

# Managing Natural Resources for Sustainable Agriculture: A Study of Village Rahurianwali of District Sri Muktsar Sahib

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## ABSTRACT

*The advent of Green Revolution in 1960s, led to commercialization of agriculture. The result was doubling and tripling of yields of wheat, rice and other crops. But the path to self-sufficiency in food grain production was achieved at the cost of natural resources. The soil and water resources in most parts of the world are facing problems of overexploitation and degradation, thus resulting in natural resource depletion and negative effects on human health and so need for sustainable agriculture was felt. Indian agriculture too is facing problems of natural resource degradation especially the most developed states like Punjab and Haryana which are called 'bread basket of the country'. The present paper makes micro level study of natural resources i.e. land, water and soils of village Rahurianwali, situated in Sri Muktsar Sahib district of Punjab. So, the objective of paper is to examine present situation of natural resources in this village. To achieve the said objectives, primary data was collected through questionnaire and then analyzed. The results of the study showed that the situation of village is grim. The natural resources are being used without much thought of sustaining them. There is need to use organic manures, bio pesticides and crop rotations to sustain the agriculture.*

**Keywords:** *Sustainable, agriculture, Natural resources*

## 1. INTRODUCTION

Agriculture is often said to be the beginning of an exploitative relation between man and nature (Prugh, 1995; Heilbroner, 1998; Gowdy, 1998). About four decades ago, farmers in most regions especially of developing countries practiced subsistence agriculture. Agricultural yields were modest, but stable. Production was safeguarded by growing more than one crop or variety in space and time in a field as insurance against pest outbreaks or severe weather. Inputs of nitrogen were gained by rotating major field crops with legumes. In turn, rotations suppressed insects, weeds and diseases by effectively breaking the life cycles of these pests. In these types of farming systems, the link between agriculture and ecology was quite strong and signs of environmental degradation were seldom evident (Altieri, 1995).

But the advent of Green Revolution in 1960s led to commercialization of agriculture. The result was doubling and tripling of yields of wheat, rice and other crops. High Yielding Variety seeds, irrigation and use of chemical fertilizers and pesticides form the core features of Green Revolution. But the path to self-sufficiency in food grain production was achieved at the cost of natural resources. The soil and water resources in most parts of the world are facing problems of overexploitation and degradation, thus resulting in natural resource depletion and negative effects on human health. Evidence has accumulated showing that whereas the present capital- and technology-intensive farming systems have been extremely productive and competitive; they also bring a variety of economic, environmental and social problems (Conway and Pretty, 1991). So, there is growing need and support for adopting sustainable agriculture.

In India, agriculture has always remained top priority of government and this is reflected in its Five-year plans. From First five-year plan onwards, government focus has been on growth of agriculture sector, self-sufficiency in food grains. The government policies have always emphasized food grain self-sufficiency, which has not necessarily coincided with agricultural sustainability.

