Participatory Learning and Action (PLA) approach was conducted in the village "Jamak" (April 2009,) organized by, LBSNAA, Mossouriee which had experienced an earth quake in 1991 and a flood in 2002. In spite of big blows, reflects rebuilding and revival capacity. With 35-40 families came into light with a hole at its bottom (tunnel) and emergence of its paddy fields to Dam Project. Aim was to assess efforts and environmental dimensions with PLA. Need assessment and report building with open questions was conducted. Preferences and gradation of the weightages for amenities were observed, constraints were there; support system was lacking. Irrigation is being done but a pipe line may become a lifeline for producing 2 K. Watt electricity, water mill, agriculture and lastly as waterfall for eco-tourism. Production of crops and shops are proposed with organic manure and farming. Minor forest produce can be utilized for households. The Intellectual Property Right, bio-gas, wheel carrier for dung distribution, youth and adolescent's training in rescue and relief and establishing latrine and self help groups are development alternatives. Man and animal conflicts can be resolved.

Suneet Naithani

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Science for Shocked Jamak;

A Case study from Uttarkashi, India

"Think Globally Act Locally"


Innocent but Ignorant

Edited

By

Dr. Suneet Naithani & Dr. Sunil Misra

Authors

Dr. Suneet Naithani, Dr.Asit Charabarti, Dr. Manjulata Jain, A. Carmalin Sophia, Dr. Sunil Garg, Dr. Debabrata Majumdar and Dr. Sunil Misra

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We extend sincere thanks to heads of all the respective organizations, nominating for the said course. We also extend our gratitude to the Director and faculty members of LBSNAA, Mussoorie for organizing this course and field trip. Many thanks to Department of Science and Technology, New Delhi for sponsoring this programme and staff members of Centre for Disaster Management, LBSNNA, Mussoorie for their unreserved assistance during the course and completion of study.

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We cannot ignore our families for their unreserved support and secretarial assistance of Mr. Abhishek Choudhary.

SUMMARY

In April 2009, when we were learning the Participatory Learning and Action (PLA) approach in the village “Jamak” (Middle Himalaya) organized by, Lal Bahadur Shastri National Academy of Administration, Mossouriee. Village had experienced a major earth quake during 1991 and a flood during 2002. In spite of big blows, the village reflects capacity of rebuilding and revival capacity. The village with 35-40 families came into light with a hole at its bottom (tunnel) and emergence of its paddy fields to Maneri- Bhali Dam Project. The objective was to assess efforts and environmental dimensions with Participatory Learning Action. Need Assessment followed by report building with open questions were conducted. Weightage preferences and gradation of the weightages for amenities were observed but constraints were there; support system was lacking (“Eco-tone Working Zone”).

- Irrigation is being done with Internal Coordination System but need to catch the whole water of that drainage. A pipe line may become a lifeline for watershed management like; producing 2 Kilo Watt electricity followed by water mill, agriculture and lastly as waterfall to promote eco-tourism.
- Destructed site has not been utilized, but villagers proposed the practices like; production of cash cropes and shops for revival.

- Chirpine needles i.e. Minor Forest Produce (MFP); can be used to make house hold things with other practices like; organic farming and organic manure.
- The certification/Intellectual Property Right (IPR) should be taken care off.
- The bio-gas plant, wheel carrier for the dung distribution in flat agricultural terraces.
- Establishing latrine and Self Help Groups (SHGs) will improve the lifestyle.
- Initiatives from Government and Non Government Organization (NGO) sectors are required for man and animal conflicts.
- The youth and adolescents should be involved in rescue and relief trainings. Technologies can be floated in the areas; cattle farming, Dairy Development, Disease and Pest Management, e-Governance i.e. One Stop Shop and the low cost technology inputs by Govt. and NGO Sectors are required for revolution in "Jamak".

Key Word: PLA, earth quake, Eco-tone Working Zone, e-Governance, IPR, MFP, NGO and SHGs.

Chapter 1

by

A. Carmalin Sophia and Manjulata Jain

Dr. A Carmalin Sophia is a Scientist in National Environmental Engineering Research Institute (NEERI), Fulbright Fellow – Nehru Environmental Leadership Scholar (2011-2012) and Young Scientist Awardee of the Indian Science Congress 2004. She has International and National research articles in her credit and travelled many countries for research and development.

Dr. Manjulata Jain, Presently working as a Senior Scientist in Madhya Pradesh Council of Science & Technology Bhopal and dealing various activities for popularizing of Science in Madhya Pradesh.

1.0 Introduction:

Centre for Disaster Management, Lal Bahadur Shastri National Academy of Administration, Mossouriee organized the science for Rural Society programme, sponsored by Department of Science and Technology, New Delhi, Govt. of India. A group of scientists and trainers from India participated in that workshop held from 20th April – 1st May, 2009. Group was taken for five days field visit to study the village Jamak, Distrcit Uttarakhashi to conclude innovative scientific inputs for capacity of rebuilding and revival of village which was totally collapsed during 1991 earthquake in participatory mode. Robert Chambers (1997) also argues that that poor and exploited people can and should be enabled to analyze their own reality.

Jamak is situated just above the dam site. This area is appeared with severely crushed and highly jointed terrain. The uniqueness of the village is that it is situated just above the tunnel made for Tiloth power station. 26 years ago the village had only 35-40 families. With the houses centrally located on the hill, nearly 320 feet high from the ground level subsequently expanded 1-2 km towards NE.

The village is situated in sub tropical condition surrounded with miscellaneous forest and dominance of Chirpine with in situ soil formation. The area is known for men and animal conflicts, regularly interacted with large number of monkeys, wild bear and pig etc., the village has a perennial tributary called Kamar Gad for irrigation

purpose. Village is a combination of four hamlets namely Jamak, Makarti, Payaru and Khanda having potable water (spring) in EES direction of Jamak. Two canals are there for irrigation in Makarti and third in Jamak. The village is connected by a steep mud road to the main road. Population dynamics of the village has shown in Table 1.

Population dynamics

Village name : Jamak **Revenue code: 602**

Table 1.

