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A CASE STUDY

Participatory rural appraisal: A systems approach for identification of problems by an agro-ecosystem analysis

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Abstract : Participatory rural appraisal (PRA) technique of selected village (Bilakundi) in Belagum district of Karnataka state revealed that village basically sugarcane and maize based cropping system. The major sources of irrigation are open well, bore well and canal and 721 hectare of land is irrigated through these sources. The PRA tools used include transect walk, agro-ecological mapping, social mapping, resource map, mobility map, time trend, seasonal calendar, gender analysis, time line, livelihood analysis, technology mapping, wealth ranking, consequence diagram, problem solving tree etc. The major constraints identified were increasing micronutrient (Zn-Fe) deficient fields, water salinity, water logging, market price fluctuation, water scarcity during summer, quality of electricity supply to run pump sets, timely non-availability of labourers for agricultural activities, infertility of buffalo and cows, root grub and woolly aphid insect pest problem in sugarcane and gradual declining of soil fertility. Based on the problems identified, suitable solutions were arrived in consultation with researchers, subject matter experts of KVK and progressive farmers.

Key Words : Participatory rural appraisal, Problem identification, Systems approach, Agro-ecosystem analysis, Field experience training

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INTRODUCTION

Since the dawn of the new millennium, Indian agriculture has been facing newer challenges that are quite different from those faced in the previous decades such as impact of trade liberalization and globalization, degrading natural resources, natural calamities etc in addition, covertly the socio-economic problem of disinterest of rural youth in agriculture is also increasing. The recent report from the National Commission of farmers is alarming, which states that ''given a chance, 40 per cent of the Indian farmers wanted to quit agriculture and moved to secondary and tertiary sector for their livelihood'', implied in this statement are the facts that valuable agriculture lands are being converted for attractive business enterprises (Rajgopal, 2005). Competition of land, water and human resources due to increasing urbanisation and industrialization, decreasing remuneration from agriculture due to unfavourable terms

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of trade, increasing production and price risks, like there are several reasons for dwindling interest among the farmers and present day youth in undertaking agriculture as an enterprise. All these developments putting enormous pressure to produce more and more food from less land with minimum labour is a tough task for the farmers as well as agricultural research scientists. To scale up the momentum of growth and make agriculture as profitable enterprises, a careful analysis into the agro-ecological situation and economic evaluation of inputs like seeds, fertilizers, irrigation sources, possible local market linkages etc. are of considerable importance. In this context, participatory rural appraisal (PRA) is an important tool for analyzing agricultural systems in order to plan and prioritize research and development activities in the fields of agriculture and natural resource management. It uses a holistic or systems approach to gather biophysical and socio-economic information and to identify key issues or problems within the eco-system that will be useful for rural development, extension and research programmes (Mascarenhas, 1991). Hence, PRA is a tool to understand the technology adoption profile and difficulties in adopting newer technologies in a cropping system, to get first-hand information about their needs, resources available, identify location specific problems and researchable issues and ultimately to come up with tangible possible solutions drawn as an action plan (Rajula *et al.*, 2004; Naskar *et al.*, 2011). The present work was carried out as a part of the field experience training of the trainee Scientists at KRC, College of Horticulture, Arabhavi, Karnataka during 2010. The objectives set for conducting PRA in selected village were; to interact with villagers to get insight of the agro-ecological situation, Identify agricultural issues and problems existing in the village so that they can be addressed by extension or research programmes and to find solutions for the prioritized problems for the improvement in livelihood of farmers.

MATERIAL AND METHODS

The study was conducted at Bilakundi village; Koujalgi hobli under the administrative control of the revenue block Gokak in Belagum district of Karnataka state with a population of 2849 (including farm houses) with 370 households. The major occupation in this village is agriculture and 57 households have a land holding above 10 acres. Major crops are sugarcane, maize, groundnut, cotton, sunflower, red gram, cucrbits, turmeric, wheat, banana, Bengal gram and horsegram. Despite being a progressive village with a wide range of crops and animal husbandry, there are some problems like water logging, soil salinity, micro-nutrient deficiency, water scarcity during summer, unavailability of labour, lack of quality power to run pumpsets, insect pest such as root grub and wolly aphid in sugarcane etc., which are extensively affecting the livelihood.

Rapport building :

By frequent visit and interact with various stakeholders like the research institutes, KVKs, farm input suppliers, farmers co-operative and agriculture and animal husbandry related officials such as Assistant Director of Agriculture, Assistant Director of Horticulture, concerned Agricultural Officers, Assistant Agriculture officers, and the Veterinary doctors were consulted before selecting the village. Reconnaissance survey was conducted for selecting the village with the assistance of the local coordinators and professors of KRC College of Horticulture and subject matter specialist of KVKs, local development officers of the village. Several informal meetings were organized in the village to get acquainted with their mode of functioning. PRA was finally conducted with full cooperation of selected people from the villages and facilitators. The analysis of data collected relies heavily on secondary data both bio-physical and socio-economic information.