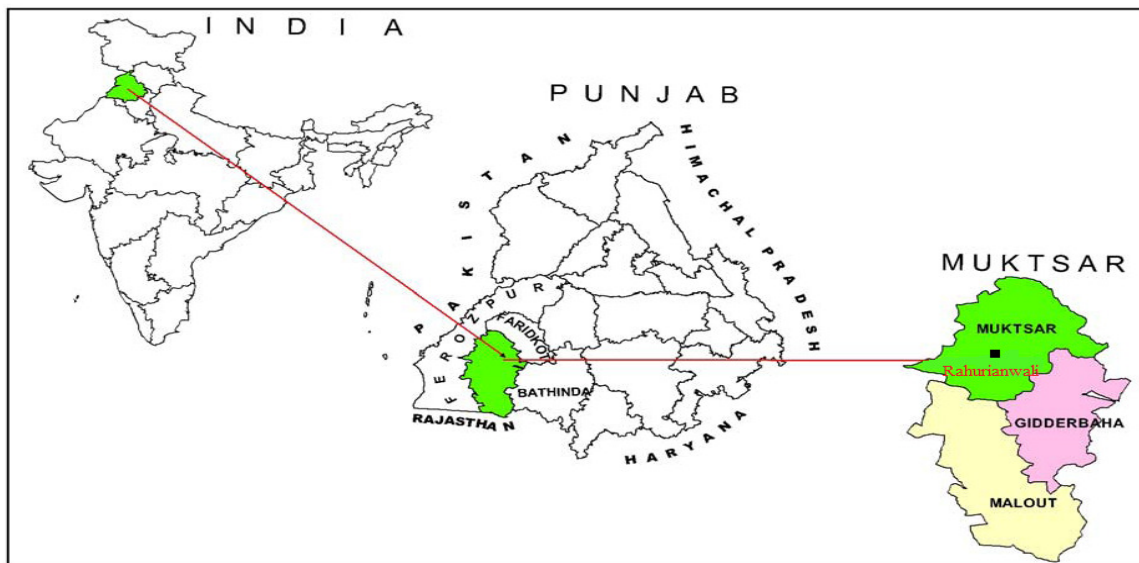
The state of Punjab made great strides in agriculture after the application of high payoff model. With only 1.5 percent of its geographical area, it produces 1% of rice, 2% of wheat and 2% of cotton of the world, leading all the states in per hectare yield of all these crops. Its per capita income (2006) at Rs 28, 605 is way above the national average of just Rs 6, 929. But over time, growth and production of crops has stagnated. Green revolution has brought serious ecological problems along with it. Farmers are increasingly complaining of depleting fertility of soils, soil salinity and alkalinity, waterlogging, problems of wheat and rice/cotton crop cycle, over mechanization, excess use of chemical fertilizers and pesticides. According to a research done by Punjab Agricultural University in 2007, Punjab's 97% of cultivable land is under plough indicating no further expansion of the cultivable land. The state has already lost 5.1m tons of nitrogen, 2.5m tons of phosphorous and 4.7mn tons of potassium, each one of these being very crucial for the crops to grow and provide nutritional value. On top of it, the water level in Punjab has been falling by 50 to 70 cm every year which is another matter of concern. Punjab consumes highest amount of fertilizers in the country, amounting to almost 17% of the national consumption. In such a situation, the management of natural resources is must.

### ***1.1 Study Area***

Sri Muktsar Sahib district lies in south western part of Punjab. Its geographical area is 2630sq.km. It is bounded by the state boundaries of Rajasthan and Haryana in the south, by the of Faridkot district in the north, Ferozpur in the west and by Bathinda in the east. There are 234 villages

constituting three tehsils (Muktsar, Malout and Gidderbaha) and four blocks (Muktsar, Malout, Lambi and Kot Bhai at Gidderbaha).

**Figure 1. Map of the study Area**



*Source: Article of Bhatt, Singh and Sharma*

Physiographically, the land is level with a very gentle slope in NE-SW direction. Sandy plains, sand dunes and topographic depressions are the common landforms. The general relief of the area varies between 185m to 219m above sea level. The area is intensively cultivated (except for high dunes) and is mostly irrigated. Wheat and cotton are the main crops in Rabi and Kharif season. However, the area under paddy is increasingly being replaced by cotton crop. The area is mainly irrigated through the Sirhind and Rajasthan Feeder canals and their distributaries.

Muktsar city is situated in the north of the district. The city lies between latitudes  $29^{\circ} 54' 15.95''$  and  $30^{\circ} 40' 9.57''$  N  $30.4395447$  and longitudes  $74^{\circ} 14' 56.00''$  and  $74^{\circ} 49' 22.34''$  E. Village Rahurianwali is located to the south of Muktsar city at a distance of 6 kilometers on Abhor Road. Its latitudinal extend is  $30^{\circ}43'N$  and longitudes is  $74^{\circ}47'E$ . The total area of village is 800 hectares out of which 60 hectares are under settlement and remaining 740 hectares under cultivation.

Sri Muktsar Sahib district holds major place in cotton and wheat production in Punjab. It has been high lightened in different reports, literature, government policies and has attracted interest of different experts like scientists, researchers etc due to many problems concerning agriculture. The

district is suffering from water-logging, salinity, poor quality ground water, injudicious use of various inputs and faulty management of orchards. Village Rahurianwai is no exception to these problems. So, to understand the whole situation of natural resources at micro level, the study has been undertaken.