No. of families	Brah-mins	Rajput	SC	0-5 years		6-8 years		9-18		Above 18		Total		Handi - capped	Drop out
				M	F	M	F	M	F	M	F	M	F		
77	1	67	9	14	11	10	10	61	63	114	129	198	214	07	02

Source: Revenue department, Uttarkashi and SBMA, (NGO) census 2001- data collected by NGO

Though people are involved in agriculture but agriculture pattern is affected due to deforestation and changing eco-climatic conditions. A small population is involved in cutting grass, stone breaking, animal rearing and black smiths. The main source of income is selling of milk and potatoes in the nearby market. The dam situated to North of the village generates 104 mega watt electricity at the cost of paddy fields of Jamak village which has become a part of submerged area.

1.2 Objectives :

1.2.1 Assessment of understanding of villagers about;

Education, Health, Environment and Agriculture

1.2.2 Outcome of the Participatory Learning and Action (PLA)

1.2.3 Action plan be implemented as per the feedback from the villagers

1.2.4 Specific objectives:

Food, Water and sanitation, Habitation, Health, Energy, Education, Livelihood and enterprises, recreation/entertainment and Disaster Management/Risk management.

1.3 Review of literature and relevance:

Sustainable agriculture system can be economically environmentally and socially viable and contribute positively to local livelihoods (by Gautam et al. 2011). According to him the organic farming is the method and recommends the use of such agricultural practices which are biological in nature and eco-friendly. They preserve environment and biodiversity. Organic farming in India around 528, 171 hactare area is under practice and around 44,926 number of certified organic farms. For integrated approach, sectorial plan is needed and they should & they should be practical Plans for land use management by Francis et al.

Maharana et al stated in 2011 that changes needed to achieve the potentials of organic agriculture like; Research & extension, supporting small scale organic farming protect livelihood of rural poor, local control of land local enterprise and education.

Ministry of rural development has embarked upon an ambitious lab to land initiatives which aims to enhance the effectiveness of programme implementation in rural areas through field level training of functionaries in collaboration with stakeholders by Tiwari 2011.

Village based management model has its origin at the time of monarchy (Mukerjee, 1995) basically village was a basic unit of production and self governance aimed at achieving self sufficiency. British gave to a legal shape through forest and land settlements. However this model suffers from following defects like; more focused on developmental aspects rather than conserving natural resources. Natural calamities are obstructing the stability the stability like landslide, cloudburst and flash floods. Efficient and sufficient use of Natural resources to meet people's requirement is missing by Vasudeva, 2010. According to Srinivasa Rao, in 2011 that micro finance loans provide financial access to the poorest to meet expenditure for marriages ceremonies and certain other rituals repayment of old dues , children

education income generating activities including agriculture and start new businesses.

Though India has achieved self sufficiency in food grain production and is able to export surplus even its ranking is 66 among 88 countries according to Global Hunger Index, 2008 released by International Food Policy Research Institute mainly based on three criteria i.e. caloric deficiency, child mal nutrition and child mortalityas quoted by samkuwar, 2011. Gramsabha approach as model implemented in M.P. with tribes, they have been given privilege to express their choice of livelihood activities under Madhay Pradesh Rural Livelihood Project by samkuwar, 2011.

Panchayat Raj is the best system for empowering women and it is the lowest unit at local government and its efficient working, clean management and activism can be the basis for good governance by Malyadri, 2010. Every village ought to be a republic or panchayat with authority and resources to realize the potential for economic and development of the village (Mahatma Gandhi).

Traditional Sources of energy still dominate the domestic sector in India (80% came from firewood, dung cake and crop reduce). there has been marked increase in the use of electricity accounting for 55.8% of households in India however only 43.5% rural households in India have access to electricity and the balance 55.6% of rural households still use kerosene as a primary source of lighting by Singh et al. 2010.

A Scientific approach of breeding feeding and animal healthcare programme is required to increase production of milk. Accordingly the National Diary Development Board has proposed to increase the countries milk production to meet the project demand of 180 million tons by 2021-2022. by Dhanasekaran et al., 2010.

1.3.1 Relevance of study: It has been reported by different studies that an actively involved and empowered local population is essential to successful rural community development. Robert Chambers, a key exponent of PRA, argues that the approach

owes much to "the Freirian theme that poor and exploited people can and should be enabled to analyze their own reality". First international conference to share experiences relating to RRA was held in Thailand. This was followed by a rapid growth in the development of methods that involved rural people in examining their own problems, setting their own goals, and monitoring their own achievements. By the mid 1990's, the term RRA had been replaced by a number of other terms including 'Participatory Rural Appraisal (PRA)' and 'Participatory Learning and Action' (PLA). Practitioners such as James Mascarenhas, Parmesh Shah, Meera Kaul, John Devavaram and others in India collaborated with Chambers to explore emerging techniques and tools. These early pioneers were responsible for the spread of PRA to Africa and elsewhere. In Africa, the methodology found enthusiastic advocates in Kenya (Charity Kabutha, Daniel Mwayaya), South Africa (Kamal Laldas Singh and others), Zimbabwe (Sam Chimbuya, Saiti Makuku), Ghana (Tony Dogbe). Chambers rose funding for South-South Exchanges which were seminal to the internationalization of the PRA community of practice. Kamal Laldas Singh who joined Chambers at the IDS, helped catalyze the South-South and in-country networking that attempted to encourage reflection and learning amongst practitioners. The rapid spread and adoption of the methodology led to issues of abuse and quality. Asset-Based Community Development (ABCD) is a methodology that seeks to uncover and utilize the strengths within communities as a means for sustainable development. The ABCD approach helps them become stronger and more self-reliant by discovering, mapping and mobilizing all their local assets. The first step in the process of community development is to assess the resources of a community through a capacity inventory. After knowing the relationship of these factors the PLA can be made more precise.

1.4 Study area:

Jamak is the village which has been totally destroyed in 1991 earth quake situated 14 Km just above the Maneri dam. This area is composed of quartzite terrain, appeared with severely crushed and combination of highly jointed area. The uniqueness of the village is that it is situated just above the tunnel made for Tiloth power station at Uttarkhashi. The area lies in vegetation of sub tropical condition with miscellaneous forest. This village is surrounded with fodder trees, and dominance of pines (chir pine). The area also regularly interacted with large number of monkeys, wild bear, black faced monkeys, pig etc., the Jamak is basically facilitated by a perennial tributary called Kamar ghat for irrigation purpose. The potable water is being fed' from spring just towards East direction in the upper catchments point area. Basically the village is combination of four hamlets namely Jamak, Makarti, Payaru and Khanda. The total agriculture land is being fed with three irrigation canals two of them lies in Makarti area and one is in Jamak hamlet connecting through Payaru. The village has got basically in situ soil formation with the black soil type. The village is in close proximity to the main road which leads to Gangotri. The same is connected by a steep kachha (raw) mud road.