PRA tools used:

Participatory rural appraisal is a methodology for interacting with the villagers understanding them and learning from them it involves a set principles a process of communication and a menu of method for seeking villager's participation. The PRA tools used include transect walk, social mapping, agro-ecological mapping, technology mapping, seasonal calendar, time trend, gender disaggregated activities, time line, livelihood analysis, consequence diagram, problem – solving tree etc. The research team made transect walks in the south to North direction of the village along with key informants who were knowledgeable about the natural resource issues. Observations were made on different micro-ecological niches, local indigenous techniques (ITKs) and discussed issues of mutual interest. Data were recorded to assess the topography, soil type, land use pattern, major crops, trees, livestock, cropping pattern, technologies adopted, socio-economic and cultural settings and agricultural problems. Based on the observations of transect walk,

agro-ecological data were compiled depicting the climatic and environmental conditions in relation to agricultural practices prevalent in the village. Data were also collected for productivity and price trend of sugarcane, maize, cotton, groundnut and wheat over the respective years to identify the fluctuations that had occurred during the last five years and how it had influenced village life.

Problem identification:

The major problems identified in the village Bilakundi were listed and rank based quotient (RBQ) of the problems was calculated based on the ranking done by 20 farmers of the village. Rank based quotient and value based formula was calculated using following formula as given by Sabarathnam (1988).

Rank based quotient

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

where,

i = Concerned ranks

N = Numbers of farmers

n = Numbers of ranks

fi = Frequency of farmers for ith rank of the technological need.

VBI = RBQ x Average monetary loss

Based on the agriculture-related problems identified, a problem-solution tree was constructed to highlight the possibilities to overcome the identified problems.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Transect and agro-ecological details :

Village Bilakundi is located at the latitude N 25°59.010' and longitude E 90°31.396' at a height of 625 m from mean sea level. Table 1 details the features identified during the transect walk. On an average, the area receives 500-1683 mm of rainfall in a year with major share from South - West monsoon. The mean annual maximum temperature is 39°C and the mean annual minimum temperature is19°C. The relative humidity varies from 50 - 63 per cent. The entire village of is divided into two zones, *viz.*, upland and low land. The residential area is in the centre and it is situated in upland surrounded by the agriculture fields. The village has several institutions including 10 temples and one church, 9 SHG (stree shakti) groups, anganwadi centres (2) and one govt. school. The soil of Bilakundi village is mainly medium black and black soil (60%), red soil (30%) and rocky sandy soil (10%) suited for growing a wide range of crops.The upland part is bordered by rocky open fields unfit for cultivation mainly using for development of social forestry, cattle and sheep rearing. Farming is practised with modern equipment and implements like tractor, disk plough, thresher, cultivator and sprayer by large farmers. Small and medium farmers use animal drawn implements for farming. The livestock population of the village consists of buffaloes, cattle, sheep, goats, pig and poultry. Major source of irrigation in the village is open well, bore well and canal.

Agro-ecological mapping :

Agro-ecological map depicts the climatic and environmental conditions in relation to agricultural practices prevalent in the village. It helps in better understanding of the topography, land use, soil type, and variation in soil fertility, irrigation system prevalent in the village, dominant crops, trees, shrubs, weeds and other agro ecological conditions of the village.

Intensive agriculture is followed in this village. Important crops grown are sugarcane, maize, banana, groundnut, wheat, cotton, red gram, Bengal gram, horse gram, chilli, ladies finger and cucurbits.

Sugarcane and maize is the major crop in the *Kharif* season. In *Rabi* season maize, wheat, Bengal gram, horse gram chilli, okra are grown. The major weeds observed were parthenium, *Tridax procumbens*, *Lentena camera*, crow foot grass, crab grass, amaranthus, bermuda grass, *Euphorbia*, striga *Celosia* and goose grass. The major tree crops are tamarind, neem, *Acacia*, eucalyptus, *Prosophis julifera* and teak. The common fruit crops are *Mangifera indica*, Custard