### **1.2 Objectives**

The main objectives of the study are to (1) study cropping cycle followed by farmers (2) access condition of soil and water resources (3) examine the agricultural practices being followed by farmers (4) examine use of insecticides and pesticides by farmers (5) analyze government programmes for land and water management

### **1.3 Methodology**

The present study is based on primary data collected through questionnaire from farmers of the village. The samples represent different farm size categories owned by farmers in different places. In other words, sample farms are not clustered at one place rather are fairly distributed. The study has been conducted by selecting crop cycle and crop yield as parameters for land, salinity and waterlogging for soil and groundwater quality and water table for water resources. Along with this, data on amount of pesticides and fertilizers used in the village has also been collected, so as to see whether these inputs used are in excess or according to those suggested by PAU.

## **2. 2. NATURAL RESOURCES OF VILLAGE RAHURIANWALI**

The paper evaluates the situation of the three natural resources i.e. land, water and soil of the village in order to understand whether the resources are being managed sustainably or not.

### **2.1 Land**

Of the total area of village, 82% is under cultivation. The crop cycle includes basically major cash crops i.e. rice and wheat or cotton and wheat. Orchards of guava and kinnow fruits are also found in the village. The orchards are grown by farmers who have more than ten hectares of land.

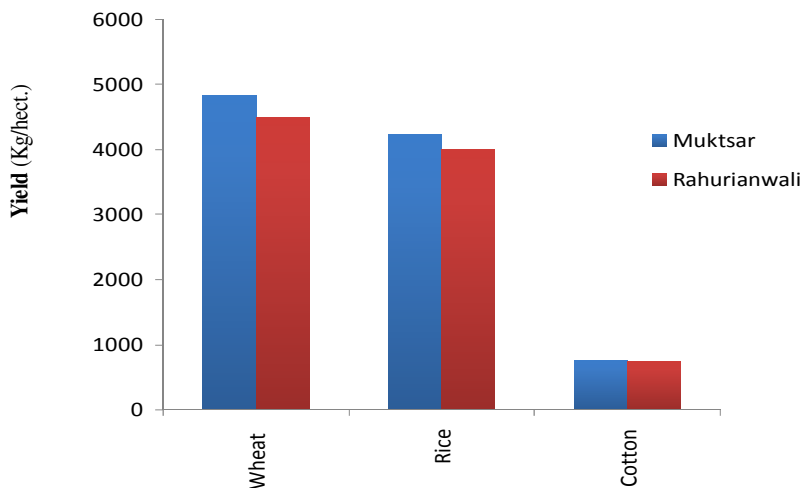
**Table1 Cropping Pattern of Village Rahurianwali**

Area (hectares)	Main Crops	Other crops	Orchards
less than 2	Wheat, Rice	No	No
2-6	Wheat, Cotton	fodder crop	No
6-10	Wheat, Cotton	No	No
10-14	Wheat, Cotton	No	Guava
14-18	Wheat, Cotton, Rice	fodder crops	Guava, kinnow

Source: Primary Data

The seeds used by farmers are Bt cotton and hybrid for rice and wheat. The wheat seeds used are PBW 343, PBW 373, PB 552, PB 711, cotton seeds are Bt 7041, Bt 6025, Bt 34 Rashi and rice 1121 baspati. The local seeds are used no more as their yield is low. As against Bt cotton whose yield is around 1200 kg, the local seeds have yield of about only 750kg. The yields of wheat, cotton and rice crops of the village are almost at par with that of the district.

Figure2. Yields of Main C rops in Muktsar and Rahurianwali (2013)



Fertilizers produce nutrients to soil while pesticides help fight against harmful insects and worms. The fertilizers used in village are mainly DAP, urea, sulphur and zinc. In a single crop season, about 200-225 kg of chemical fertilizers is used. Animal manure is also being used by some farmers, which is 84-112 quintal per acre. PAU recommendations after soil testing of village are 100kg usage of urea while farmers are using 150kg and above.

The pesticides used for wheat are Roger, Monochlorophas, Sopper10, Confidor, for cotton Monochlorophas, Tracer, Confidor and for rice Monochlorophas. The usage of different pesticides depends on concentration of salt contents. So, some pesticides are used in very small quantities. Punjab consumes 17 percent of pesticides in India i.e. 923g/ha. In village Rahurianwali average of 910g/ha.

