

Executive Summary

“Mapping of S&T needs – inventorization and documentation of location specific problems requiring Scientific/Technical interventions in Punjab”.

In Punjab, the dominance of science became evident only after independence, where, due to it, profound changes occurred in the method & technique of cultivation. This led to the increase of food grains but the variety of crops dwindled considerably. The green revolution began quickly changing the village life through mechanized farming and by replacing the traditional methods. As stimulation to good crop, there was unrestrained use of toxic compounds and chemical fertilizers, for maintaining the non-resistant hybrid crop breeds. The new situation with respect to agriculture was critical from ecological point of view as well. It reduced drastically crop biodiversity and biodiversity in general; it began adding to global warming and depleting ozone through harvesting and post harvesting practices; it poisoned the surroundings through overuse of insecticides, it starved the soil of natural nutrients; it reduced the green cover around the villages and it reclaimed wetlands for cultivation. In spite of apparent signs of development in terms of supply of power and laying of roads, the filth still clung to the streets and houses remained dingy and shabby without appropriate disposal of household garbage. No one made serious efforts to tap the available resources and no one really sought anything else from the villages excepting rice & wheat. It is precisely on this account that ponds dried up, water table went down, trees became uprooted and filth and garbage of all kinds accumulated in and around the villages. And in the areas where canal earthwork was porous or soil was oozy, water logging rendered the cultivation non-productive. Indeed, what a development? It only amounted to series of revolutions passing under the titles of green, white and blue and couple of wealthy cultivators emerging out of the ruins of dwindling biodiversity, disrupted environment, mismanaged resources and filthy dwellings.

Development in Punjab is failing because of the total break with the past in terms of agricultural methods, choice of crops, care for nature and surroundings, the ethics, the social relationship and reverence for all life. The cultivators are being disarmed because of over use of fields, non-availability of skilled mechanics and in the choice of crops. Those crops are being sown, which had no business to be in Punjab. These are a total drag on natural resources, besides infusing infirmities in agricultural methods.

The solution to the problems concerning Punjab can be suggested through S &T interventions, but in the first instance, these problems could be documented through pictorial, graphical and descriptive depiction. This was precisely the objective of the project titled **“Mapping of S&T needs – inventorization and documentation of location specific problems requiring Scientific/Technical interventions in Punjab”.**

To fulfill the above objectives, the following core sectors were identified by the project advisory committee in consultation with DST, GOI for the state of Punjab:

Agriculture, Horticulture, Aquaculture, Animal Husbandry, Irrigation, Health & Hygiene, Drinking Water, Natural Disasters/Hazards, Natural Resources, Environment and Ecology, Transportation, and Industry and Pollution.

The sources for the secondary data from which information was collected are:

Statistical Abstract of Punjab, District Census Handbook, Primary Census Abstract, Punjab Remote Sensing Centre, Soil and Water Conservation, Punjab, Punjab Pollution Control Board, Punjab State Council for Science & Technology, Centre for Research in Rural & Industrial Development, Universities, Institutions, Libraries and N.G.O's & Other Sources (Publication, Journals, News Papers etc)

Suitable questionnaires were designed under the project to include the problem description, severity of problem (severe, moderate, least), current status and the need for S&T Interventions. For spatial representation of the problem (map format), digital database has been created for state boundary, district boundary and block boundary in a GIS environment. For preparation of base map, data has been collected from SOI, Revenue Department and Block Development offices. Further, linking of spatial and non-spatial database in a GIS environment has been attempted in a GIS environment and suggestions have been given for S & T interventions in the areas having severe problems.