1.5 Methods and approach:

Asset-Based Community Development (ABCD) seeks to uncover and utilize the strengths within communities as a means for sustainable development. This approach helps them to become stronger and more self-reliant by discovering, mapping and mobilizing all their local assets. The first step in the process of community development is to assess the resources of a community through a capacity inventory (McKnight et al.1996). After knowing the relationship of these factors the PLA can be made more precise.

The base map from the revenue department, secondary data from the administration and NGO, collection of indigenous colors and materials for community mapping and

development of weightage matrix chart of facility in the village was done collectively.

1.5.1 Day one: repute building

- PLA initiated report building and introduction of participants along with villagers.
- Subsequently the group was divided into two sub-groups for collecting base line information.

1.5.2 Day two

1.5.2.1 Slightly open questions and report continued

Individual interaction emphasis was given to know the facts about resources, initiations by outer agencies, nature of habitat, types of activities and events involved in village as reflected in Fig 1.

Fig. 1 Interaction with villagers Photo by; Sofia Camalin

1.5.2.2 Open questions

Group members interacted with the villagers through open questions, did assessment for technological input and their usage.

1.5.3 Day three

1.5.3.1 Cross check with revenue data;

All collected data from the village level were compared with the revenue data of agriculture, population, health and education.

Fig. 2 collecting the information regarding the life style of the villagers' photo by; Sofia Camalin

1.5.3.2 ***Final questionnaires were avoided which, when, why and how as a prefix.*** The villager's ideas about all above fields were questioned and observed.

1.5.4 Day four

1.5.4.1 The PLA: In intensive mode i.e. community mapping in participatory approach.

Near about 60 villagers were participated (old man, woman, adults and children) in the community mapping exercise. The map was drawn by the villagers with the coordination among all the participants as depicted in Fig. 3.

Community Mapping

Fig.3

Instruction to villagers before PLA exercise

Participation of villagers in mapping

Interaction and discussion among the villagers during PLA

Community mapping by the villagers

All Photos by; Sofia Camalin

1.5.4.2 Cross questions and preparation of resource development plan by the villagers.

During the mapping, various points of developmental issues were emerged and discussed with the villagers for their suitable implementation.

1.5.5 Day five

The collected informations were cross checked with the secondary data.

All the data collected from the villagers as well as by the team members were cross checked with the secondary data.

CHAPTER 2

by

Asit Charabarti and Sunil Garg

Dr. Asit Chakrabarti is Senior Scientist, ICAR Research Complex, Veterinary College, Patna. Ph.D. (2004) in Animal Production & Management, Assam Agricultural University, Jorhat. More than 45 five articles in National and International Journal and edited six books and advance trainings in respective field.

Dr Sunil Garg , presently working in Madhya Pradesh Council of Science & Technology, Bhopal as a Scientific officer and dealing various activities for popularizing of Science in Madhya Pradesh.

2.0 Observations during participatory learning;

2.1 **Irrigation in village**

With available natural drainage (Gad) traditional way of irrigation is being practiced for the past 20-25 years by using their Janshakti canal. Each house hold that water supply through pipe lines which is clear and tasty and believe to have high amount of minerals, salts and Jadi booti (medicinal plants).

2.2 **Water harvesting system**

The spring water is the main source for the drinking purpose. Canals are perennial in nature. No specific roof water harvesting structure found in the village.

2.3 **Land holding size:**

In the village there is no land less labor. Most of the villagers are having land holding capacity of 50 to 60 Nalis (Unit of Land) for the big land holders and minimum with 10 Nalis. (20 Nalis is 1 acre, and 50 Nali is 1 hector). Landholding is depicted in Table 2 and Graph 1.

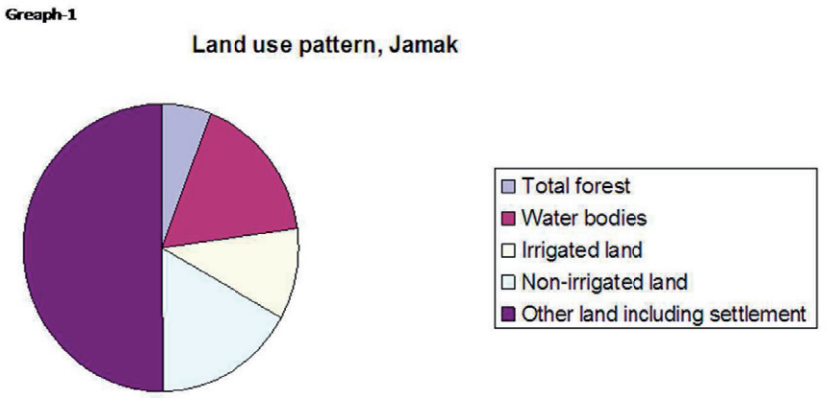
Table 2

Land holding size

Total area	Total forest	Total area of water bodies and its flood	Total agriculture land			Other land including settlements
117.440	6.944	19.670	12.352	19.411	31.763	59.063

Source: Revenue department, Uttarkashi and SBMA, (NGO) census 2001- data collected by NGO

Greaph-1



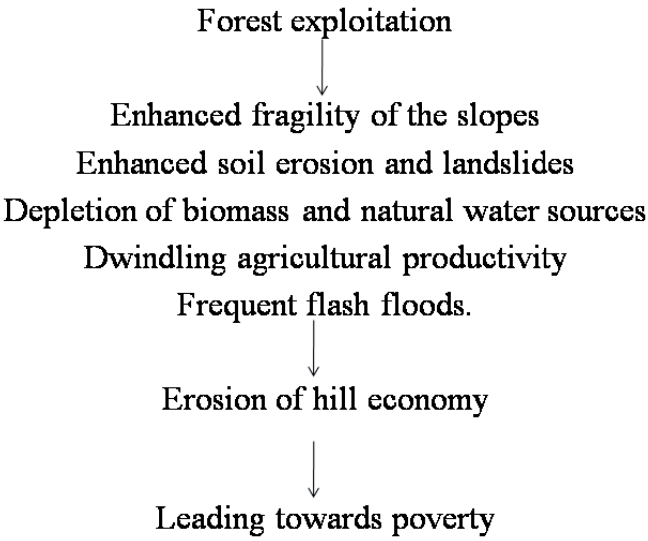
2.4 **Forest produces:** Tun, Devdar and Chirpine are used as timber for furniture making and house building whereas mixed forest are used as fodder. Gorar is used for making pickle. The fodder (Trees;Bheemal and Kharrek) is brought from at least 4-5 km away from village.