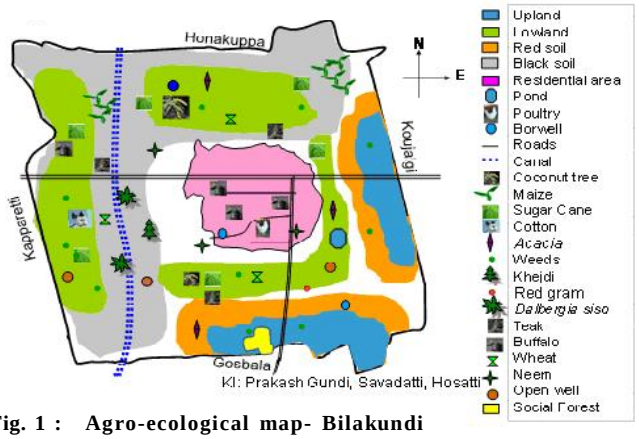

Fig. 1 : Agro-ecological map- Bilakundi

apple, *Zizyphus mauritiana*, *Ficus bengalensis*, *Prunus amygdalus*, *Psidum guajava*, *Carica papaya*, *Cocos nucifera* and citrus (Table 1 and Fig. 1).

Social mapping :

Social mapping is one of the visual PRA techniques which involves direct participation of villagers. It is used to analyze the social structure, stratification and availability of social facilities including spatial distribution of castes, information regarding occupational pattern, location of households, social institutions, groups, leadership patterns, value systems, social gatherings, norms, customs, social evils existing in the village etc. In short, the social map enables us to understand and analyze the existing social scenario of the village.

Table 1: The general transect of Bilakundi village

Sr. No.	Particulars	Upland	Lowland
1.	Soil type	Red soil , red loam and rocky sandy soils	Medium black soil and black soil
2	Major crops	Groundnut, bajra, sunflower and fox tail and maize	Sugarcane, maize, bengal gram and khapli wheat
3.	Minor crops	Horse gram, *Sesamum indicum*, niger and red gram grow as an intercrop	Cotton and soyabean
4.	Vegetables	Tomato, chilli, brinjal, ladies finger, coriander, cucurbits and clusterbeans	
5.	Livestock	Buffalo, cow, sheep, goat, bullock, and pig	
6.	Trees	Palm, neem, tamarind, *Pongamia*, *Acacia*, Eucalyptus, mango, custard apple, ber tree, *Ficus bengalensis*, *Prosophis julifera*, almond, guava etc.	Teak, neem, papaya, coconut, *Acacia c*itrus, ber, bamboo,mango *Pongamia*, *Ficus bengalensis*, *Prosophis julifera*, guava,etc.
7.	Weeds	Parthenium,*Tridax procumbens*, *Lentena camera*, crow foot grass, crab grass, Amaranthus, Bermuda grass, *Euphorbia*, Striga, *Celosia* and goose grass etc.	Bermuda grass, Amaranthus, Parthenium, crab grass,jungle rice, *Cyprus rotundus*, *Commelina bengalensis*, Striga etc.
8.	Water source	Bore well, open well and ponds	Canal, ponds and open well
9.	Pests	Leaf eating caterpillar, stem and shoot borer in maize, leaf minor in groundnut	Woolly aphid and root grub sugarcane
10.	Diseases	Head smut of maize	Red rot , yellowing and whitening of sugarcane leafs and smut in sugarcane
11.	Problems	Shortage of farm labours at right time for attending various farm operations Escalating labour and input charges Pest and disease problem Lack of local markets for selling agricultural produce Shortage of water for irrigating crops in summer Passive transport system	Water-logging of soil, soil salinity, Increasing number of micronutrient deficient fields water scarcity during summer,
12.	Opportunities	Milk processing and its value added products units Sericulture forming Fish rearing Production units for vermicompost, vermiwash and compost from available sugarcane biomass it will encourages utilization of organic fertilizer Bio-pesticides production units from abundant neem trees. Integrated pest and disease management Poultry farm can be introduced. Co-operative market for sheep wool. Rural marketing opportunities for agricultural inputs. Adoption of *Pongamia pinnata* as green manure inter crop. Fallow land can be utilized for Agro-forestry and social forestry.	

Caste and settlement :

Majority of people in this village belong to Hindu, Uppar, Lingayatha, Kurba, Swamy, Bajantri, Panchala (Pettar and Bedige) and Kshatriya (75%) agriculture and livestock rearing are the common bread earning activities of most of these communities. Piggery is practised by Bajantri caste and Panchalas include blacksmiths and carpenters followed by scheduled castes communities (16%). Most of them work as labourers for stone crushing, jiggery making units. Christian (9%) and Scheduled tribes (0.5%) are involved mainly in labours and agriculture. Minority muslims constituents 0.5 per cent of population these families are devoid of any land and hence, are involved in activities like mat making, bangle selling. It was interesting to note that the households belonging to Hindu castes/categories were occupied centre and at entry of the village around temples followed by village outer boundaries occupied by scheduled castes, tribes and christian at outer boundaries of the village minority muslim communities were occupied. Ring settlement was seen with houses at the centre and entry of the village. The existence of social stratification based up on caste and community was noticed.

