

Alternate land use plan

for integrated development of village using land resource inventory datasets: A case study of a village in Gujarat

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In a village, Taluka, or district no lands are equally suitable for profitable agricultural purpose. Land is used for multifarious activities like agriculture, forestry, pasture growing, recreation, industrialization, urbanization, mining, etc. The production potential of an area depends on the quality of land resources and agro-climatic conditions of the region. Evaluation of land for its suitability for various uses is a prime requisite for preparation of plan land use of an area. For suggesting alternate land use plan of the village Pata Meghpar, Jamnagar district, Gujarat was carried out a detailed soil survey to characterize land resources. Land use plan was developed by integrating the information of landforms, soil, land use/land cover, slope, land capability and land suitability maps in a GIS environment.

Keywords: Integrated village development, Land use planning, Natural resources

THE Low level of agricultural productivity coupled with inadequate farm and non-farm diversification, low level of technological change and lack of infrastructural facilities of irrigation, roads, market, etc., act as major constraints for rural development in general. High rate of soil erosion, land degradation and groundwater depletion in many regions of Gujarat due to indiscriminate use of land, water and other natural resources have posed additional threat to ecological balance and sustainability of livelihood system of the people. Therefore, any planning for land use should attempt to solve the general problems of the poorly developed regions and arrest area specific non-sustainable use of natural resources. In a village, Taluka, or district no lands are equally suitable for profitable for agricultural purpose. Part of land may support intensive agriculture and rest may sustain under pasture or agroforestry systems. Hence, cluster approach to development, based on agro-climatic as well as techno-economic potentials of each region would be essential.

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For suggesting alternate land use plan of the village Pata Meghpar, Jamnagar district, Gujarat we have carried out a detailed soil survey to characterize land resources. Land use plan was developed by integrating the information of landforms, soil, land use/land cover, slope, land capability and land suitability maps in a GIS environment. The suggested land use map was reclassified applying the decision criteria developed based on the information from various maps, available literature, discussion with resource persons and experience gained during the fieldwork. Various soil and land properties were considered for suggesting conservation measures and preparation of suggested land use

plan and their distribution pattern (Table 1).

The Pata Meghpar village covers 1683 ha total geographical area out of that 56.6% is cultivated and remaining area is under ravenous, degraded and waste/scrub land. The detailed soil survey has provided information on the distribution of different kinds of soils, their inherent characteristics and qualities. The extent of suitability of soils to various crops has been worked out. It, would, therefore be pertinent to look into the potential and constraints to the productivity of the soils of the area. These will helps to identify their management needs to suggest alternative land use. The soils having similar problems and requiring similar management needs is grouped together for suggesting optimum land use. Based on constraints, potentials and management needs of soils five suggested land units were identified in the village and shown in Fig. 1 and Table 1. Soil map was delineated and presented in Fig. 2.

Afforestation

Afforestation is suggested in the

degraded/scrub lands where canopy cover has reduced drastically. The unit covers about 65.4 ha (3.9% of TGA) of village. The area occurs on uplands. It is essential to launch a massive afforestation programme with locally adaptable species on these lands to improve vegetation density along with suitable soil and water conservation measures suggested in Table 1.

Silvipasture

These units comprised of soil series Pata Meghpar-2 occurring on uplands, which are the inclusions under degraded/ scrub lands. The unit covers an area of 53.8 ha (3.2% of TGA) of the village. The interpretation of prevailing soil-site characteristics suggests for silvipasture systems with restricted grazing designed for dry land condition. Silvipasture is the practice of combining forestry and grazing of domesticated animals in a mutually beneficial way. Silvipasture serves two purposes. It provides pastoral activity for fodder and growing trees for timber and fuel. The practice also allows rearing of cattle for developing dairy as a supplementary activity of agriculture.

Community forest

Community forestry is suggested for ravenous lands of the village. This area is acting as a natural drainage system during rainy season. The unit comprises soil series Pata Meghpar-3 spread over an area of 409.6 ha (24.3% of TGA) in the village. The unit have undulating physiographic position with very deep drainage channels. In a part of land surface the soil is deposited to form dunes and at some places soil is completely washed out and parent material is exposed. Such lands cover a vast area of the village. The Und river (seasonal river) flows through this unit. Therefore, it can be brought for the development of village forestry, community forest by involving the local people. Trees of locally adaptable species which are useful to farmers can be planted along the drainage channels. This practice will contribute to stabilize the soils and reduce the further land degradation