## 2.2 Soils

The soils found in the village are sierozem and sandy soils. The sierozem is light yellow pale brown in colour. These soils are calcareous. These are deficit in Nitrogen, Phosphorus and medium in Potassium. The soils are fertile but they suffer from problems of kallar and salinity. The problem

of water logging was faced by this village for 10 yrs between 1991 and 2001 but now this problem is not so severe. Only during heavy rains, the problem of waterlogging surfaces.

### **2.3 Water**

Water is an important input for good agriculture production. Good quality water produces high yields. The sources of water in village are canal, tube wells and Chander Bhan Drain. The village being situated on the tail end of canal has shortage of water. So, farmers try to fulfill the need through tube wells and drain water.

The quality of tube well water is below average. The ground water is alkaline in nature and is moderate to highly saline. The depth of water is 90-110 ft. Continuous tapping of water has led to fall in water table and in last few years it has fallen 2-3ft. The drain contains industrial waste water, water drained from waterlogged areas which the farmers are forced to use due to shortage of canal water. The water quality of this drain is poor and is not very good for crops.

### **3. FINDINGS AND CONCLUSION**

The paper evaluates the natural resource situation of village Rahurianwali. The findings of the study are that no other crop cycle is being followed other than rice/cotton- wheat to sustain soil. No land is being left fallow and no agroforestry practices are being undertaken by farmers. The mono crop cycle practice has resulted in depletion of organic content and plant nutrients in soil. The farms where canal water is available grow rice while farms which have less canal water availability grow cotton. The small farmers having less than 2 hectares land grow rice and not cotton because the cost of production of cotton is higher than rice. The comparison of yields of different varieties like hybrid, Bt and local seeds shows that local seeds have low yields than those of the former and cannot survive without heavy dose of pesticides. As such local seeds are being replaced by HYV seeds. This shows that natural flora diversity is getting destroyed. Orchards are grown by farmers having land above 14 hectares because they have resources and can bear cost of market fluctuations in the fruit.

The soils are deficit in all the basic nutrients NPK, so input of fertilizers and manures provide necessary nutrients to soil but farmers are using excess chemical inputs and less of green manure. Kallar is found in soils and to overcome it canal water, gypsum and sulphur are used. Salinity of soil is result of two factors- water-logging and excess usage of chemicals. Since water-logging problem is faced only during heavy rains, it shows village is using excess fertilizers. The quality of soil is getting depleted due to this mono- cultivation rotation as both these crops require heavy water requirements.

Underground water available is not of good quality. The fall in water table shows un-sustained usage of water. Due to shortage of canal water, farmers are continuously tapping underground water without due consideration to natural recharge.

Usage of pesticides and fertilizers is also excess as against suggested by PAU experts to farmers. There is no usage of bio- pesticides, mulch or crop rotation etc. Partial factor productivity of NPK in Punjab has dropped from 80.9 in 1966-1967 to 16.0 in 2003-2004. This shows that farmers have to applying higher doses of major nutrients like nitrogen for sustaining adequate production levels.

The Government has taken some steps to manage natural resources sustainably like 1) ban on burning of wheat and rice stubble. This will help preserve soil organisms in the soils.2) Soil and water testing availability for farmers will help in soil and water management.3) Pipelines for supplying water to fields which are away from canal are being made available to farmers at subsidy. This will also help in reducing water loss through friction and seepage. 4)Krishi Vigyan Kendras have been set up each district to provide every possible helps to farmers. They have set up SMS service which provides information on correct sowing time, how to irrigate fields, when to apply pesticides and what amount etc to its member farmers. But these are not enough. The government will have to make more efforts to make farmers conscious of ill-effects of intensive agriculture and benefits of sustainable agriculture.

The study indicates that the situation of village in relation to natural resource management is grim. The natural resources are being used without much thought of sustaining them. The farmers are following conventional or intensive farming. Their focus is increased production. The soils are degrading; water level is falling, no crop rotation other than cotton/rice and wheat and no legumes being grown to provide nutrients to soil naturally. The local seeds have low yields and cannot survive without excess pesticides. The usage of pesticides and fertilizers has not decreased but is increasing. This shows that our agriculture has not yet made much effort towards adopting sustainable agriculture and road ahead looks very far.

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