Leadership pattern and other social information:

Active leadership pattern was observed in Hindus (particularly in Uppar and Lingayath caste). One Zila Panchayath member was belonging to this village. Apart from this a progressive farmer and secretary of DSS unit's leaders influenced the villagers in decision making process and also intervene in social activities. Political conflicts arise between the Uppar and Lingayatha communities, especially during elections. Except for such political conflicts, people are generally harmonious and due respect was given to elders by the children and youth, clearly representing the existence of a strong value system in the village. People participate in social gatherings like Okali and Basavajayanthi Jatra where monitory contribution is made by all the communities equally, indicating social harmony.

Social evils :

Social evils are the unconstructive elements in any rural sector of the country that hampers its progressive development and growth. Child marriage was found prevalent in the village wherein girls are forced to discontinue their education in schools and get married. An alarming 40 per cent of girl students end up as school drop-outs due to this system. The other social evil observed was dowry system, child labour, consumption of liquor and tobacco leading to unrest in homes.

Time trend of productivity and price in sugarcane and maize :

It is a simple PRA technique, usually depicted in the form of graph (bar/line) to show the trend of crop/ animal production, commodity prices, human/cattle population etc. Maize productivity in trend analysis revealed gradual increase in productivity from 1990 to 2005 mainly due to adoption of high yielding varieties and competition among private seed producers bringing many high yielding varieties in maize during the period but after that productivity declining. This is mainly because