The major location specific problems identified in Punjab at block levels under the project are:

1. Agriculture-

Land degradation

- a) Waterlogging: The severely affected blocks are: Jalalabad & Guru Har Sahai (Ferozepur district); Mukatsar, Malout, Kot Bhai & Lambi (Muktsar district); Dasuya, Hazipur, Talwara & Bhunga (Hoshairpur district); Anandpur sahib (Rupnagar district).
- b) Salinization of the Ground water: Affected blocks: Mansa Bhikki, Jhunir, Sardulgarh and Budlada (Mansa district); Bathinda, Nathana, Talwandi Sabo, Phul, Rampura, & Maur (Bathinda district); Moga I, Moga II, Bagha Purana (Moga district), Faridkot & Kotkapura (Faridkot district); Muktsar, Malout, Kot Bhai & Lambi (Muktsar district); Abohar, Guru Har Sahai, Khuyan Sarwar, Jallalabad, & Fazilka (Ferozepur district).
- c) Brackish Water: Jhunir, Bathinda, Nathana, Talwandi Sabo, Phul Rampur, Faridkot, Nadala, Patti, Khara Majha and Bhikkiwind blocks.
- d) Desertification and water scarcity was more severe in the central portion of the Punjab.
- e) Depletion of water level: Due to wheat paddy rotation the ground water resources of the Punjab are depleting at an alarming rate of 21cms per year.

- f) Micronutrient deficiency: Deficiency of more than three micronutrient is found in the areas of Patiala, Ludhiana, Amritsar & Muktsar districts
- g) Soil toxicity: Problem of soil toxicity is high in the areas of Garhshankar & Mahilpur of Hoshiarpur district, Saroya, Nawanshehar and Balachaur blocks of Nawanshehar district
- h) Other problems: Biomass reduction, Stagnating productivity, Decrease in the growth of cropping intensity, Rise in cost of production, Shifts in employment patterns, Social Impacts, Dwindling ground water resources, Deteriorating fertility of soil

2. Horticulture

Problems in production technology & Post harvest Management in the fruits of Citrus, Guava & Grapes are as follows:

- ❖ Non-availability of good quality of plant material
- ❖ Monoculture of single fruits
- ❖ Poor quality such as High seed number
- ❖ Pre harvest of fruit drops
- ❖ Late fruit maturity
- ❖ Rapid decline in area
- ❖ Lack of processing industry
- ❖ Saline soils and poor quality of ground water

Blocks under reference are: Abohar, Bathinda, Hoshiarpur, Muktsar, Mansa, Nawanshahar, Hoshiarpur, Ferozepur, Sangrur and Faridkot.

3. Aquaculture

Problems regarding fish & fisheries

- ❖ Salt affected & water logged areas,
- ❖ Flood land
- ❖ Culture based capture fisheries: Under utilization of natural resources
- ❖ Declining water table
- ❖ Lack of culture for high value fish species
- ❖ Lack of Marketing facilities

4. Animal Husbandry

Problems faced by dairy farms

- ❖ FMD and HS diseases are playing havoc with the animals and farmers are suffering a lot.
- ❖ Animals suffer mineral deficiency in whole of Punjab.
- ❖ Selenium toxicity is prevalent in Nawanshahar area and is on the increase in other parts of Punjab.
- ❖ The Kandi area is poor in cereals, grains and fodder due to which the milch animals depict various deficiency diseases which ultimately affect the production of milk.

Blocks severely affected by the problem are Hoshiarpur, Ropar, Nawanshahar and Fatehgarh Sahib.

5. Irrigation

- a) Water logging and salinity

- b) Depletion in water level
 - c) Degradation in ground water quality
 - d) Point Source Pollution in Canals and Rivers
- Affected area: Whole of Punjab

6. Health & Hygiene

- ❖ Areas of Bathinda, Rampura Phool & Gidderbaha are affected by heavy dose of pesticides and insecticides which may be the causative factor for reported cases of Cancer in these areas
- ❖ Impact of on pesticides on vegetables in Dera Baba Nanak block
- ❖ Jaundice cases in Pathankot Block.
- ❖ Health related problems with Mechanical Harvesting problem are more severe with stone crushers
- ❖ Health related problems due to unsafe drinking water in Kharar, Mohali, Morinda, Ropar, Chamkaur Sahib and Kurali Blocks of Rupnagar district.
- ❖ Genetic disorders reported in Jhanjeri & Kajauli villages of Ropar district

7. Drinking water

High Level of contaminants (Calcium , Magnesium & Iron) found in drinking water at Mandi Gobindgarh and in areas of cities like Ludhiana, Jalandhar, Amritsar, Batala etc where large number of Industries such as Metallurgical, Steel Rolling, Induction, Furnace and Arc Furnace, which generate waste water that contain contaminants like Calcium, Magnesium and Iron. This water discharges into the sewer and is ultimately disposed off into surface water bodies.