2.4.1 **Time line of forest covered:** Since 40 years it observed that the forests are open in nature. The forest exploitation basically began around 19th century and continued after the independence.

- Encroaching on traditional rights of the locals begun around 1911.

- Large forest area came under government control (Reserve forests), locals were forced to content with small piece of forest for their sustenance. It can be understand as follows as described by Naithani (2008) in flow chart 1.

Flow chart 1



2.4.2 **Forest fires:**

There are two schools of thought for the issue. One says that villagers apply fires in forest before rainy season for the better fodder production. According to other opinion, most of the tropical and temperate region, full of Chirpine species may catch fire when it rubbed with each other because of high winds in the spurs of watersheds as shown in Fig 4.

Fig. 4.

Forest fires shown near the village Photo by; Sofia Camalin

2.5 **Indigenous knowledge and practices:**

Usually people are doing traditional agriculture/harvesting practices. People are making heap of cow dung and is taken away by head load by women folks. The uniqueness found in the village is storing harvested grains in "**Kothars**", made up of Pine, Devdar and Tun wood, which is still intact and not even destroyed during 1991 earthquake or even faced in earlier past, which reflect the technology used in building those structures as reflected in Fig. 5.

Fig.5.

Kothars" for storage of grains and unique type of locking system in "Kothar"
Photo by; Sofia Camalin

Maximum snake bites are being successfully cured in traditional way by a well known 85 years old village men in and around village. It is noticeable if this knowledge has been disseminated to his family members or any other?

2.6 **Agriculture:**

Only few new crops have been introduced in the area except the emergence of potato cultivation is 1960s. Besides that Ground nuts, Til, Urad dal, Mandwa, Kadaun and Green peas grown and has become the source of income. Some fruit trees have also been introduced till now.

2.6.1 **Crop pattern:**

The farmers are practicing only Rabi and Kharif crops. Types of cropping system as shown in Table 3,Table 4 & Fig 6:

Table 3.

Type -I: Rabi and Kharif cropping:

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Potato ←							Khrif				
		Rabi				Rice →					

January sowing of potato
June harvesting of potato
June – plantation of rice
October – Harvesting of crop

Source: Revenue department, Uttarkashi and SBMA, (NGO) census 2001

Table 4.

Type -II:

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
←				Wheat Harvesting				Wheat sowing →			
					Rice →						

September wheat sown
April to May – Harvest of wheat
June – rice sown
Sept – Harvesting of rice

Source: Revenue department, Uttarkashi and SBMA, (NGO) census 2001

Fig.6.

Potato cultivation Habitat inside the cultivation field
Photo by; Sofia Carnalin

2.6.1.1 **Crop pattern for vegetables:**

There is a usual practice in village of maintaining sagora (kitchen garden) as depicted in Table 5.

Table 5

Crop pattern for vegetables

Name of the vegetation	**Time**	**Insects**	**Control measures (Medicines)**
Green leafy vegetable	August-Sept	Insect borer, Stem borer, Trips, Jadish bunk, Insect fly, Mites, Termites and Beetles	Endosulphan Cypermethrin Melathion Chlropyriphos Farrat Carbofuran
Capsicum	Feb- April		
Potato	Sept- Oct		
Ladies finger	June – August		
Fenugreek and Spinach	July –August		
Turnips/radish	Oct.- Nov		
Brinjal	May-July		
Green peas	Sept- Nov		
Fenugreek/ladies finger	July		
Red chilly	Feb- April		
Fenugreek and spinach)	Nov-Jan		
Potato/green peas	Nov- Jan		
Tomato/onion	Nov- Jan		
French beans	Feb- April		
Coriander	July- December		
Cucumber	May-July		
Pumpkin	May-July		
Cauliflower	July-August		

Source PLAN / SBMA, (NGO), Uttarkashi (2009)

2.6.2 **Mechanization/tools/practices for agriculture:**

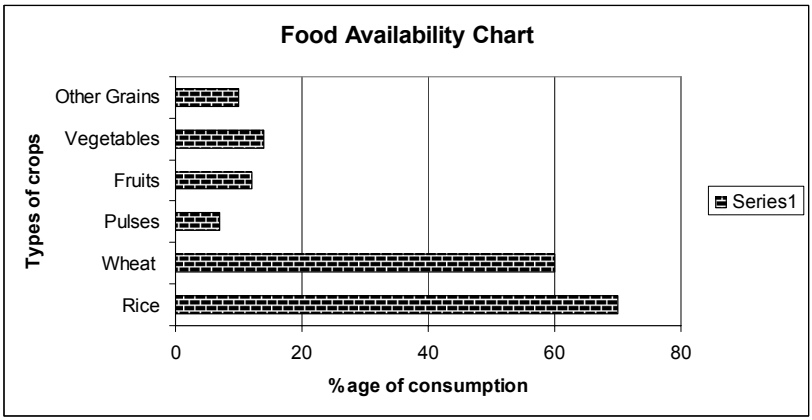
Traditional way of cultivation is Plough ("Hal") with bullock. They don't use tractors and harvesting machines because of terrain complexity.

2.6.2.1 **Post harvesting process:**

The process of extraction of grains is called 'Dain' (crushing of grains with the help of bullock). It takes two-three hours for extracting grain like rice of 20Kg. Table 6 depicts the food availability in village.

Table 6.

Food availability chart



Source: Verbal communication with the villagers on 25th - 28th April, 2009 at Jamak, Uttarkashi

2.7 **Fruits:**

The natural fruits are Akhrote, Aadu and Hinsor. It is unfortunate that villagers cannot retain the total yield due to interference of wild animals.