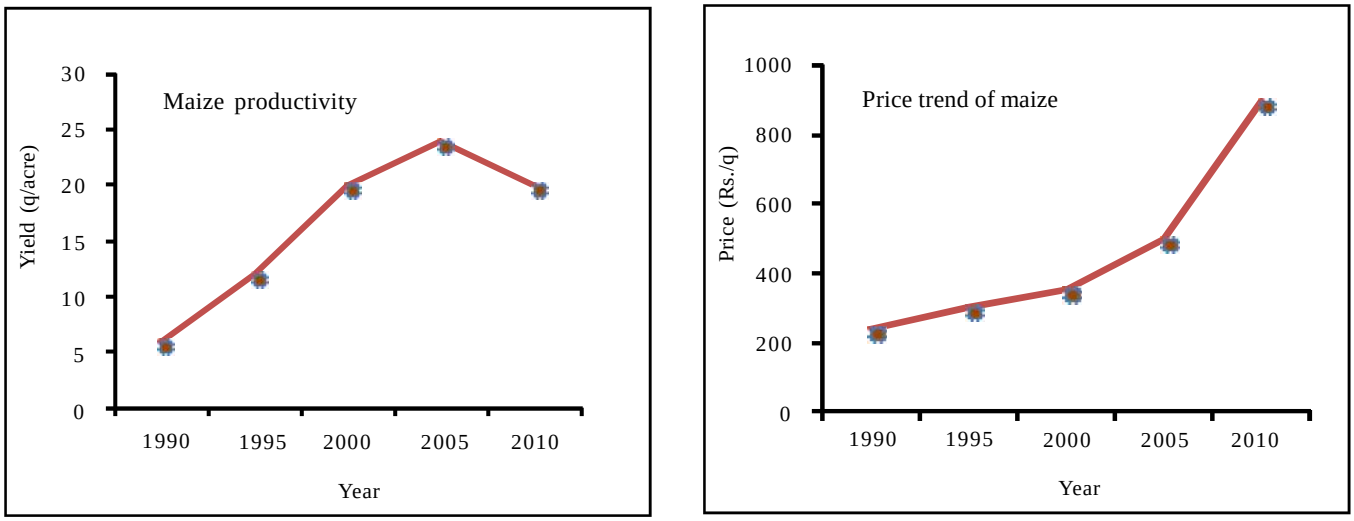

Fig. 2 : Productivity and price trend for maize in Bilakundi village

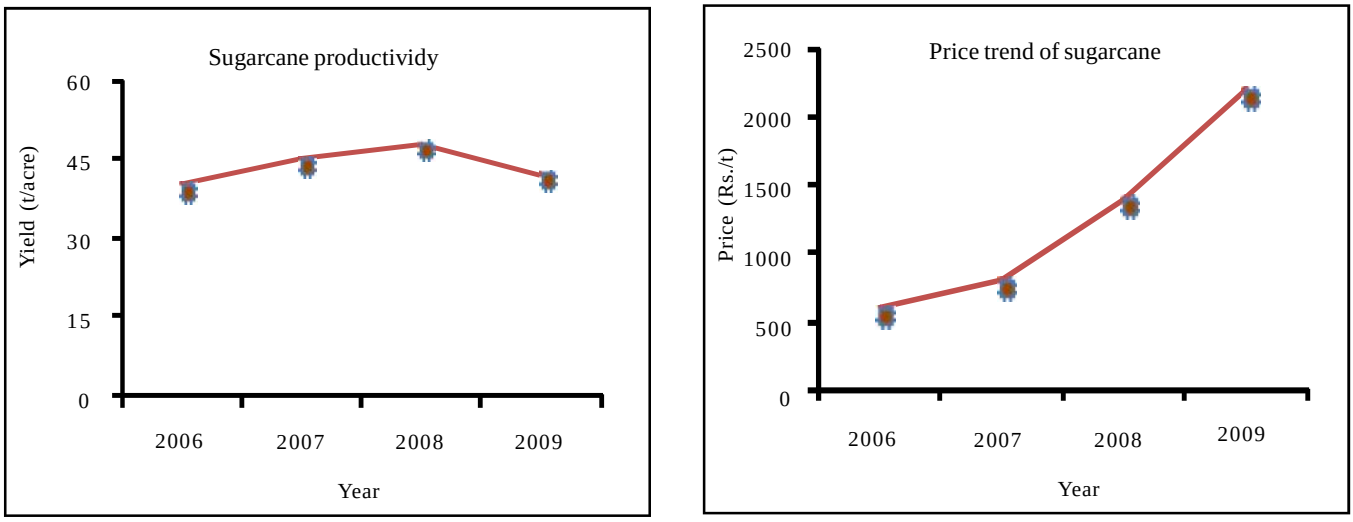

Fig. 3 : Productivity and price trend for sugarcane in Bilakundi village

of salinity and water logging conditions of soil. Price trend analysis indicates the gradual increase in price of maize from Rs. 250 per quintal to Rs. 900 per quintal. This is mainly due to the increase in demand from maize processing industries and decline in production due to, increase in soil salinity, water logging and micro-nutrient deficiency there by increased in prices over a period of time (Fig. 2).

Sugarcane was introduced in 2006 in Bilakundi Village. Trend analysis of sugarcane productivity indicates that the production trend was in increasing order from 2006 to 2008 with the yield of 40 tonnes per acre to 48 tonnes per acre, respectively. But the yield declined after 2008 due to increase in water logging, salinity problems, and also iron and zinc deficiency was found. However, price trend of sugarcane indicates almost linear increase in price from Rs. 600 per tonne to Rs. 2,000 per tonne (Fig. 3).

Seasonal calendar and analysis :

Seasonal calendar indicates month wise information about all the aspects related to cultivation of crops and livestock rearing. The common crop seasons in the village are *Kharif, Rabi* and summer with sugarcane and maize as the main crops. During labour intensive seasons, migrant labourers from Bijapur, Bagalkot and Dharwad districts are employed by the farmers of the village. The most remunerable activities in the village are production of jiggery from sugarcane milk. Farmers are well aware of improved crop varieties and are adopting latest technologies. In this village most of the farmers are well connected to extension workers from state department of Agriculture/ Horticulture and seed company office. Hence with the assistance from them they get technical guidance and follow year round cropping system. The animal husbandry enterprise includes piggery, dairy, sheep and goat rearing and backyard poultry. Seasonal analysis helps in identifying the period which are critical with respect to labour demand, pest and disease problems and availability of fodder. In sugarcane, root grub and woolly aphid. Leaf eating caterpillar and shoot borer in maize, leaf minor and tikka disease in groundnut are the major threats faced by the farmers.

Gender disaggregated activities :

Women in this village contribute mainly to agriculture, livestock management and home management. They feed the livestock, milk animals, take the animals to the fallow land, bath them at noon and cut the fodder for the animals. They do weeding, sowing/ planting, harvesting and apply fertilizers as and when required in field. Landless women and women from poor families work as agricultural labourers within the village or nearby town. Men are mainly involved in field activities, transportation of harvested produce and also take the livestock for feeding, vaccinations, artificial insemination and grazing (sheep and goat) as well as selling milk. Both men and women feed animals, do milking, take them for grazing and collect fodder, whereas only women clean the shed. Women do all kind of household work along with agricultural activities.

Timeline :

Time line is a PRA tool used to know the history of

major remembered events in the village and community and their significance with the social development. It indicates the causal link between past and present. The purpose of this tool is to obtain historical account of changes in demography, socio-economic condition, communication, social relationship and interaction, technology diffusion and adoption. Time line of major events in Bilakundi village shows more or less similar pattern as what is generally indicated by the majority of the Indian villages, *viz*., construction of temple, primary school, open well, electrification, anganwadi, bus-stand, hand-pump, drinking water supply system, direct to home (DTH), high school, milk society, fertilizer traders etc. From the time line of agriculture, it is evident that farmers grew a number of crops. It indicates that farmers used to follow conventional agriculture earlier with very less farm mechanization and used to rear local breeds of cattle. Development of village in terms of education, primary school (1973), High school (2008) and agriculturally fertilizer traders and milk society resumed (in 2009). There is a gradual increase in use of communication technologies like use of television (in 2001), landlines and mobiles (in 2002), DTH (in 2007).