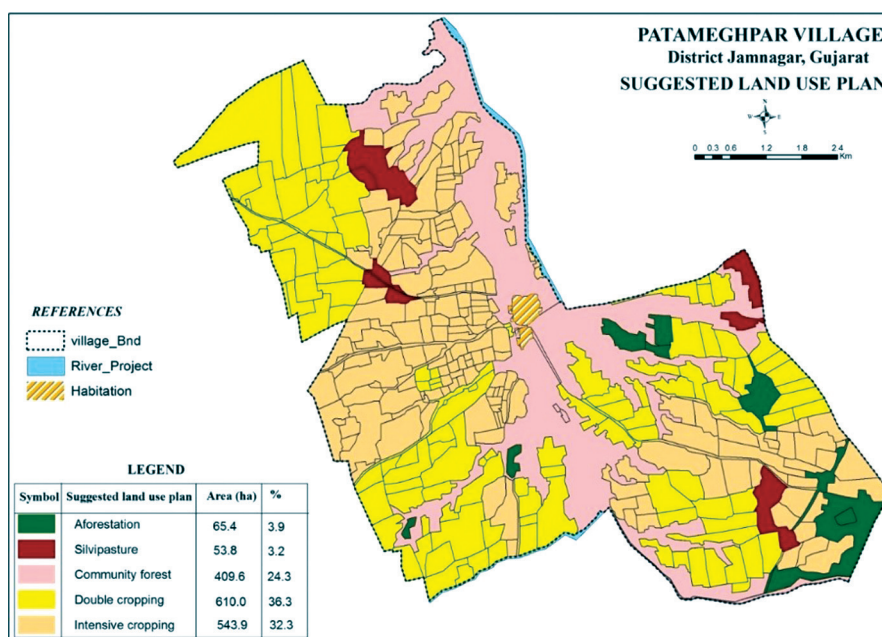


Fig. 1. Map of suggested land use plan for soils of Patameghpar village

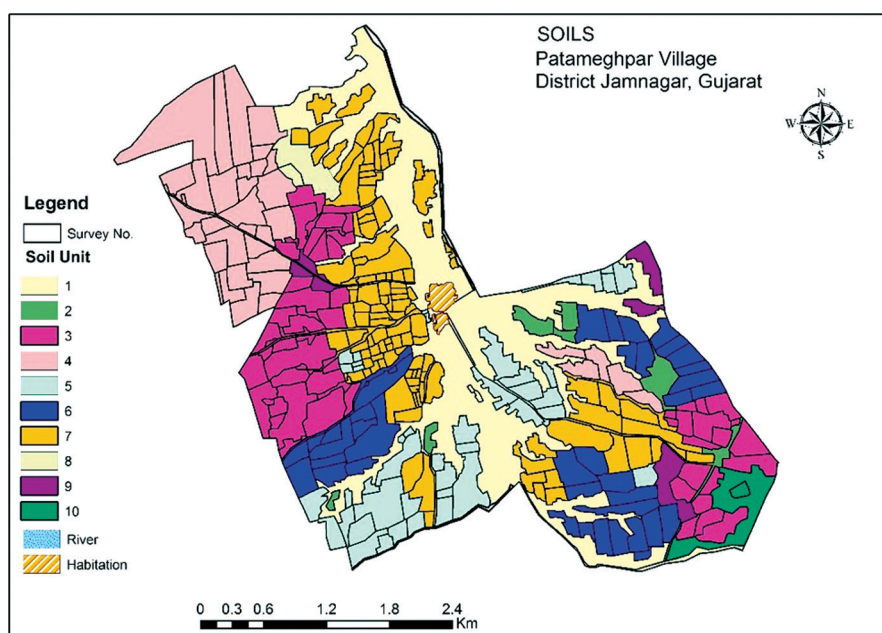


Fig. 2. Soils of Patameghpar village, Jamnagar district, Gujarat

in order to increase social, economic and environmental benefits for villagers.

Double crops

In this unit, two crops *Kharif* and *Rabi* can be taken which is equal to the potential of the soils to produce in a year without any extra-ordinary efforts. The area occurs on very gently to gently sloping plains of the village comprising soil series Pata Meghpar-4 and Pata Meghpar-5. The soil and water conservation measures like deep summer plowing, crop rotation and conservation practices like vegetative bunds and field

bunding are advised to arrest soil losses. This land management unit have medium ground water potential that can be tapped to provide irrigation in *Rabi* season. The unit covers 610 ha (36.3% of TGA) area of village. Presently, the farmers taking only cotton crop in a year. Therefore, it is recommended to grow green gram (short duration variety) between March to June if farmers have irrigation facility and pigeon pea may be planted on field bunds.

