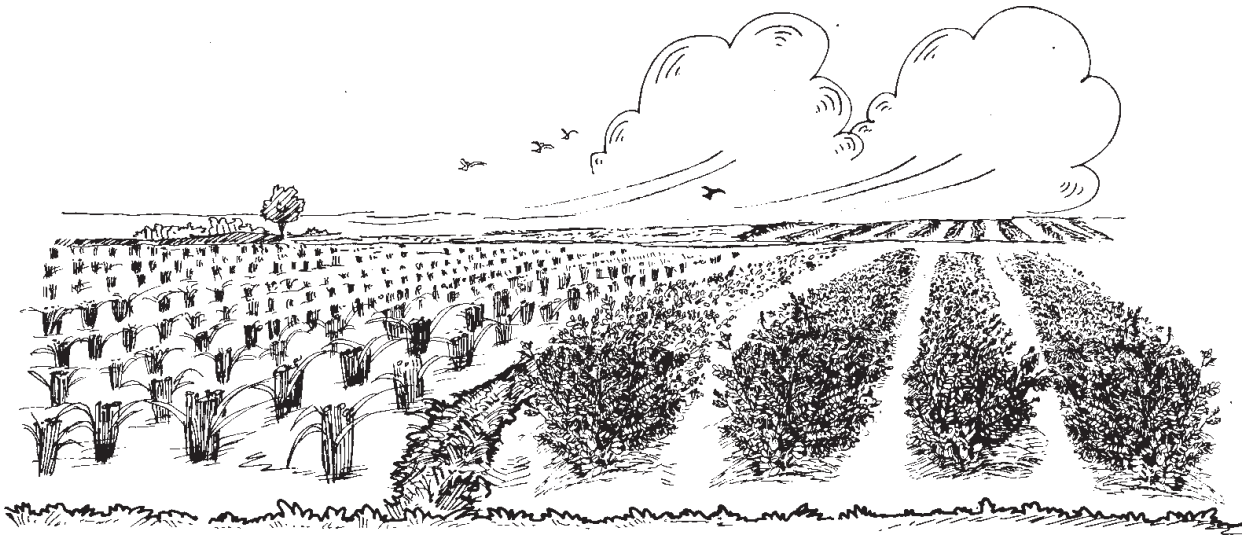
Utilizing Rice-Fallows in South Asia:
A Potential for Legumes



South Asia is one of the major rice producing regions of the world, with around 50 million ha planted with rice. A substantial proportion of this area is under only a single crop, usually kharif (rainy) season rice, with the land being left fallow during the following rabi (post-rainy) season. This situation largely occurs for rainfed rice, where irrigation facilities for either rice or a post-rice crop are not available. Nevertheless, residual soil moisture, derived from the previously-flooded ricefields that could support growth of a short-duration (legume) crop after rice, is available even in the rabi season.

Large areas of land lying fallow for a long period after kharif rice during the year are particularly a cause of concern in South Asia, for two main reasons. Firstly, the large and growing population of the region requires ever-increasing quantities of locally-available food grains, and fallow lands on which crops could potentially be grown represent under-utilization of agricultural land resources. Secondly, continuous cereal cropping is unsustainable over a period of time and some form of crop rotation or diversification is desirable for sustaining the agricultural production system.

Precise estimates of rice-fallows and their spatial distribution were not available. Rice-fallows in South Asia have been quantified by using satellite image analysis and their spatial distribution documented. Using geographical information system (GIS) tools, spatial distribution of the rice-fallow was overlaid on to the climatic and soil information data to understand the soil types and climatic conditions of these areas. This information is critical for developing strategies to utilize

Potential Legumes for Rice-Fallows

- Chickpea
- Lathyrus
- Lentil
- Mungbean
- Black gram

these lands for short-season crops (e.g., legumes) that are suitable to the climatic and soil conditions of this region. Legumes may not require supplemental irrigation and they enrich the fertility status of the soils by fixing atmospheric nitrogen and adding organic matter. They help in sustaining the rice-based cropping systems by breaking pest and disease cycles associated with sole rice systems. They also enhance the microbiological activity and thereby increasing the nutrient availability in the soils following rice.

Satellite image analysis estimated that rice area during 1999 kharif season was about 50.4 million ha. Rice fallows during 1999/2000 rabi season were estimated at 14.29 million ha. This amounts to nearly 30% of the rice-growing area. These rice-fallows offer a huge potential niche for legumes production in this region. Nearly 82% of the rice-fallows are located in the Indian states of Bihar, Madhya Pradesh, West Bengal, Orissa and Assam.

