

RELATIONSHIP BETWEEN CROPS GROWN AND FIELD PATTERNS IN A PUNJAB VILLAGE

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ABSTRACT

The objective of the present research paper is to undertake a critical geographical analysis of relationship of crops grown with the field patterns in village Bath, situated in Bathinda district of Punjab in India. The study is based on primary data collected from different sources. The study reveals that the agricultural landscape of the village has transformed after the implementation of consolidation of landholdings, provision of canal irrigation and the subsequent adoption of Green Revolution technology. The cropping pattern has shifted from traditional low value subsistence types to economically more remunerative non-traditional commercial crops. Farmers today decide to allocate fields under different crops not in terms of their size, shape and distance from the settlement but in terms of price of crops, yield, maturity period and market demands. The double mono cropping patterns of kharif (summer) rice and rabi (winter) wheat introduced in recent decades has resulted in the use of water beyond its sustainability. Eco-friendly cropping patterns based on local agro-climatic conditions suitable for small sized fields and landholdings should be followed for sustainable agriculture and water resource management.

Keywords: *cropping pattern, field pattern, kharif, rabi, sustainable agriculture.*

I. INTRODUCTION

An agricultural field is the most important visible component of rural landscape in the structure of Rural Settlement Geography. In farming settlement people establish permanent relationship with land and create field patterns. Field pattern is the arrangement of parcels of land in terms of size, shape and distribution. The importance of the study of relationship of crops grown with the field patterns in the state of Punjab stems from the fact of its revolutionary changes in agriculture after the adoption of Green Revolution technology. Mukerji in his work *Field Pattern in a Telangana Village* concluded that 'field pattern as an element in the synthetic integrated picture of agricultural landscape is the concern of the cultural geographer who alone can observe and interpret fully the pattern of combination of fields with all its related elements like micro-topography, habitation complex, soil types, cropping patterns, tenure, land systems, methods of cultivation and technological and socio-economic organization of irrigation' [1]. Each crop has its own method of cultivation and eco-technological requirements. 'Consequently the field patterns under different crops tend to be different'[2]. Villages with same

field patterns may have different cropping patterns because of differences in topography, soils, climate and culture of the people. Manku in his book *The Gujar Settlements; A Study in Ethnic Geography* says that connection between the field and cropping pattern may be observed in the infield and outfield areas of the village [3]. The present author in his paper *Evolution of Field Pattern in a Punjab Village* concludes that the cropping pattern has shifted from traditional subsistence types to non-traditional commercial crops due to the adoption of Green Revolution technology [4]. The 2009 issue of *Survey of Advances in Research* in the book *Geography of India: Selected Themes* published by Indian Council of Social Science Research has highlighted the limited coverage of field patterns in India [5]. The limited coverage on field patterns in Settlement Geography has generated the need to carry out studies on distribution of field patterns, as characterized in different areas in different historical periods, and their interpretation in terms of physical, cultural and technological factors' [6]. The present study has been undertaken in this direction.

II.OBJECTIVE

The objective of the present research paper is to undertake a critical geographical analysis of relationship of crops grown with the field patterns in village Bath, situated in Bathinda district of Punjab in India.

III.METHODOLOGY

3.1 Sources of Data and Method of Study

The study is based on primary data obtained from village *Patwari* (village level government official) and Land Record Office of Bathinda district in Punjab. *Shajra Kishtawar* (village map showing field boundaries) of the sample village has supplied information on fields with their *khasra numbers* (identification numbers). The data on field-wise *fasal* (crop) grown in the study village obtained from *Khasra Gardavari* (book of crop harvest) is used for making *rabi (harri)* winter season and *kharif (saoni)* summer season cropping pattern maps.

