Unfortunately, the number of farmers who believe in continuing farming as a means of livelihood is comparatively lower than youth who wish to migrate and find new opportunities in cities. The climate change has not only affected the production but the vocational set up of rural society. Now it has become important to make farming a lucrative business option to save the farm land from turning into barren.

Livestock

Initially, all the households held few milch animals and earning a livelihood from livestock was primarily a business of selected few castes. Now, livestock have become an integral part of every household as a source of income.

As dairy has become a lucrative venture, more and more people are keeping milch animals for business purposes. The rural is selling the milk to nearby dairy collection counters at a pre-defined rate. It has raised the level of income of rural population.

But to the dismay climate change is severely affecting the new vocation of rural society. The rise in temperature and less availability of water is affecting the productivity of cattle. The farmers told that rise in temperature are adversely affecting the cattle.

The count of sheep has fallen down due to heat. Sheep does not stay calm in hot temperature and fails to adjust in very hot temperature leading to high

mortality in sheep. A Gir cow owner told that the progeny period has prolonged from 1.5 years to 2.5 years due to non-availability of fodder. Similarly, it has become difficult for the buffaloes to cope up in high temperature with less and less water sources.

Fig 12 A young girl with Gir cow

The high breed cows are known to give more milk than local breeds. The local breeds are more resistant to high temperature and drought like situations unlike high breed species. The input cost is comparatively high and the rural are making a trade-off between high input cost and monetary output. They are far away from making an informed decision after calculating risks.

The climate change have changed the ecology portrayed by rise in temperature, depletion of water sources and pasture lands affecting not only the reared livestock but also small animals like brown rabbit and *Siyar* (Jackal). The livestock owners are forced to sell the cow at Rs. 30 to 50 thousand due to non-availability of fodder and pasture. The livestock rearing and dairy is proving to be business on its offset.

Food basket

The food basket of an area has a long history of cultural and nutritional needs shaped through years of needs. Climate change has forcefully changed the food basket of the rural population.

Traditionally, people were dependent upon milk and milk products as it was an essential part of their dietary plan. They consumed the local and seasonal grains like jwar, bajra, and maize etc. which were highly nutritional and local to the area. As it was an arid region the availability of fresh vegetables has always been a challenge. The women have developed a unique way to dry all the vegetables and use it in summers. Dried vegetables like *Kachari, Sanagari, Tamatar, Kair etc.* were served on the table. Also, *Gur* (jaggery) was an unavoidable part of diet.

The old farmers take pride in boasting about their strength and stamina which according to them was attributed by eating *Shudh Ghee, Chachh* and seasonal grain. As they say, "*Gur ghee ki bhaji aur sab dagabaji*", is the real reason for their strength and stamina.

Today the food basket has completely changed for the rural population. Downfall in farm income has forced the farmers to sell milk leading to non-availability of Ghee and allied products of milk for the children leading to malnutrition in some few cases.

Secondly, the change in crops like infiltration of wheat as a substitute crop has raised the wheat consumption in households. The small children are

Utilisation of crop in Food

A Rajasthani women takes proud in telling the use of one grain in five ways to show the knowledge we inherit. Chana crop is used in five ways:
Tender leaves: Pansee, A delicacy
Chholiya (tender green chana): Spiced curry vegetable
Chana: Ghugni is cooked using chana as the main ingredient
Chana dal: Delicious dal is served
Besan (powdered chana dal): An integral part of delicacies like *Gatte, Kadhi, Pitod* and many other..

resistant to eat grain like Bajra and Makka (Miaze). The high dependency on market for vegetables is also raising the economic burden. The sudden shift in the food practices is posing a threat to the health of current generation.

Only market forces could not be blamed for the change in food basket as the aged rural share that the grains like Bajra, Jwar and Makka has lost their sweetness. They have a bitter and harsh taste attributed to less water. The old generation is empathetic to the fact of selling milk to dairies due to the economic condition of the family.

Scepticism about Tradition Knowledge

India is nation which takes pride in its traditional knowledge of AYUSH, scriptures, Vedas and Purans. *The guru-shishya parampara is based on shruti paramapa*, the student teacher relation is based on oral tradition.

Rajasthan is no different. Through ages of experience people have developed *Doha* (Couplet) and *Lokokti* (Proverb) to map the seasons. Different natural processes have helped them anticipate seasonal conditions. A few such *Doha, Lokokti* and process are mentioned.

"*Durjan ki krapa buri, sajjan ki bahi traas, jab surya tape tab barsat ki aas*".

"Teetar panchi badla bindua kajal rek, wo warsh waghar kare ji man meenan megh"

"Shawan suryo, bhadoda purvayi aur aashad ka doongra nada tangad yaai"

"Aathad mokh subai surya aur gailaya Brahmin ne kyun pucha"

These proverbs do not suffice the knowledge base of the rurals. Small events like, bathing of sparrow in sand is a sign of rain. Similarly, birds like *Tithari* lay egg in deep in the sand if there are chances of rain. Ants also play a role in rain speculation. If ants are moving with eggs in their mouth, it is likely to rain in the next few days.