2.8 **Flowers:**

It is noticed that colorful roses and other decorative flowers are grown in household in an unconscious way which can be a promising area for floriculture entrepreneurship.

2.9 **Soil:**

The soil is in-situ. Though soil analysis is not available however farmers are using urea as well as chemical pesticides for rich production.

2.10 **Amenities**

Table 7

School

Primary School	**No of students**		**Name of the school**	**Teachers**	**Latrine**	**Water**	**Building with field**
	Girls	**Boys**					
Primary Pathshala, Jamak	9	8	Primary Vidhya Mandir	2	Yes	Yes	Yes

Source: Revenue department, Uttarkashi and SBMA, (NGO) census 2001

2.11 **Education:**

The village has only 17 students and 3 teachers in a primary school established in the year 1968. Mid-day meals facility is there (Govt. Scheme). Higher secondary schools and colleges are located 4-8 km away from the village. Some of the children are also studying at private schools far from village as shown in Fig. 7.

Fig. 7.

School going children of Jamak Village
Photo by; Sofia Camalin

2.11.1 **Time line of educational opportunities:**

Higher education facility is 2Km away from the village at Maneri

Before 40 years- Inter college was established at Maneri

2001-2006 a few more educational facilities developed like Vidhya Mandir Shishu Mandir, Himalaya Torch Bearers Academy

2.11.2 **Literacy Percentage out of 175 adults:**

Table 8.

Sl . No.	**Literate**		**Illiterate**		**Semi-literate**	
	Male	Female	Male	Female	Male	Female
1	90	20	Nil	40	10	15

Source: Revenue department, Uttarkashi and SBMA, (NGO) census 2001

Table 9.

Others	Hospitals	Roads	Other schools	Bank and post-office	Shops	Anganbadi
TV, Radio sets, Mobile phones	Govt hospitals in Maneri – 2Km away from Jamak Village	Zeepable road with (Pagdan di)	Shishu Mandir Himalya Torch Bearers Academy Inter College	2-3 Km away from Jamak at Maneri village.	shops are available Maneri – 2Km away from Jamak Village	Yes

Source: Revenue department, Uttarkashi and SBMA, (NGO) census 2001

2.12 **Other amenities:**

2.12.1 **Power/ Energy:**

Electricity is there in village but having only one phase line resulting dim altogether. Besides forest wood as main source of fuel 13 families have gas cylinders and 3-4 families use kerosene. One family uses solar energy. Cow dung is also used as fuel for domestic purpose.

2.12.2 **Medical facility:**

There is no hospital, clinic or local doctor (Vaidh) accept snake bite saver. There is no superstitious belief also existing in this village for e.g. chasing demons, smoking out diseases etc. An NGO runs Asha Yojna for providing minimum health care to women. A regular visit by the Basic Health Worker (BHW) is noticed. For further complications the villagers had to go downhill.

2.12.3 **Initiative by NGO:**

After 1991 earth quake the ADRA (NGO) with University of Roorkee, India, constructed the Tin sheds. Subsequently the SBMA (NGO) had taken a lead while

introducing the PLAN/SBMA Project (7 components i.e. livelihood, health, sanitation, agriculture, learning, disaster management and building relation).

2.13 **Constraints during field work:**

It has been observed by the participants during the field visit that support system is lacking which is a combination of frontline staff and panchayat functionaries or can say "Eco-tone working zone". So there is a need on working on behavioral, environmental and motivational aspects within this zone. For that Information need assessment should be there with proper follow up and it should to Lab to Land approach.

CHAPTER 3

by

Suneet Naithani, Debabrata Majumdar and Sunil Misra

Dr. Debabrata Majumder is presently involved as Coordinator for the TIFAC MSME Technology Up gradation Programe, N-Delhi. Ph. D., from Jadavpur University, M. Tech from Indian Institute of Technology (IIT) Delhi and Kolkata. Fellow of Association for Project Management (FAPM), Buckinghamshire, U.K. and Fellow of Institute of Food Science & Technology (FIFST), London, U.K. He has publications to his credit.

3.0 The discussion and recommendation in participatory mode:

Primary and secondary data was critically analyzed and following innovation has come out;

The houses of the villagers are having cracks due to large number of underground blasts done for the preparation of tunnel for hydroelectric project. This further resulted in larger casualties during earth quake.

3.1 **Irrigation and water harvesting system (participatory observations and discussions).**

Time Line- Table 10.

Time Line	**1991**	**1996**	**2002**	**2007**	**2009**
Rain Fall	Good and sufficient.				
Temperature range (^{0} C)	Winters - very cold Summer - mild cold				
Population	220	250	265	300	375
Road	No road				Jeep Road
Agriculture	Conventional				

Source: Verbal communication with the villagers on 25th - 28th April, 2009 at Jamak, Uttarkashi

The irrigation system is facilitated by GAD and spring (perennial). The village has a unique “Internal coordination system” (depends upon the requirement of water at appropriate time) for irrigation. We observed that community is unable to repair the canal when it is required. Spring water is diverted to households through pipe lines for domestic purposes. To catch the whole water the efforts were made to produce a substitute technology for the green revolution and integrated watershed management practices shown in Fig. 8.

Fig.8

Irrigation And Water Harvesting System
Photo by; Suneet Naithani

3.2 **Land holding size:**

Jamak is a combination of four tokhs (hemlets), Makarti is demarcated as the most vulnerable because of cloud burst in the past. All the 30 inhabitants rehabilitated in Dhankoti area with their new establishment of Rs. 3.60 lakhs/family from Govt. The destructed village site has not reclaimed so far and intact as wastelands. During discussion it is revealed that village needs alternate sustainable livelihood practices like; emergence of new seeds, cash crops, better water irrigation system and shops. The experiential learning of villagers also suggested that the new site is best suited

for the production of rice and wheat. Around 60% of domestic requirement is full filled from this land only. Farmers use cow dung to enhance the soil conditions and for better crop production.

3.3 **Gender issues:**

We observed that there is very specific type of inter-disciplinary activities in day to day activities. When compare the work load of the women population, maximum work at home, at farm and also as labour and cutting of grass. Gents only plough the fields, breaking of stones, and cattle rearing. In comparison to men, women work lot such as; taking care of children, cooking, cleaning, agriculture work etc. They have no time for their own health and sanitation. Even old woman are involved in food grains processing.