3.2 The Study Village

The study village Bath is located in Bathinda district of Punjab in India and forms a part of flat upland plains of Punjab (Fig 1). The village was founded by *Jat Bath* caste in the beginning and at present also they are the principal land-owners. It covers an area of 684 acres (5471 *kanals*, 1 *kanal*=600 square yards). The soils are predominantly sandy in character. The village experiences extreme continental type of climate with cold winters and hot summers with little rainfall. Majority of people are engaged in agriculture as small and marginal farmers. Due to high percentage of owners average per-capita size of land-holding is 9.5 *kanals* (1 *kanal*=20 *merlas*, 1 *merla*=30 square yards) nearly one acre only in 2016. The agricultural system is subsistence cum commercial type. Wheat and paddy are the main commercial crops. Two main cropping seasons *Rabi/Harri* (winter) dominated by cultivation of wheat and *Kharif/Saoni* (summer) dominated by cultivation of paddy are prevalent. One transitional cropping season, *zaid* between *Rabi/Harri* (winter) and *Kharif/Saoni* (summer) also prevails in which hot season vegetables like cucumber and guard and fruit crops like water-melon and musk-melon are grown. Mechanised farming is prevalent after the adoption of Green Revolution technology.

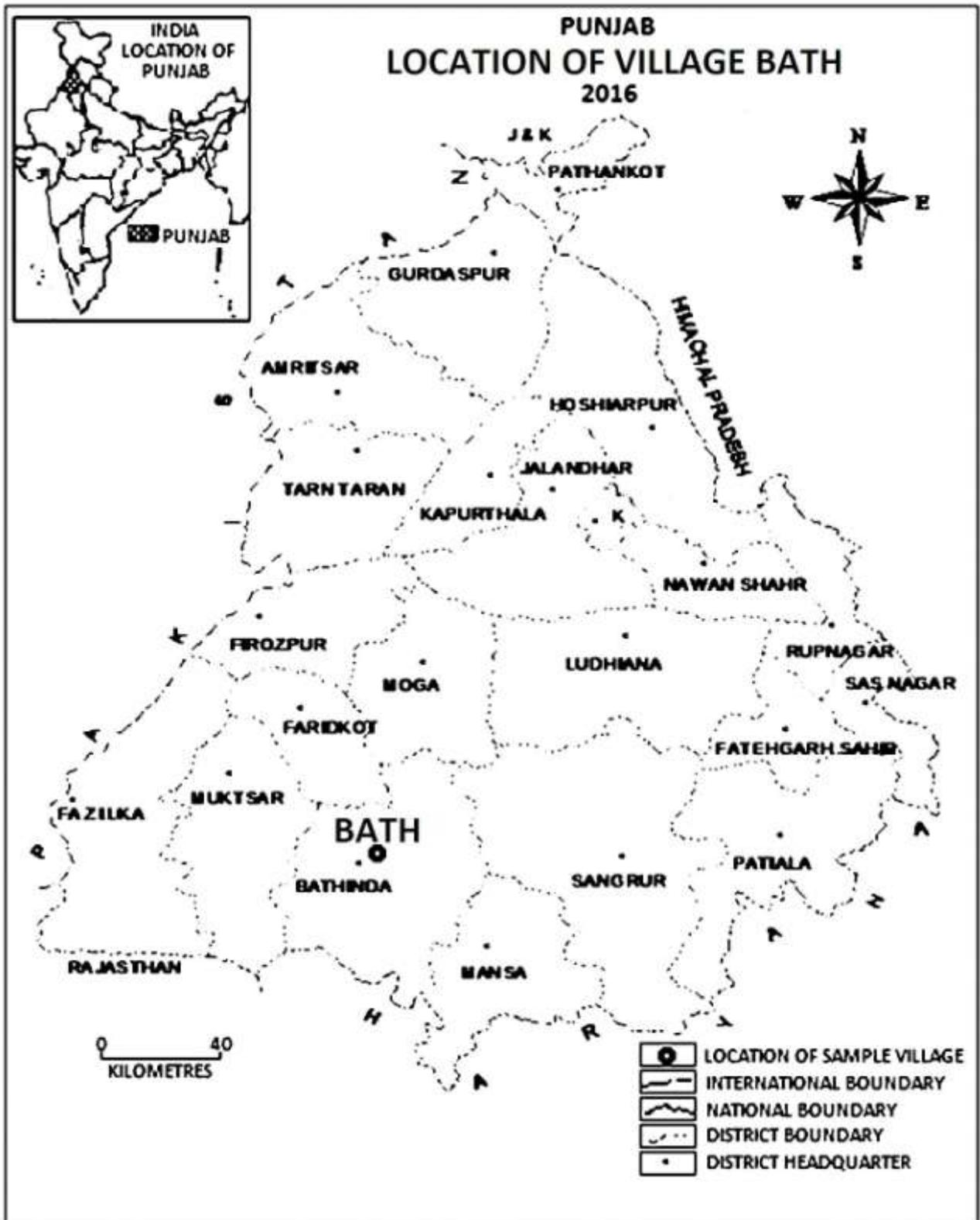


Fig. 1

IV. RESULTS AND DISCUSSION

A farmer grows several crops in his fields to meet his own needs and market demands. The pattern of his fields is related to the types of crops he raises in his fields.

4.1 Pre Green Revolution Crops Grown and Field Patterns

The traditional agricultural landscape of the village prior to the adoption of Green Revolution technology before 1960 was dominated by subsistence type of agriculture with wheat, *javi* (cereal), millets, cotton, *guar* (beans), grams and pulses as the major crops. Most of the fields were *ekfasali* (one crop grown in a year) and some fields were *dofasali* (two crops grown in a year). *Dofasali* fields were found more in the fertile patches near the *abadi-deh* (settlement) as infields (fields situated near settlement) where *roori* (animal waste) was used as manure to keep the soils fertile and proper care was given to the fields to increase the productivity of the soils. The infields which were