The traditional medical knowledge is also shedding away. *Haldi, Gur, Tulsi, Ghee* (Turmeric, Jaggery, basil and ghee) were the only remedy for cough and *Laung, Sont, Kaali Mirch, Tulsi* (Clove, dried ginger powder, black pepper and basil) were remedial for cold. Dried *Kadwi Kachari* (Bitter variety of Kachari) was used as stomach ache remedy for cows and buffaloes.

In later times it was very uncommon for the people to visit to doctors to seek medical consultations. Now with change in time visit to doctors have become a regular affair.

Fig 13 An old farmer sharing his knowledge

To the dismay, previous few years have questioned the age old traditional knowledge. The climate has become so un-predictable that the farmers have started to question these omens. They have become sceptic about the knowledge they hold from so many years. The oral traditions are losing their efficacy and are challenged by the young generation.

Now *Purvaiya* (winds from east) does not bring rain leaving the farmer in a gullible situation making him dependent only upon the technological precisions provided to him by the met-department.

Recommendations

Climate change has been a harsh reality of our life, affecting the social and economic structure of the society. Worldwide it is a political issue as well. We have the voice of the rural and the most unheard but largely affected by the wrath of climate change, an on-going debate.

This unheard population have come up with some coping mechanism but it has affected its traditional knowledge making him an alien in their own space. The scepticism about their own traditional knowledge has left them in the most vulnerable situation in years of history. We do not promise to provide cent-percent solution to the problems but we are making an effort to suggest a few solutions.

Solutions come from within

The best solutions to a problem always come from within the society. More and more public hearings should be conducted in the community to hear solutions from within the society. The problems of the farmers should be heard by the policy makers to find conducive and grounded solutions.

Organic farming

Organic farming offers the most effective solution to climate change and opportunity for employment generation. It is the sustainable form of agriculture. The organic produce also gets a high premium. But the organic farming also requires few inputs. The story of Kamla ji, helps to develop an understanding about organic farming.

Kamla Ji, a change maker

Kamla ji is one agent of change in the era of modernity marked by the use of machinery, pesticides and hybrid seeds. She is an old lady with few acres of land. She still believes in continuing the age old practices of farming. She pursues organic farming and does not use any chemical or fertilizer in her land. Even with her utmost efforts to live the organic way, she is hit with problems like less productivity and salinity of the soil.

This year she is terrified by the idea of low produce from the crop due to lack of rainfall in the area. Another problem she faces is, the fertility of the soil is decreasing due to water inflow from other farms. The nearby farmers are treating the soil with chemical which flows to her farm and affects the fertility of the soil.

Although she and her family is taking all the steps to pursue organic farming she is not a certified organic farmer and hence away from her due profits. The likes of Kamla ji is rare to find but these few require monetary, and paper work assistance to help gain their due profits.

Cater to the losses of farmers

Most of the farmers are unwilling to adapt Organic farming because it takes almost 3 years for conserving the soil. The conserving of these areas for organic farming will initially cause some loss of productivity. The govt. should provide some compensation to the loss of farmers.

Training

Farmers training for organic farming should be conducted at the panchayat level. Extension officer or field functionaries can be put to monitor the farmers. The rules of certification and inspection agencies should be made available to the farmers to make an informed decision.

Generate a market place

The government should take steps towards creating a market place for organic produce sellers and buyers. These mandis should be free from contractor and perform as a meeting platform for farmers to consumers.

Fig 15 Farmer showing the low groundnut produce

Water management schemes

Government should map the water resources of the villages on the parameter of availability of water and no of days the water resource will sustain the requirements of the farmers. Initiatives which are effective like channelizing water and recharging the ground water should be implemented.

Land Management

Land management is a necessity of today's time. The panchayat are required to map the different land uses and ensure demarcation of pasture lands. Livestock rearing is the second most income generating option of rural society. Saving the pasture lands will save the livestock and soil erosion.