Matrix ranking :

Matrix ranking technique is applied to know the relative importance of technologies or varieties of crops or breeds of cattle over the others based on key informants (KI). The villagers have adopted and discontinued several varieties of maize and sugarcane. The grower's usage of three varieties of sugarcane and maize were compared to know what drives their technology adoption behaviour. It was found that despite being susceptible to pest and diseases the varieties that were adopted and are being used mainly, had the highest yields. Hence, the most decisive factor for a farmer regarding crop adoption is its yield. Among these three varieties in maize, all round varieties is most preferred because of drought resistance, moisture resistance (under *Kharif* after crop establishment delay in rains withstand the moisture stress) high productivity (Table 2). Among the three varieties of sugarcane *i.e.*, CO8011, CO740 and CO640, the farmers of this village prefer mostly CO811 variety because of high productivity, more number of rationing and higher resistance to moisture and drought (Table 3).

Technology map :

Technology map is used to know the different types of technology present in the village and behavioural pattern of the villagers towards technology adoption (Chambers *et al.*, 1989). Adoption type, discontinuance, rejection and over adoption are the different type of technology behaviour. This technique is used as feedback mechanisms which help to identify the problems of the farmers by scientist and extension personnel. Among the several varieties/ technologies introduced in the village, some of them are discontinued and others are being adopted. The farmers have adopted Co811, CO86032 and CO740 variety of sugarcane, All round and lakshmi1818 variety of maize. However, due to low yield and fodder palatability they have discontinued CO8040 variety of sugarcane and CO 671 variety of sugarcane due to skin allergy (more spines on leaves) and unfit to use as fodder. In maize Deccan 101, 102 and 103 rejected due to low yield and variety Kanachana discontinued due to less seed filling percentage in cobs. Most popular and widely adopted vareites in maize is all round and CO86032 variety in sugarcane.

Consequence diagram :

Consequence diagrams are drawn to know the impact of adoption of technology (Kar *et al.*, 2002). The farmers of this village are using high yielding and moisture stress withstanding varietieal technologies are adopting in maize (cultivar all-round) and sugarcane (cultivar CO86032). These technologies have both positive and negative effects which are analyzed using consequence diagram. Consequence analysis of all round varieties in maize indicated that higher resistance to drought and moisture stress, higher grain filling percentage on cob and higher fodder palatability and negative effects are higher susceptibility to pest and diseases and non availability of seeds at the time of sowing. In sugarcane varieties CO86032 had more number of ratooning crop, withstand moisture stress, fodder palatability and higher productivity. The major drawback was lesser brix percentage and susceptible to pest and disease.

Problem prioritization and problem-solution tree:

In spite of being a progressive village, there are some problems such as Zn-Fe deficient soil, increasing soil salinity, water logging soils, water scarcity during summer season, non-availability of labours in time for taking up various agricultural operations, non-availability of chemical fertilizers in time, infertility in buffalo and cows, pest and diseases problem in maize and sugarcane etc. Based on RBQ (Table 4), four problems were

Table 2 : Matrix ranking for maize varieties

Features	K_1	All round		Lakshmi 1818		Kaveri	
		Rank	Points	Rank	Points	Rank	Points
Availability of seeds	K_1	C	1	A	3	B	2
	K_2	A	3	B	2	C	1
	K_3	C	1	A	3	B	2
	K_4	A	3	C	1	B	2
Score			8		9		7
Higher drought	K_1	A	3	B	2	C	1
resistance	K_2	A	3	B	2	C	1
	K_3	A	3	B	2	C	1
	K_4	A	3	B	2	C	1
Score			12		8		4
Higher resistance to	K_1	A	3	B	2	C	1
soil moisture	K_2	A	3	B	3	C	1
	K_3	A	3	B	2	C	1
	K_4	A	3	B	2	C	1
Score			12		8		4
Higher productivity	K_1	A	3	B	2	C	1
(kg/ha)	K_2	B	2	A	3	C	1
	K_3	A	3	B	2	C	1
	K_4	A	3	B	2	C	1
Score			11		9		4
Higher grain filling	K_1	A	3	B	2	C	1
% on cobbs	K_2	A	3	B	2	C	1
	K_3	B	2	A	3	C	1
	K_4	A	3	B	2	C	1
Score			11		9		4
Lower susceptibility	K_1	B	2	A	3	C	1
to pest and diseases	K_2	B	2	A	3	C	1
	K_3	B	2	A	3	C	1
	K_4	B	2	A	3	C	1
Score			8		12		4
Good fodder	K_1	A	3	B	2	C	1
palatability	K_2	A	3	B	2	C	1
	K_3	A	3	B	2	C	1
	K_4	A	3	B	2	C	1
Score			12		8		4
Shorter crop	K_1	B	2	A	3	C	1
duration	K_2	B	2	A	3	C	1
	K_3	B	2	A	3	C	1
	K_4	A	3	B	2	C	1
Score			9		11		4
Better taste quality	K_1	A	3	B	2	C	1
	K_2	A	3	B	2	C	1
	K_3	A	3	B	2	C	1
	K_4	A	3	B	2	C	1
Score			12		8		4
Grand total			95		82		39