primarily *dofasali* experienced greater degree of sub-divisions due to disintegration of joint families as each member of the family wanted to have an equal share in such fields because of their more economic value. With the increasing distance from the settlement, *ekfasali* fields increase both in their number as well as size. *Ekfasali* fields have low productivity as these were given less manures and attention by the farmers. Pulses were grown in these *ekfasali* infertile fields situated away from the settlement in the outfields (fields situated away from the settlement). The outfields largely *ekfasali* fields constituted an open field system with large size fields. Wheat and *javi* were grown as the main *Rabi/Harri* crops. Millets, *guar* and cotton were grown as main *Khari/Saoni* (summer) crops.

4.2 Post Green Revolution Crops Grown and Field Patterns

The adoption of Green Revolution technology in late 1960s provided a foundation to the present cropping and field patterns assisted by the process of consolidation and introduction of canal irrigation in the study village like many other villages of Punjab. The total regularity and uniformity to the shape and size of the fields was provided by the process of consolidation adopted in the village in 1960. *Khals* (small irrigation canals) were laid along the straight field boundaries to provide irrigation facilities to the fields from the Sirhind canal. The implementation of consolidation of landholdings and subsequent provision of canal irrigation transformed the agricultural landscape of the village. All the earlier small and inconveniently very large size fields were consolidated into one *killa* (8 *kanals*) rectangular block fields by the process of *chakbandi* (consolidation of landholdings). The cropping pattern has shifted from traditional subsistence types to non-traditional commercial crops. An analysis of existing cropping patterns in the study village reveals that cropping pattern has shifted from low value traditional crops to economically more remunerative crops. The fields are covered by wheat, *barseem* (fodder), *javi* (cereal), potato, vegetables and *sarson* (oilseed) in the *rabi/harri* season and paddy, *narma* (American high quality cotton), *chari* (fodder), and *guar* (beans) in the *khari/saoni* season (Fig 2, Fig 3 and Table).

