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## Indigenous technical knowledge on soil and water conservation, soil health management and tillage techniques in Bagalkot district

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### Abstract

Conservation of land and water not only controls land degradation but also can lead to sustain productivity. Considering the above facts, a study was under taken to document and identify indigenous soil and water conservation practices prevalent in Hungund, Badami, Bagalkot, Bilagi, Jamakandi and Mudhol talukas of Bagalkot district of Karnataka. Study revealed that with the help of long historical knowledge, traditions and experiences indigenous practices for soil and water conservation were developed by farmers. Snow ball technique methodology was used for the study (No. of samples 120). The most common practices followed by farmers are categorized as agronomical measures like tillage (deep summer ploughing), bunding and vegetative barrier, soil mulching (sugarcane trash, sunflower stalks etc), erosion control and runoff diversion structure (sand bags structure as gully check, brushwood structure), water harvesting, seepage control and groundwater recharge (farm pond and check dams). These indigenous techniques of soil and water conservation are mostly individually managed. Presently the adoption percentages of these ITK are low due to unawareness, non-availability of suitable implement and financial difficulty. By the improvement the existing technology, these practices may be more adoptable among the farmers.

**Keywords:** ITKs, farm pond, ITK, soil and water conservation, tillage

### Introduction

#### Material and Methods

Bagalkote district was purposively selected, based on area receiving low rainfall in northern Karnataka. A total of 120 farmers practicing ITKs in soil and water conservation, soil health management and tillage techniques were purposively selected using snowball sampling technique. A semi structured schedule was prepared with the help of experts in the fields of Agricultural Extension, psychology, Agronomy, Agricultural Engineering and Statistics. The schedule included all the items under each of the variables selected for the study. By initiating an informal discussion with the respondents, they were asked questions on each farming practice under different crops being grown by them. During the course of discussion the respondents were requested to give details of such practices which seemed to be different from the normal recommendation practices either traditional or innovative technologies developed by the farmer himself or by peer group. The details procedure involved in following such practices was noted down along with the required inputs, advantages etc.

After completion of field survey a comprehensive list of technologies identified was prepared. The list was then sorted out, based on the nature of technologies identified by consulting experts. Simple frequency and percentage were used to quantify the data and draw the inferences.

### Results and Discussion

For the convenience of the study, the ITKs were divided into four categories i.e., ITKs pertaining to soil conservation, water conservation, soil health management and preparatory tillage. Among the soil conservation measures, preparatory tillage was performed by all the farmers under the study area followed by earthen bunding and field bunding (66.6%).

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**Table 1:** Prevalence of ITKs on soil conservation

SN	ITKs	Villages				No of farmers (%)
		Benakatti	Hallur	Hunagund	Bevoor	
<b>I</b>	<b>Soil Conservation Measures</b>					
a	Vegetative barriers	20	5	6	9	40 (33%)
b	Compartmental bunding	6		4		10 (8.3%)
c	Field bunding	35	22	14	9	80(66.6%)
d	Bench terrace	1	1	1	2	5(4.16%)
e	Earthen bunding	31	19	27	13	80(66.6%)
f	Stone bunding	6	7	3	9	28(30%)
g	Cover crops	2	1	1	4	8(9.6%)

Vegetative barrier was another category of soil conservation measures adopted by 33% of the farmers in the study area, stone bunding was adopted by 30% of farmers, while compartmental bunding (8.3%), cover crops (9.6%) and bench terrace (4.16%) were the measures were least adopted by the farmers. From the villagewise data (Table 1), it is clear that among soil conservation measures, field bunding and earthen bunding were the most prevalent practices followed by vegetative barriers. Among the villages, Benakatti has highest number of vegetative barriers followed by Bevoor. Field bunding were also prominently seen in Benakatti followed by Hallur and Hunagund area. Whereas earthen bunding was also prominently practiced in Benakatti followed by Hunagund and Hallur farmers. Cover crops, compartment bunding and bench terrace were minimally practiced with 9.6%, 8.3%, 4.1% respectively. Similar results were obtained by Ingle *et al* (2000) <sup>[1]</sup>, Padaria and Singh (1996) and Chittiraichelvan and Raman (1992) and Verma *et al* (1993). These studies