Estimates of Rice Areas and Rice-fallows Based on Satellite Image Analysis

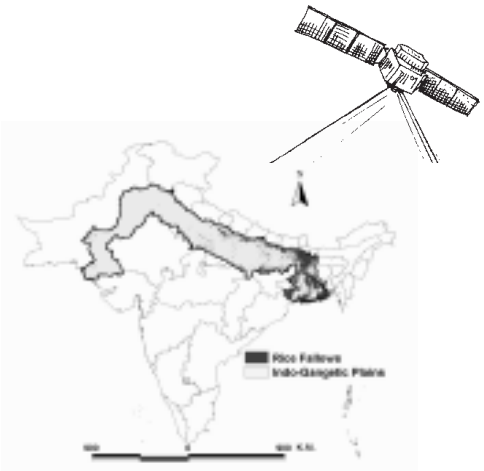
Country	Rice area* (million ha)	Rice-fallow** (million ha)	Rice-fallow as % of rice area	% total rice-fallow in South Asia
Nepal	1.45	0.39	26.9	2.7
Bangladesh	6.36	2.11	33.2	14.8
Pakistan	2.45	0.14	5.7	1.0
India	40.18	11.65	29.0	81.5
Total	**50.44**	**14.29**		

* During 1999 kharif season
** During 1999-2000 rabi season

The GIS analysis of these fallow lands has indicated that they represent diverse soil types and climatic conditions; thus a variety of both warm season legumes (such as soybean, mungbean, black gram, pigeonpea, and groundnut) and cool season legumes (such as chickpea, lentil, lathyrus, faba bean, and pea) can be grown in this region. Available soil water-holding capacity (1 m soil profile) for most of these lands ranges from 150mm to 200mm. If it is assumed that the soils in these lands are fully saturated during most of the rice-growing season, the residual moisture left in the soil at the time of rice harvest will be sufficient to raise a short-season legume crop.

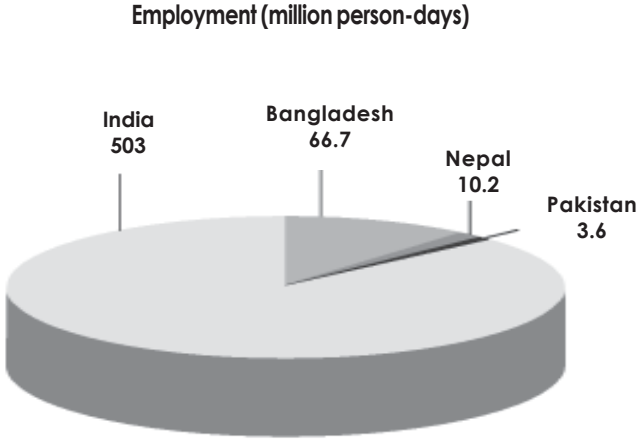
Methodology for Estimating Rice-Fallow Area Using Satellite Image Analysis

Satellite remote sensing is an appropriate tool for deriving information on spatial and temporal domains by providing multi-spectral reflectance data at regular intervals in a synoptic mode. Also, satellite data are amenable to geo-referencing, thus making it compatible for analysis by GIS. The rice acreage and production at district, state, and national levels are being routinely generated with the techniques developed and tested under Crop Acreage and Production Estimation (CAPE) project using single date Linear Imaging Self Scanning Sensor (LISS-I/II) data of Indian Remote Sensing Satellite (IRS 1A/1B).



A number of abiotic (soil acidity, salinity, alkalinity, and terminal drought), biotic (diseases and insect pests) and socioeconomic (social unrest, lack of awareness of legume technologies among farmers, and lack of effective policy initiatives to promote legumes) constraints contribute to the lack of cropping during this period in this region. These will have to be addressed by appropriate research and policy initiatives in addition to developing suitable legume varieties that have targeted adaptation to these rice-fallows.

A review of existing technologies indicates that it is possible to productively cultivate legumes in most of these identified rice-fallows. An economic analysis has shown that growing legumes in rice-fallows is profitable for the farmers with a benefit-cost ratio exceeding 3.0 for many legumes. Also, utilizing rice-fallows for legume production could result in the generation of 584 million person-days employment for South Asia. Thus, introducing legumes into these rice-fallows will have a multi-faceted impact on the economy through employment generation, poverty alleviation, food security, quality of nutrition to human and animal population and contribution to the sustainability of these production systems in South Asia.



Adapted from:

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