Women Folks in Village

Fig. 9.

Photo by; Suneet Naithani

3.4 **Community policing:** It is initiated by police. Report building in social and cultural functions has been observed. Social issues, law and order are handled within the community.

3.5 **Forest produces:**

"Laghukuteer Udyog' (Small scale industries) is one of the dimensions where community can be involved. With already established technology, chirpine niddles can be used for light weight brick making, roof making and other households (already practiced by some NGO's in hills of Uttarakhand).

3.6 **Strengthening other livelihood practices as a whole:**

The weightage preferences were given after interviewing the villagers.

Matrix scoring in village

Table 11

Weightage preferences	Gradation of the Weightage
1. Water -10 2. Public latrine – 1 3. Poverty – 8 4. Health – 2 5. Education – 7 6. Irrigation – 6 7. Road condition – 4 8. Wild animal disturbance – 9 9. Occupation/employment – 5 10. Market facility – 3	1. Water 2. Wild animal disturbance 3. Poverty 4. Educational facility 5. Irrigation 6. Occupation/Employment 7. Road condition 8. Market facility 9. Health 10. Public Latrine

Source: Verbal communication with the villagers on 25th - 28th April, 2009 at Jamak, Uttarkashi

3.7 **Soil for agricultural practices:**

Though the status of the animal population and the availability of bio-manure are sufficient and SBMA has introduced 43 vermi-compositing units at village but villagers are not conscious and units have gone waste.

Interestingly two agriculture flats are available in the village along with huge amount of cow dung for which one wheel carrier can be introduced. Villagers have shown

less interest. There is even no bio-gas plant. These initiations will certainly enhance the lifestyle.

We also observed the man and animal conflicts in and around the village. The methodology adopted by the villagers, introducing a watch man for taking care of agriculture fields is not sufficient.

3.8 **Power:**

The collection of total potable water from perennial source using pipeline up to Jamak can produce 2 kw (approx) electricity. This water can run the local Gharat (water mill) which again can be used for drinking, irrigation, floriculture and cash crop with increased income of villager. The last water can be dropped to the downhill straight into the river Bhagirathi which in turn can become the centre of attraction from eco-tourism point of view.

3.9 **Flowers, horticulture and fruits:**

Floriculture (rose production) –Village has great potential to grow roses and flowers as it is near to the main road which goes to the Gongotri temple. Training and necessary support is required for this highly valued practice along with Bee keeping cultivation as an alternate source of income.

3.10 **Horticulture:**

Corps such as; lemon, citrus food, straw berry papaya etc. can be introduced; Amla, Behera, and other medicinal plants can be grown throughout the year. Seeing climatic conditions the good variety of apricot can be produced with an estimated yield of 3000 to 4000 seeds per year.

3.11 **Heath and sanitation:**

There are no major health problems seen in the village. It was interesting to note that the life span of the villagers was larger than the city dwellers. The average life span has been increased up to 70-75 years for women and 80-85 years for men. interestingly people are spending worth Rs.4-5 lakhs for their houses but not for

latrines. Only 15-17 latrine has been noticed so far. Only 4-5 toilets with sanitation system are available. With changing scenario the village may suffer with various diseases in future. Most of the villagers go for toilet outside. Discussion with the women folks revealed that they are vulnerable not only to natural calamities like heavy rains, rock fall/landslides but also sensitive towards animal attack in early hours of the day in all seasons. Disease pattern among the different months of a year is depicted in Fig 10., 11 and Table 12.

Fig. 10. Ignored Vermi-composting unit
Photo by; Suneet Naithani

Fig. 11. Photo by; Sofia Camalin
Slope for dumping waste

Table 12.

Health and sanitation

Disease	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Cold cough	***	***	**	*	*	*	**	**	*	*	**	**
Headache	*	*	**	**	*	*	*	*	*	*	*	*
Diarrhea	*	*	***	***	***	***	**	**	*	*	*	*
Measles	-	-	-	-	-	-	-	-	-	-	-	-
Jundice	*	*	**	**	*	*	*	*	*	*	*	*
Malaria	*	*	*	*	*	**	**	**	*	*	*	*
Anemia	**	**	**	**	**	**	**	**	**	**	**	**
Surgical accident	-	-	-	-	-	-	-	-	-	-	-	-

***Rarely occurrence, ** Often observed, ***severely Occurred**
Source: Verbal communication with the villagers on 25th - 28th April, 2009 at Jamak, Uttarkashi

3.12 **Educations:**

Children here are eager to pursue higher education, want to become doctors, solider (boys) teachers (Girls). Women folk are also eager to take up some kind of job to be financially independent.

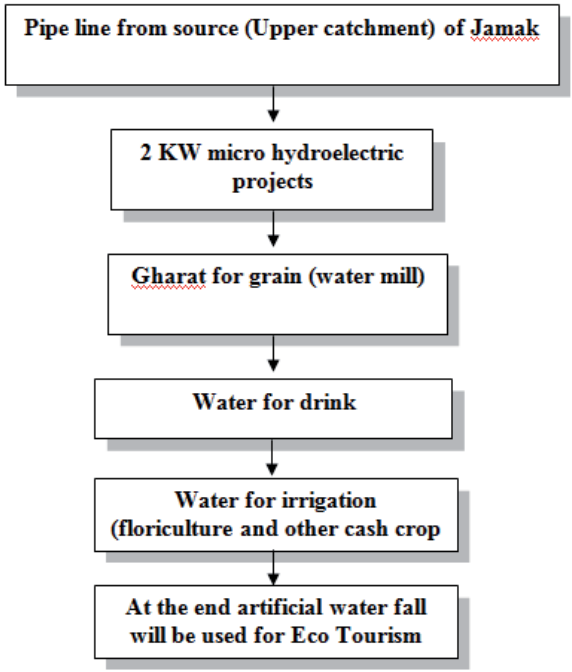
3.12.1 **Reasons for drop out children from the education:**

People seem to be illiterate because the primary education is not graded. The quality of education offered also seems to be poor will affected their employment opportunities in the government and other sectors. Soldiers are only Govt. Employees, which further supports our doubt about the quality of education. The drop outs from school may be also due to other factors like, lack of road and poverty.