8. Natural Disasters/ Hazards

Floods: In Punjab 4 million ha of the state area is affected by floods. It accounts for 10% of the flood affected area of the country. Most of the flood affected areas are along the four main rivers- Satluj, Beas, Ravi and Ghaggar. **21 Villages in Pathankot sub-division are declared as flood prone areas** (Ghumri, Kiri Khurd, Mairan Kalan, Katani, Kathlour, Repar, Chandigarh, Chhorian, Pamma, Nashial, Kajlo, Shahpur, Makhanpur, Khudaipur, Jaidpur, Tash, Samrala, Khozki Chak, Simbal & Sakol) Khanouri & surrounding villages are severely affected by the catchment's area of Markanda & Tangri tributaries of Ghaggar River.

9 . Natural Resources

- a) **Forest degradation:** Forest area in Punjab are under serious threat due to a number of factors such as unrestricted felling and over grazing, poor enforcement of the forest act leading to deterioration of forest in Punjab, large displacement of population and its re-settlement during partition, improvement in irrigation facilities and high cropping intensity resulted in the decline of forest area in Punjab. The worst affected districts in terms of forest depletion rate are Ferozepur (11 %) Amritsar (10.6 %), Hoshiarpur (84 %), Bathinda (76 %), Gurdaspur (21%) and Ludhiana (55 %).
- b) **Soil Erosion:** About 10 % of the state's soils face the problem of water erosion. Gurdaspur (Dhar kalan & Pathankot) Hoshiarpur (Mukarian,

Dasua & Garhshankar) Nawanshar (Balachaur) Ropar (Kharar Anandpur Sahib & Ropar).

- c) **Biodiversity & wildlife:** - some of the wild life sanctuaries under threat are: Abohar wild life sanctuary, Harike WLS, Ferozepur, Bir Aishwan WLS Sangrur, Bir Bhadson WLS, Patiala, Bir Bunerheri WLS Patiala, Bir Dosanjh WLS Patiala, Bir Gurdialpura WLS, Patiala, Bir Moti Bagh WLS Patiala, Takhani Rehmapur WLS Hoshairpur & Jhajjar Bacholi Protected area Ropar.
- d) **Threatened Species of major wetlands of Punjab:** Rare Duck at Harike wetland, Burrowing frog, Bar headed geese, Aquatic bug, lapwing, small egret, purple moorhen, Grey heron, Vultures, Yellow wagtail, red crested pochard.
- e) **Endangered species of Shiwaliks:**
 - a) Endangered Reptiles are Python, Yellow monitor, Monitor Lizard and Indian desert monitor.
 - b) Endangered Birds are Chakkor, Spotted Munia, Brahamani Duck, Darter, Magpie Robin, Rufous Shrike, Himalayan Golden eagle, Indian Peafowl, Lapwing Horned Owl, Shahin Falcon, Painted Stork
 - c) Endangered Mammals are Indian wild dog, Indian fox, Indian Otter, Jungle cat, Leopard cat, Leopard, Red Fox, Striped Hyena, Indian Pangolin and wolf.
- f) **Selenium Concentration:** High Level of Selenium (Se) reported in 8 villages of namely Panama, Nazarpur, Simbli, Barwa, Jampur, Menhdupr, Rakkara, Dhamai & Bhano Majra with an area of 1150 acres are suffering from this problem in Hoshiarpur, Ropar & Nawanshahar districts.
- e) **Alkalinity & Salinity in Soils**

In Punjab about 0.688 million ha of good agricultural land is affected by salinity and alkalinity. Problem of Soidicity & Salinity is especially severe in non-kandi areas of Punjab (Gurdaspur, Hoshiarpur, Ropar, Patiala, Jalandhar, Kapurthala, Ludhiana, Fatehgarh Sahib and some parts of Sangrur and Amritsar Districts.