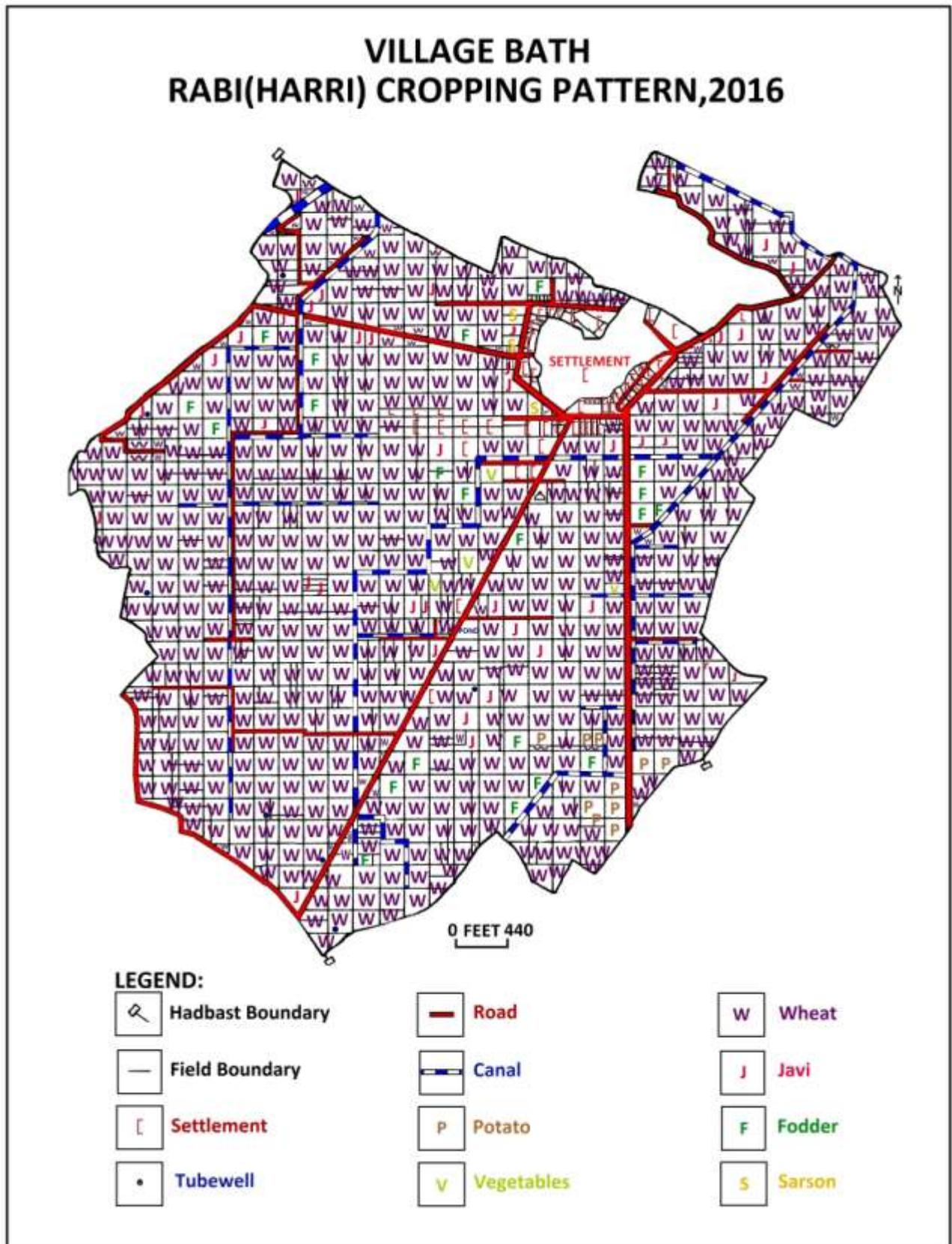