Agricultural area is sufficient thus strengthening community welfare fund, community contingency plan or introducing self Help Groups (SHGs) is required to build a self sustain village. After discussion with villagers a proposed action plan has been introduced as depicted in flow chart 2.

Flow chart 2.

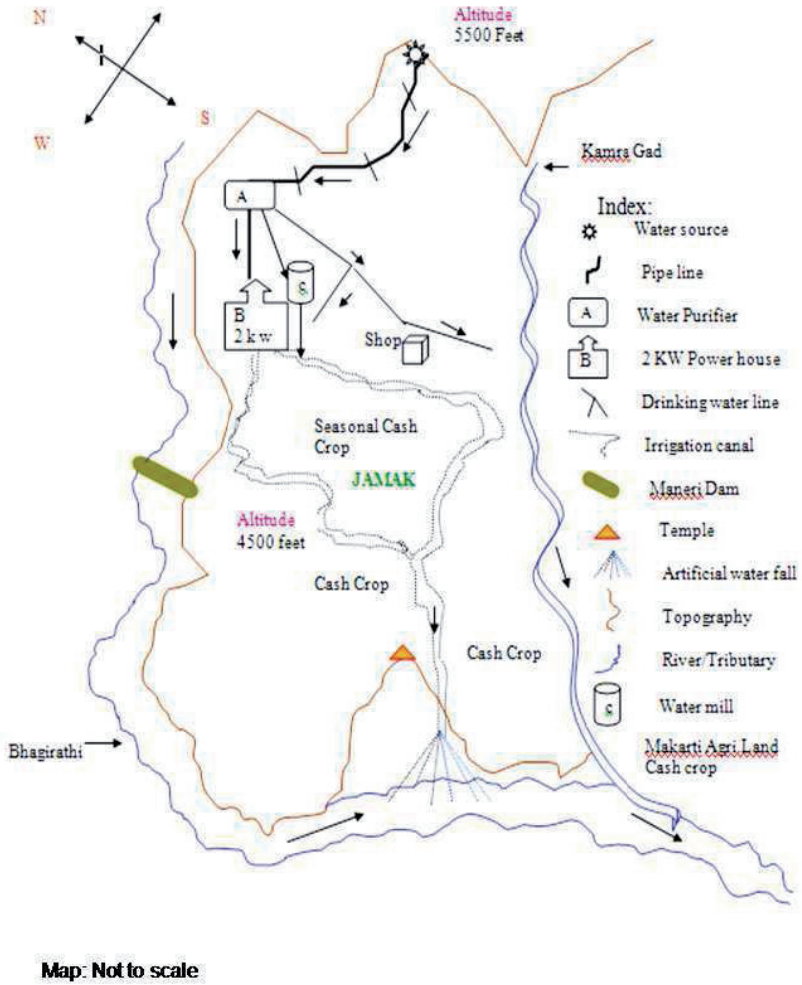
DEVISED MECHANISM FOR INTEGRATED DEVELOPMENT



The above flow of action plan can also be understood through following Fig. 12.

Fig. 12.

INTEGRATED VILLAGE DEVELOPMENT PLAN
JAMAK, UTTARKASHI, (A WATERSHED APPROACH)



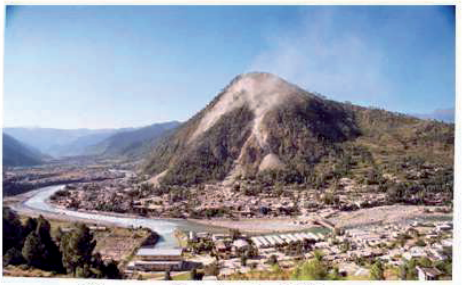
Map: Not to scale

Sketch by Dr. Suneet Naithani

3.13 **Search & rescue trainings at village level:**

It is known that area comes under seismic zone five and suffered from severe earth quake and trimmers. The vulnerability of the village has also been increased with introducing tunnel at the toe of the village for power production. Besides that all the vicinities are also not safe as shown in Fig 13.

Fig. 13.



Varunavrat during landslide

Village Jamak
Photos by; Suneet Naithani

Naithani (2008) argues that the youth and adolescents should be involved in community based disaster management approach. The SBMA (NGO) has taken initiatives to give exposure to some youths (Young girl and boys) for rescue and relief trainings. This process can be regularized at Govt. and local level. After big blow of 1991 villagers are making earthquake resistant houses.

Traditional technology had all the ingredients towards earthquake engineering. It is good that we try to blend the traditional knowledge with modern know how.

3.14 **Immediate implementation of technology:**

Through discussion with villagers it was concluded to introduce four (4) other sustainable developmental packages for immediate implementation remedies which are as follows;

3.14.1 **Package -1***:*

Commercial Dairy Development Project

Statistics*:*

Total no. of Cow:30 (Jersey cross breed)

Buffalo: 45 (Murrah breed)

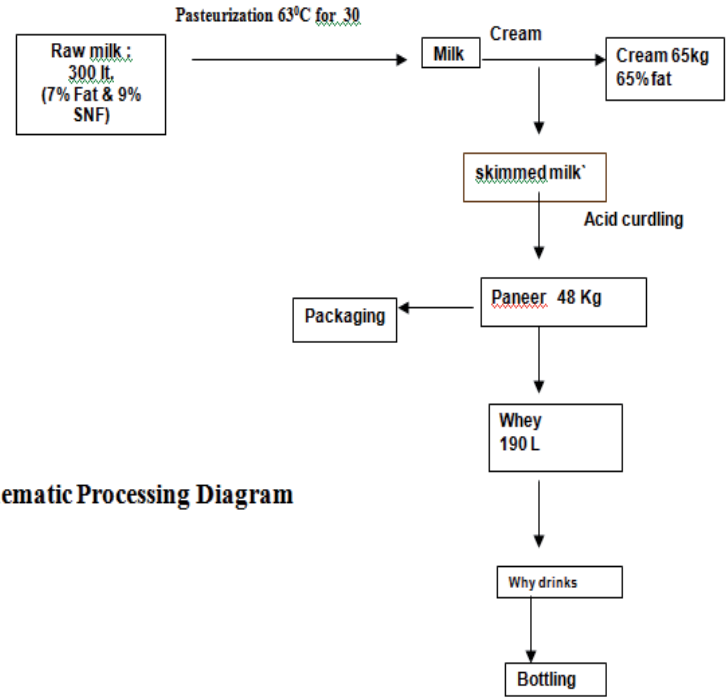
Average milk production: 400lt. / day

Local consumption: 100lt./ day

Surplus milk: 300lt./ day

As depicted in Flow chart 3.