Table 3: Matrix ranking for sugarcane varieties

Features	K_1	CO 8011		CO 740		CO 671	
		Rank	Points	Rank	Points	Rank	Points
higher fodder palatability	K_1	A	3	B	2	C	1
	K_2	A	3	B	2	C	1
	K_3	B	2	A	3	C	1
	K_4	A	3	C	1	B	2
Score			11		8		5
Increased number of	K_1	A	3	B	2	C	1
ratoonings	K_2	A	3	B	2	C	1
	K_3	A	3	B	2	C	1
	K_4	A	3	B	2	C	1
Score			12		8		4
Higher productivity	K_1	A	3	C	1	B	2
(kg/ha)	K_2	A	3	B	3	C	1
	K_3	A	3	C	1	B	2
	K_4	A	3	B	2	C	1
Score			12		7		6
Higher resistance to	K_1	A	3	B	2	C	1
moisture and drought	K_2	B	2	A	3	C	1
	K_3	A	3	B	2	C	1
	K_4	A	3	B	2	C	1
Score			11		9		4
Shorter crop duration	K_1	B	2	C	1	A	3
	K_2	B	2	C	1	A	3
	K_3	B	2	A	3	C	1
	K_4	B	2	C	1	A	3
Score			8		6		10
Higher brix % and demand	K_1	C	1	B	2	A	3
from factories	K_2	B	2	C	1	A	3
	K_3	C	1	B	2	A	3
	K_4	B	2	C	1	A	3
Score			6		6		12
Easy availability of seeds	K_1	A	3	C	1	B	2
	K_2	A	3	C	1	B	2
	K_3	A	3	C	1	B	2
	K_4	A	3	C	1	B	2
Score			12		4		8
Lower susceptibility to	K_1	C	1	B	2	A	3
pest and disease	K_2	C	1	B	2	A	3
	K_3	C	1	B	2	A	3
	K_4	C	1	B	2	A	3
Score			4		8		12
Grand total			72		48		49

Table 4 : Rank based quotient of the major problems identified in the village

Problems	Ranks				RBQ	VBI (lakhs)	RANK
	i	ii	iii	iv			
Zn-Fe deficient soil	12	11	6	1	78.33	21,149	I
Increasing soil salinity	6	8	9	7	60.83	14,781	III
Water logging in soil	10	8	8	4	69.99	18,897	II
Water scarcity during summer in sugarcane	2	7	11	10	50.82	6,352.5	IV

identified as the most important ones as per their perception were Zn-Fe deficient soil, Increasing soil salinity, water logging soil and water scarcity during summer in sugarcane. Then they were asked to rank them between one and four according to their severity. They were also enquired for extent of damage in terms of acreage of crops affected in the village by the respective problems. The average monetary loss for the village by each problem has also been taken from the farmers for each problem. Frequency of each rank was calculated for the entire four problems. Rank based quotient (RBQ) and value based index (VBI). The possible solution for three major problems is given in problem solution (Fig. 4-6).

The gradual increase in micronutrient deficient soils and water logging are major problem which can be overcome to a certain extent by use water judiciously, give alternative row of irrigation in sugarcane, use bulky organic matter, open the trenches around field for better drainage, soil testing based nutrient application, crop diversification, application of zinc sulphate/ferrous sulphate.Sugarcane-sugarcane and maize-maize cropping system was commonly practicing by majority of the growers in village which has led to heavy nutrient losses. Therefore, there is a wide scope for diversifying the cropping pattern and adopation of integrated farming systems which can improve the soil health and enhance the farmers' income and their living standards.