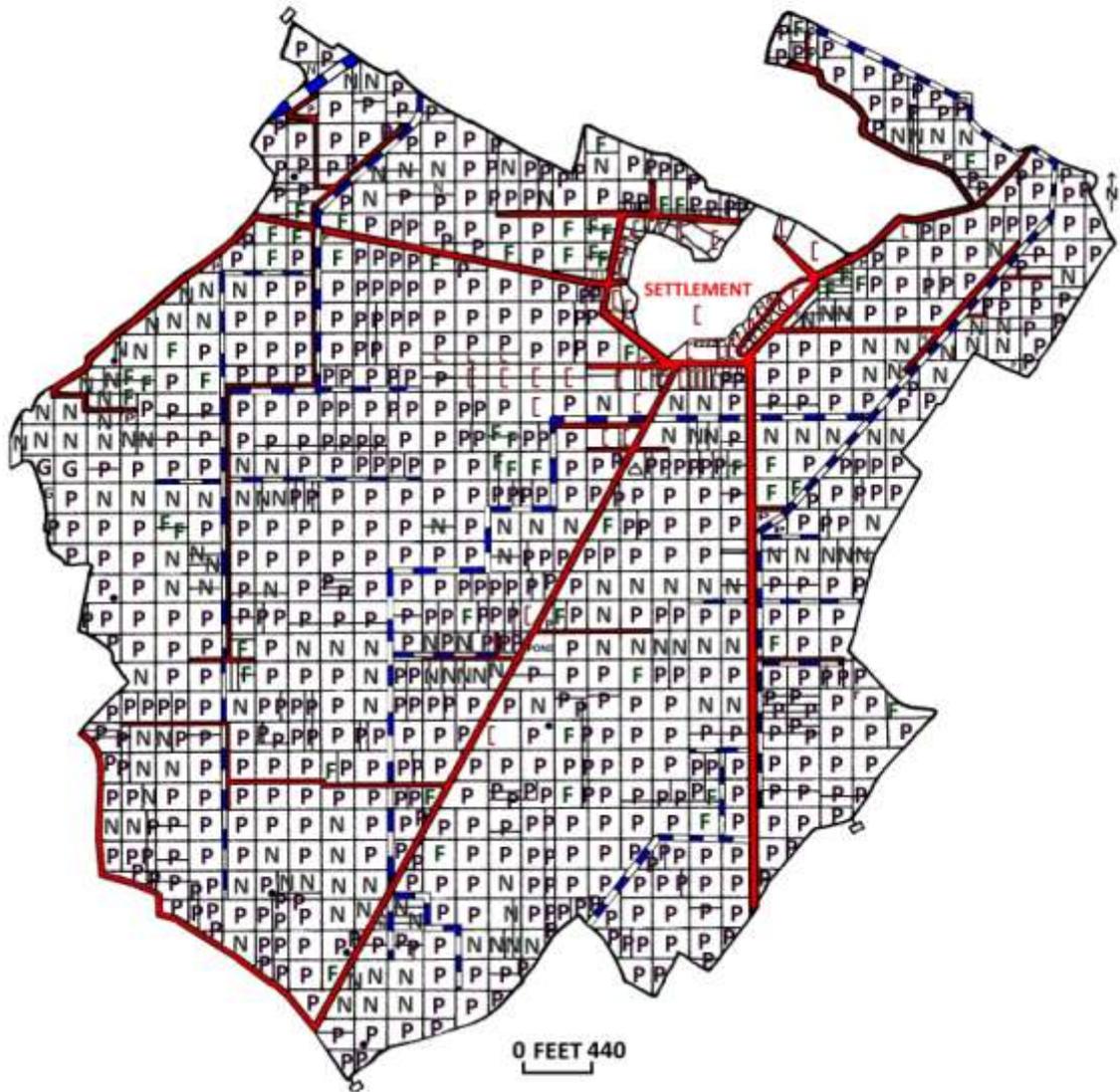