Flow Chart 3.



Schematic Processing Diagram

Capital Equipment required

- Automatic Milk Testing Equipment
- Batch Pasturizer
- Baby boiler (to utilize locally available wood as fuel)
- Pipeline and bulk cooler (500 lt. capacity)
- Cream Separator
- Autoclave

- S.S. Storage Tank 400 lt. capacity.
- Batch type bottling unit.

Capital expenditure:

Land & building (25 ft. / 15 ft.) – Rs. 3 lakhs.

Equipment cost- Rs. 14 lakhs

Recurring expenditure- Rs. 5 Lakhs./ year

Total investment (Rs. 3 lakhs + Rs. 14 lakhs + 5 Lakhs) = Rs. 22 Lakhs.

Employment Generation:

Direct: 12 person

Indirect: 50 family

Product to be produced

Cream – 60 kg. / day

Paneer- 48 kg./ day

Whey drinks- 190 lt./ day

Daily Revenue Expenditure

Procurement price of milk- 300 lt. * @Rs.11/ day = Rs. 3300 / day

Fixed & Variable expenditure = Rs. 5000/ day

Total= Rs. 8300/day

Earning

Cream 60 kg. * Rs. 120/ Kg. = Rs. 7200/-

Paneer 48 kg. * Rs. 160/ Kg. = Rs. 768/-

Whey drinks 190 lt. * Rs. 22/ lt. = Rs. 4356/-

Total = Rs. 12324/-

Daily saving = Rs. 12324/- - Rs. 8300/- = Rs. 4024/-

Payback period 2.5 years.

(before considering interest on investment)

4.0 years

(After calculating interest @ 9% per anum.)

Market

- Uttarkashi
- Just crossing the River on the road side (Way to Gangotri)

Benefit as a whole

- Regular cash flow in the village
- Direct employment – 12 person, Indirect employment – 50 family
- Develop Innovation capability & entrepreneural attitude among the villagers.
- Byproduct utilization (Cow dung as manure)

Implementation of the project

- To be at Jamak village through formation of Cooperative Society among the local youths.

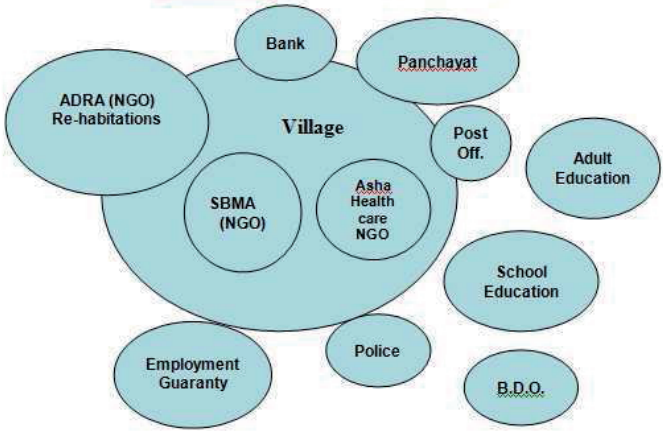
Note: *Rates are subjected to market Fluctuations*

3.14.2 **Package -2**:

Animal husbandry (Sheep and Goat):

The production of wool has got numerous employment generations. With increasing awareness villagers are having rashion (food/grain) card and voter identity card. But still very few interlinkages have been developed and observed between villagers and Govt. Offices. These can be strengthened by regular visits of officials responsible for development of this village. The interlinkages observed in Village shown n Fig 14.

Fig. 14. Interlinkages of village with institutions



VENN DIAGRAM

3.14.3 **Package -3:**

Integrated disease and pest management:

Introducing chemical pesticides for controlling the various fungal, viral and insect infections in agricultural has direct and indirect effect on the animals and human health (exposure). The alternatives like; medicinal plants for controlling of these pests and diseases can be used. We discussed the usage of bio-pesticide which is a new concept and can be used successfully.

The success of this approach has potential in many ways:"

- Easy availability of the medicinal plants in and around the village (mostly found in the hilly habitation).
- Cold and hot extraction of product can be done in the village (no cost effective).
- There will be no health hazard in the future.

- Some of the bio-pesticides can also be used as growth enhancer for the crop and horticultural plants.
- This technology can be propagated in the nearby villagers.

3.14.4 **Package -4:**

Information technology for rural development through Samadhan Kendra (e-Governance i.e. One Stop Shop)

- Samadhan Kendra is a Sustainable Rural Information Centre, would be able to provide services to the rural public and to concerned government departments with developing an integrated information system using audio and graphics.
- Baseline information on the requirements about agriculture, health, education is required.
- Easily identifiable icons representing the above mentioned topics are required.
- Developing audio files and expert advice suitably translated into local language.
- Customized software in order to cater the needs of village.
- Samadhan Kendra, forms the economic and administrative center for village/villages.
- Provision of decision support systems for local planning and information access.

3.14.4.1 ***Requirements***

1. House with 10 x 12 feet
2. One computer unit with internet connection
3. Infrastructure like table chair, electricity connection, stationary items
4. An computer operator with minimum knowledge (10th or Intermediate).

3.15 **Other alternatives for revival of Village:**

- Glossary shop, flour mill, oil mill, Smokeless Chula, papad making etc.

- Pickle making; self employment for woman from indigenous fruits like; Guryar through SHGs'.

3.16 **Conclusion:**

Though the village is having unique pattern of cropping system and traditional way of harvesting and production of grains, indigenous system of irrigation, storing grains, indigenous skill for curing snake bites but the full utilization of available natural resources and technological interventions are still lacking.

The need of an hour is to work on integrated watershed development approach, establish Samadhan Kendra, training on search and rescue, establishment of self-help group and community contingency plan, water mill, micro-hydro electric project, irrigation, cash crop, eco-tourism, dairy for revival of village.

Community policing is welcome realization helping the community in social front. But interlinkages are still lacking with work on behavioral, environmental and motivational aspects in "Jamak".

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