Intensive agriculture

The areas in which intensive

Table 1. Suggested land use plan for Pata Meghpar village

Series	Landform	Slope (%)	Present land use	Constraints	Management need/ soil conservation measures	Suggested land use	Area (ha)
Ptm-1	Upland	8-15	Degraded lands/ scrub land	Very shallow, strong stoniness, severe to very severe erosion, moderately sloping, excessively drained, rapid permeability and very low in available water capacity	Contour vegetative bunds, contour trenching and field bunding	Afforestation	65.4
Ptm-2	Upland	3-8	Degraded lands/ scrub land	Very shallow, moderate to strong stoniness, moderate to severe erosion, gently to very gently sloping, very low in available water capacity, somewhat excessively drained and rapid permeability	Contour vegetative bunds, contour trenching and field bunding	Silvipasture	53.8
Ptm-3	Ravenous land	8-15	Ravenous/ scrub land	Moderately shallow, severe erosion, undulating and ravenous land, strong stoniness, moderate slope and rapid permeability.	Contour vegetative bunds, contour trenching and field bunding	Community or village forestry	409.6
Ptm-4	Very gently to gently sloping plain	1-3	Cultivated (double crop)	Very gently sloping, moderately shallow with moderate erosion and low to medium in nutrient status	Field bunding	Double cropping	248.1
Ptm-5	Very gently to gently sloping plain	1-3	Cultivated (double crop)	Moderately shallow with medium available water content, strongly alkaline and low to medium in nutrient status	Field bunding, apply fine powdered gypsum	Double cropping	361.8
Ptm-6	Nearly level plain	0-1	Cultivated (double crop)	Medium available water content, moderately alkaline and low to medium in nutrient status	Field bunding, apply fine powdered gypsum	Intensive cropping	238.4
Ptm-7	Nearly level plain	0-1	Cultivated (double crop)	Moderately alkaline, strongly calcareous and low to medium in nutrient status	Field bunding, apply fine powdered gypsum	Intensive cropping	305.5

agriculture is suggested, has very good productivity potential and minimal limitations from crop growth point of view. These areas are at present under double crops and occur on level to nearly level plain that includes soil series Pata Meghpar-6 and 7. The area covers around 543.9 ha representing 32.3 per cent of village. Judicious soil and water conservation practices such as crop rotation that includes legumes mixed cropping, introduction of seasonal vegetable crops, adopting alternate beds and furrows for irrigation, proper application of manures and fertilizers and pesticides for pest control, etc., should be implemented to maintain productivity on sustainable basis. The ground water potential in this unit is medium to high that may even support a third crop in a year.

Suggested activities

Considering, the above information the following recommendations are made for integrated development of village:

- The practice of monocropping of Bt-cotton should be discouraged

in mapping units 4, 5 and 6 and it is suggested to involve legume crop (green gram) in crop rotation. Soils of mapping unit number 7 have full potential to support Bt-cotton. Trend of cotton-based monocropping in village induced the deficiency of iron and zinc. Therefore, it is recommended to apply iron and zinc fertilizers along with standard package and practices for cotton crop.

- Groundnut-wheat or groundnut-gram based cropping system is the second most adopted practice in village. The soils of the cultivated fields (mapping unit 3 to 7) are clayey in texture. Under fine textured soils the pod formation and development is adversely affected. Therefore, it is recommended to apply *murrum* of weathered basalt (pure or in combination of FYM) in line of groundnut crop to improve physical properties and supply of calcium and potassium.
- Soils of mapping unit number 2, 8, 9 and 10 are not suitable for cultivation. These soils can be best utilized for silvipastoral systems. If

farmers of the village are interested to cultivate these soils instead the development of silvipastoral system it is advised to grow fenugreek crop for restoration.

- In the soils of very gently to gently sloping plain and nearly level plains (mapping unit no. 3 to 7), almost half of the fields are surrounded by field bunds to conserve soil and water. Same conservation structures are also recommended to the remaining unprotected fields in uplands (mapping unit no. 2, 8 to 10) of the village.
- The area under ravenous land (mapping unit no. 1) is severely eroded and highly undulated. It should be kept undisturbed but community forestry can be developed in the pattern of Uttarakhand and Himachal Pradesh. Such community forests should be administered by a locally elected body (*Van Panchayat*).

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