Fig. 2

VILLAGE BATH KHARIF(SAONI) CROPPING PATTERN, 2016



LEGEND:

	Hadbast Boundary		Road		Paddy
	Field Boundary		Canal		Narma
	Settlement		Cremation Ground		Fodder
	Tubewell		Guar		

Fig. 3

TABLE
VILLAGE BATH
RABI (HARRI) AND KHARIF (SAONI) CROPPING PATTERNS, 2016

RABI (HARRI) -2016			KHARIF (SAONI) -2016		
CROP	AREA (KANALS)	PERCENTAGE IN TOTAL CROPPED AREA	CROP	AREA (KANALS)	PERCENTAGE IN TOTAL CROPPED AREA
WHEAT	4544	92.81	MUNJI (PADDY)	3544	72.18
BARSEEM (FODDER)	144	2.94	NARMA (AMERICAN COTTON)	1016	20.70
JAVI(CEREAL)	136	2.78	CHARI (FODDER)	304	6.19
POTATO	40	0.82	GUAR(BEANS)	16	0.33
VEGETABLE	16	0.32	-	-	-
SARSON (OIL SEED)	16	0.32	-	-	-
TOTAL	4896	100.00	TOTAL	4910	100.00

SOURCE: KHASRA GARDAVARI OF VILLAGE BATH, 2016.

Wheat, paddy and *narma* (American high quality cotton) crops are grown at commercial level. Wheat covering 93 per cent of the total cultivated area and paddy covering 72 per cent of the total cultivated area are the dominant *rabi* and *kharif* crops respectively. Wheat and paddy are grown intensively because government provides MSP (Minimum Support Price) and guaranteed procurement by the government agencies on lucrative prices. These crops are grown both in small as well as large size fields. The rice grown fields are divided relatively in to smaller sections with the help of *watts* (embankments) for easy water storage within these fields as per the requirement of the crop. Paddy has replaced the traditional low water demanding crops like cotton, pulses and millets. Less number of fields is given to *Narma* (American high quality cotton) crop in recent years because this crop is highly vulnerable to diseases, attacks by the pests and has more input cost. *Guar* (beans) crop which was grown in abundance in dry areas of the village in the past has been replaced by paddy today due to introduction of irrigation facilities. *Javi* (cereal) crop is grown more by small farmers with small fields and landholdings. Area under *javi* (cereal) has also been replaced by wheat in recent years. *Sarson* (oilseed) crop is grown in small sized fields near the main settlement. Fodder is grown more in the fields situated near the main settlement and other smaller settlements to meet the daily requirements of cattle, as animals are kept in the settlements. A few small *kyaries* (cultivation units) are created near the tube-well for growing vegetables.

Vegetables growing fields are generally small in size and cover only a little area. The cropping pattern has shifted from traditional and subsistence types to non-traditional commercial crops due to the adoption of canal irrigation and Green Revolution technology dominated by market demands. On the whole the existing cropping pattern does not seem to have affected the field patterns to a large extent. Now, there exists no relationship between cropping pattern and infield (fields situated near settlement) and outfield (fields situated away from the settlement). Almost same crops are grown both near and away from the settlement. The intensive subsistence cum commercial farming is practised both near and away from the settlement. Most of the fields today are either *dofasali* or *teenfasali*. *Ekfasali* fields do not exist anywhere in the village territory. Farmers grow at least two or more crops in a year both in infields and outfields due to assured irrigation facilities. The *dofasali* (two crops in a year) and *teenfasali* (three crops in a year) fields are distributed everywhere in the village territory. The *teenfasali* fields are relatively larger than the *dofasali* (two crops in a year) fields because they occupy large landholdings. Early maturing high yielding variety seeds are used in the fields. After the harvesting of one crop, new crop is immediately grown without wasting time. Mechanised farming along with use of intensive irrigation, chemical fertilizers, insecticides and pesticides help the crops to grow early. Farmers today decide to allocate fields under different crops not in terms of their size or shape but in terms of price of crops, yield, maturity period and market demands.