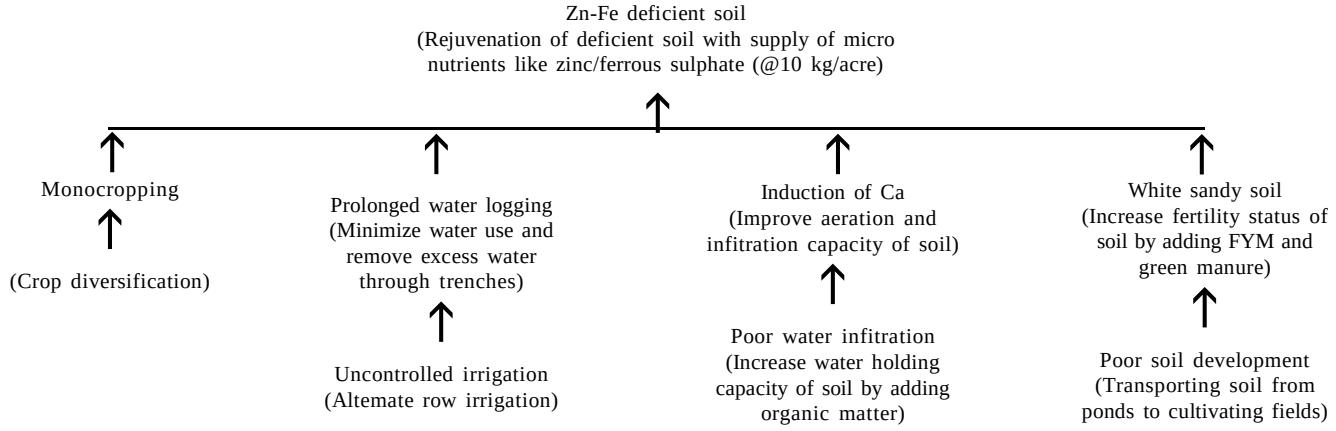

Fig. 4 : Problem-solution tree for Zn-Fe deficient soils

Fig. 5 : Problem-solution tree for water logging soil

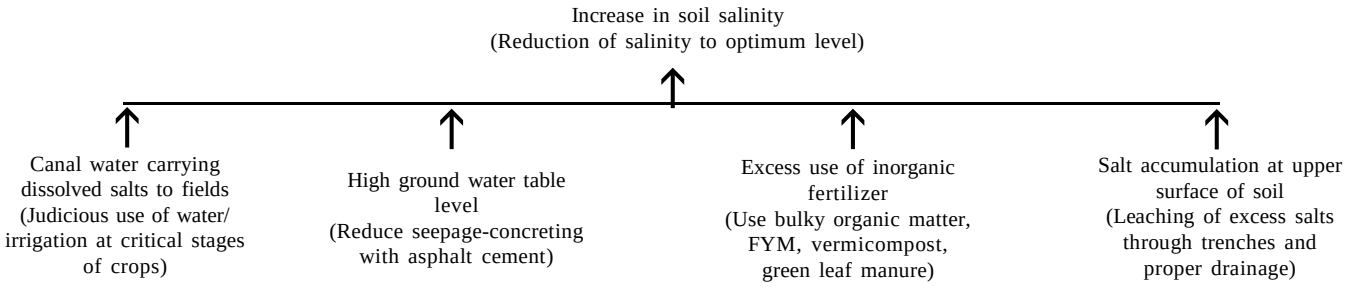

Fig. 6 : Problem-solution tree for increasing soil salinity

Conclusion :

The social scenario as evidenced through the rural appraisal techniques in this village calls for improvement in many sectors. Development needs to be done in many aspects, especially in providing amenities for common agricultural inputs supply market, health care, lavatory facilities, veterinary aids etc. There is no primary health centre in the village and people are not even aware about proper health care and sanitation. The lack of a veterinary dispensary is also a major drawback. Problems like infertility among cattle need to be addressed with due priority. This would certainly result in up liftment of the social status of the people as well as overall development of agriculture and rural livelihood as a whole. The researchable issues focused on the means to develop technology on micronutrient replacement, study the antioxidant system and polypeptide pattern during Zn-Fe deficiency in sugarcane, critical irrigation schedules, soil and water conservation plan both *in situ* and *ex situ* conservation practices in upland, trials on different cropping patterns/systems including sugarcane as main crop and short duration pulse and other vegetables so as to break the mono cropping of sugarcane and maize, evaluation of rate and time of application of Zn in sugarcane and maize crop, introduction and analysis of integrated poultry- fish culture in the fallow ponds, promotion of ornamental fish farming among the women SHG groups, find out the suitable integrated farming system in the Northern dry zone of Karnataka, integrated pest management for sugarcane, maize, Bengal gram and red gram. Moreover, suitable extension programs may be formulated and implemented with a problem solving approach considering the local resources and skill available within the farming community.

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