10. Environment & Ecology

- a) *Air Pollution*
- b) *Water Pollution*
- c) *Loss of Biodiversity*

Air Pollution: - The ambient air quality in industrial zones and major cities of Punjab (Ludhiana, Amritsar, Jalandhar, Mandi Gobinndgarh, Patiala and Bathinda) has higher than permissible limit. Sulphur di-oxide and nitrogen are usually within limits. Vehicles and industries are major contributor to urban air pollution. Fly ash generated from thermal power plant also posses a major air and land pollution problem. Coal based industries also contribute to air pollution. Use of rice husk, a major source of agro based fuel for industry has been responsible for increase in suspended particulate matter in the atmosphere. In rural area burning of stubble in the field after harvesting, fertilizers & insecticides spraying, threshing

operation, use of wood and coal as household fuel and large scale use of tractors harvester, combines and diesels operated tube well are major factor contributing to air pollution.

Water Pollution:-

Location of Major Water Polluting Industries in Punjab: Point Source of Toxic Pollutants in Punjab Rivers:

Beas River	Satluj River	Ghaggar River
1. M/s Mukerian Paper Mills, Mukerian 2. Goindwal Industrial complex, Goindwal	1.NFL Naya Nangal 2.PNFC Naya Nangal 3.Punjab Alkalies, Naya Nangal 4.Ropar Thermal Plant, Ropar 5.DCM, Asron 6.M/s Swaraj Mazda Asron 7.M/s United Pulp and Paper mills, Asron.	1. M/s ABC Ltd., Rajpura 2. Hindustan Lever, Rajpura. 3. M/s Stepan Chemicals, Rajpura 4. Focal Point, Rajpura 5. M/s RMI (P) Ltd., Rajpura 6. M/s Bharat Commerce India Ltd., Rajpura 7. M/s Patiala Distillers (P) Ltd. 8. M/s Escorts (P) Ltd., Bahadurgarh 9. M/s Goetze India Ltd., Bahadurgarh 10. M/s Hindustan Wire Products, Patiala

c) Major Threats to Harike, Kanjli, & Ropar wetlands are from Siltation, Grazing in the surrounding Hills, Pollution, Weeds and Deforestation.

The location wise problems in core sectors of Agriculture, Water and Health could be summarized as under:

Agriculture:

Water Logging	Ferozepur, Muktsar, Hoshiarpur, Ropar
Salinity & Alkalinity	Mansa, Moga, Bathinda, Faridkot, Muktsar and Ferozepur
Sandy Soils	Bathinda
Gullied/Ravenous land	Amritsar and Gurdaspur
Flooding	Ferozepur, Ludhiana, Patiala, Mansa and Sangrur
Soil Toxicity : Selenium in fodder crop	Hoshiarpur and Nawanshahar
Overuse of insecticides/Pesticides	All districts

Health:

Cancer cases	Bathinda and Muktsar
Pre-Mature Ageing	Malwa Belt
Jaundice	Gurdaspur (Pathankot area)
Skin diseases due to Selenium toxicity	Hoshiarpur and Nawanshahar
Others such as Dengue, Cholera, gastroenteritis, TB, Viral diseases, Malaria	All districts

Water:

Depleting Ground Water Resources	Hoshiarpur, Moga, Kapurthala and Sangrur
Brackish Water	Ferozepur, Faridkot, Muktsar, Bathinda and Mansa
Point & Non-Point Source Pollution in River and Drains	Along the main water bodies like Satluj, Beas and Ghagar rivers and drains such as Budha Nallah
Industrial pollution in Ground Water	Ludhiana, Jalandhar, Sangrur and Ropar
Selenium in ground water	Hoshiarpur and Nawanshahar

Based on the above problems, it is suggested that detailed investigations may be undertaken to study the following acute problems:

- Study of health related problems due to soil toxicity in Bathinda, Malout, Rampura, Gidderbaha and Nathana blocks.
- Study of water logging in Muktsar, Malout, Lambi and Kot bhai blocks of Muktsar district
- Study of selenium toxicity in Garhshankar, Saroya, Balachaur, Mahilpur and Nawanshahar blocks
- Study of ground water quality in industrial cities (Ludhiana, Khanna, Madi Gobindgarh, Amritsar etc.) of Punjab
- Study of problems of solid waste in industrial cities of Punjab.