Use of IT to provide climate information

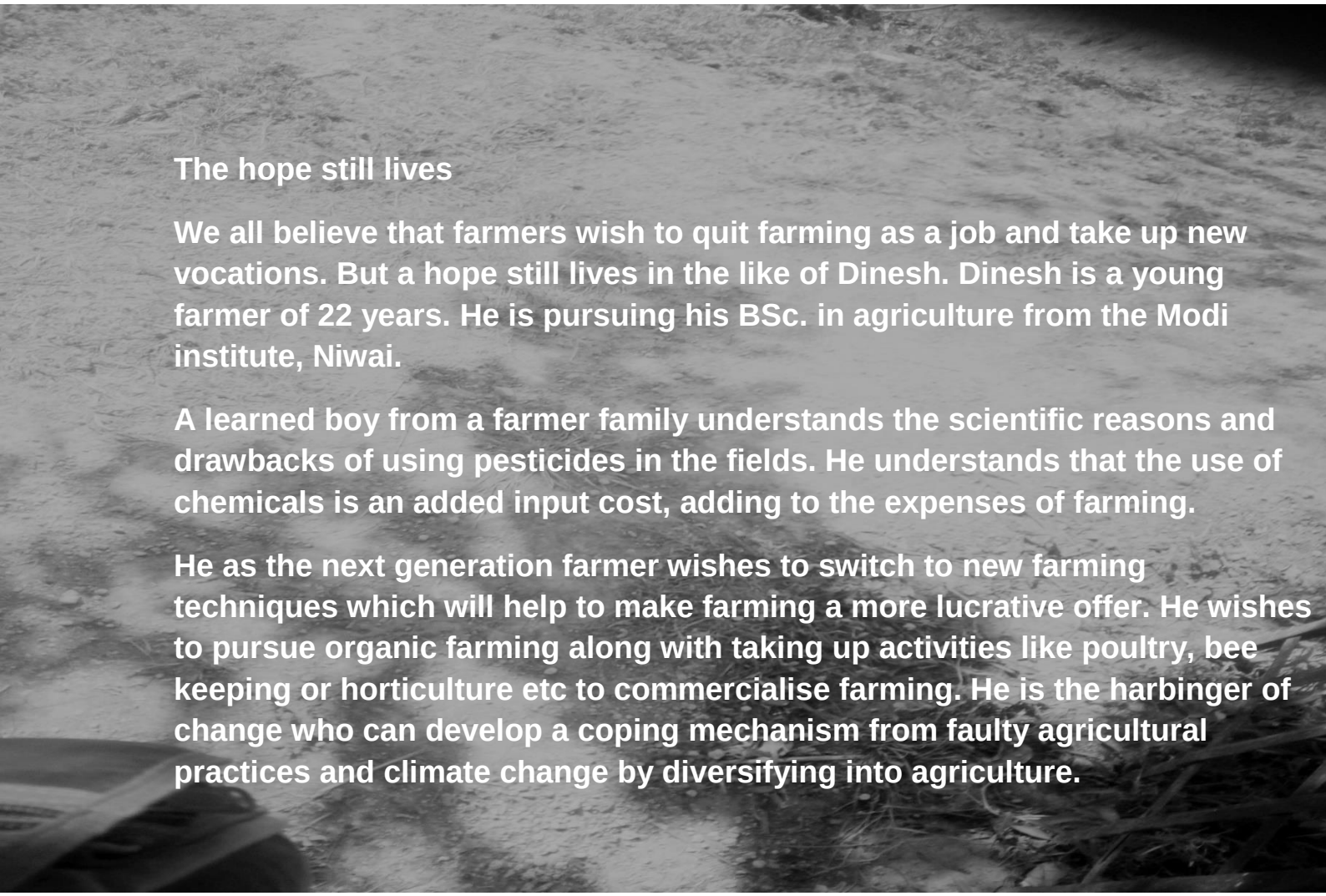
As the traditional knowledge has become less relevant, the farmers are left with no knowledge to forecast the weather conditions. In such a scenario, the govt. should facilitate correct and timely information to the farmers about weather conditions. Use of mobiles and TV can be a source of quick information dissemination.

The solutions are not exhaustive for the problem. The government should take steps with the help of local people to develop a coping mechanism from climate change for the farmers. The farmers are the backbone of the country and should not be punished for the crimes not committed by them.

Conclusion

We have admitted the fact that climate change is the inevitable reality and we have to find a mechanism to deal with it. The traditional knowledge is losing its relevance and the new generation is readily adopting to change.

The changing practices have changed the social structure of the rural society. Old people have become sceptic of their own knowledge. The government will have to take strong measures to save the rural population from the wrath of climate change and changing practices. We believe that if the government provides proper inputs and incentives to the farmers, the new age farmer is ready to blend the age old knowledge with the new modern technology. Now the future of farming rests on the young farmers. We are hopeful that the young will develop a coping mechanism against climate change.



The hope still lives

We all believe that farmers wish to quit farming as a job and take up new vocations. But a hope still lives in the like of Dinesh. Dinesh is a young farmer of 22 years. He is pursuing his BSc. in agriculture from the Modi institute, Niwai.

A learned boy from a farmer family understands the scientific reasons and drawbacks of using pesticides in the fields. He understands that the use of chemicals is an added input cost, adding to the expenses of farming.

He as the next generation farmer wishes to switch to new farming techniques which will help to make farming a more lucrative offer. He wishes to pursue organic farming along with taking up activities like poultry, bee keeping or horticulture etc to commercialise farming. He is the harbinger of change who can develop a coping mechanism from faulty agricultural practices and climate change by diversifying into agriculture.