V. CONCERNS AND CHALLENGES

Prior to the introduction of canal irrigation *barani kheti* (rain-fed agriculture) was common in the village with traditional crops like wheat, *javi*, gram, pulses and *guar* requiring less amount of water. Land types have improved to the maximum extent due to the adoption of canal irrigation in the study village after 1960. The latest field map of 2016 reveals that entire cultivated area and all the fields have been brought under irrigation in the form of *nahari* (canal irrigated) and *chahi* (tube-well irrigated) land type fields. Out of total 994 fields 961 fields (96.68 per cent) belong to *nahari* (canal irrigated) land type and remaining 33 fields (3.32 per cent) are *chahi* (tube-well irrigated). There is a complete transformation of land types and resultant cropping patterns due to the introduction of irrigation. Irrigation has provided the farmers, the most important input for increasing agricultural production. This type of irrigation revolution in the study village and in majority of the other villages in Punjab has provided enormous economic gains to the state of Punjab and the country in the form of increase in agricultural production leading to much needed food security. The double mono cropping of summer rice and winter wheat has resulted in the use of water beyond its sustainability. Excessive use of irrigation in the absence of effective drainage system can prove to be a serious environmental problem. Canal irrigation has not brought benefits to all the villages in Punjab. It has the potential to convert green fields into *seim* (water-logged) fields. The canal irrigated areas are usually flat and poorly drained. The continuous supply of canal water to such flat and poorly drained fields may result in water-logging over a period of time. Excessive use of canal water in many parts of south-west Punjab has lead to land degradation by water-logging and salinity. Due to the unplanned canal irrigation system, inadequate drainage system and over irrigation seepage, the problem of water-logging becomes an important issue in the different part of Punjab [7]. The level of underground water goes up due to water-logging caused by excessive use of canal irrigation. This water reaches up to the crop

roots and damages them. Crops productivity is declined. The land ultimately becomes unproductive. The productive cultivated land turns into a wet desert. Water-logging also affect roads, buildings and other structures. Traditional cropping patterns kept the agricultural landscape of the village free from adverse effects of over irrigation. The existing cropping pattern dominated by paddy cultivation has exposed the village to environmental threats. Paddy cultivation introduced in the study area should either be stopped or minimized. Seepage from the canals should be checked. Concrete water channels will not allow the water to seep and thus protect the fields from water-logging. Water supply to the fields through strong pipe lines instead of open drains will not only save water from wastage in the passage but it will also avoid water-logging and spare more land for cultivation. The balanced use of irrigation facilities should be promoted for sustainable water resource management. Another serious challenge is to keep the size of landholdings of appropriate size to sustain the present cropping patterns. Due to continuous sub-divisions, the fields and holdings have become small in size. The per-capita number of fields and size of landholdings is decreasing continuously. The per-capita number of fields has decreased from 3 in 1884 to only 1.89 in 2016. Per-capita size of landholding has declined from 49 *kanals* in 1884 to only 9.5 *kanals* in 2016. In some cases a single field now forms a complete landholding of a farmer. The number of land owners has increased from 108 in 1884 to 525 in 2016. The cultivated land has also shrunk due to encroachment by the fast expanding settlements both near and away from the main settlement in recent years due to rapidly increasing population. Eco-friendly remunerative cropping patterns based on local agro-climatic conditions suitable for small sized fields and landholdings with due weight age to vegetables, fruits, herbs, oilseeds, grams, pulses and spices crops should be followed for sustainable cropping patterns.

VI.CONCLUSION

The implementation of consolidation of land holdings, provision of canal irrigation and the subsequent adoption of Green Revolution technology has transformed the agricultural landscape and the resultant cropping patterns of the village. Presently there exists no remarkable relationship between crops grown and the field patterns. The cropping pattern has shifted from traditional low value subsistence types to economically more remunerative non-traditional commercial crops. Wheat and paddy are grown intensively because government provides MSP (Minimum Support Price) and guaranteed procurement on lucrative prices. This double mono cropping patterns of summer rice and winter wheat has resulted in the use of water beyond its sustainability. Per-capita size of landholding has also declined to unsustainable levels. Small family size and availability of more jobs outside farming sector can control the problem of uneconomic size of landholdings. Traditional eco-friendly diversified cropping patterns based on local agro-climatic conditions should be followed for sustainable agriculture.

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