highlighted the use of summer ploughing which was largely adopted by the farmers in their studies. Hulagur (2006) in his study on watershed development-NABARD initiatives revealed that IGWDP made efforts to create basic potential like conservation of soil fertility, recharge of ground water, increase in fodder availability etc. through effective soil and moisture-conservation measures. Similarly, Ranganath (2002) <sup>[3]</sup> in a study on identification of indigenous farm practices followed by Soliga tribal reported that great majority (80-90%) of the tribal expressed the erection of small section bunds and digging against slope was relatively advantageous and compatible. Ingle *et al* (2000) <sup>[1]</sup> stated that the tribal farmers of Dharani District of Amaravathi conserve soil and water by digging diversion trenches, by constructing stick and stones bunds and by sowing the crops across the land slope, they further recorded that these methods over a long period also helped the tribal to level the fields and increase the productivity.

**Table 2:** Prevalence of ITKs on water conservation

SN	ITKs	Villages				No of farmers (%)
		Benakatti	Hallur	Hunagund	Bevoor	
<b>II</b>	<b>Water conservation</b>					
a	Runoff storage structures	2	3	9	1	15(12.5%)
b	Rain gauge water management	-	-	-	-	-
c	Farm pond	9	11	41	4	65(54.6%)
d	Percolation pond	13	6	38	3	60(50%)
e	Ground water recharge	2	1	9	1	13(10.83%)
f	Earthen check dam	6	7	5	2	20(16.66%)

Among water conservation measures, farm pond was adopted by 54% of the farmers followed by percolation pond (50%). Rest of the measures like earthen check dam runoff storage structure and groundwater recharge were adopted by the (16.66%) 12.5% and 10.83% respectively. Among the water conservation measures, farm pond was the single largest measure adopted by 54.16% of the farmers followed by percolation pond, earthen checkdam (16.66%), run off storage structure (12.5%) and ground water recharge were the other practices followed by the farmer in study area. Respondent farmers from Hunagund had more number of farm ponds and percolation ponds.

These results are in line with the studies conducted by Nandini *et al.* (1996) have recorded on adoption of indigenous soil and water conservation practices by the farmers of NGO and Govt organization in Pharmapuri District of Tamil Nadu. Majority of the farmers were following different indigenous soil and water conservation practices like summer ploughing (100%), manuring (70%) construction of earthen embankments bunds (25%) and stone walls (40%) growing cover crops (41.67%) intercropping (87.50%), growing bushy shrubs like lantana camera (12.50%) agave planting (8.33%) and digging of trenches around tree crops (12.50%)

**Table 3:** Prevalence of ITKs on soil health management and preparatory tillage

SN	ITKs	Villages				No of farmers (%)
		Benakatti	Hallur	Hunagund	Bevoor	
<b>III</b>	<b>Soil health Management</b>					
a	Application of tank silt	21	4	6	4	35 (29.16%)
b	Application Farm Yard Manure	30	30	30	30	120 (100%)
c	Application of goat and sheep manure	14	16	19	11	60(50%)
<b>IV</b>	<b>Preparatory Tillage operation</b>					
		25	30	30	30	120(100%)

In the category of soil health measures, application of FYM was widely practiced by all the farmers followed by application of sheep and goat manure (80%) the farmers. In the category of soil health management application of FYM was practiced by all the farmers followed by application of sheep and goat manure (50%). Application of tank silt was practiced by 29.16% of the farmers. Preparatory tillage was another practice which was being followed in the study area. Application of tank silt was an additional source of nutrients to the soil and finally the application of tank silt (29.16%) was practiced in the farmers' field wherever possible. Preparatory tillage was adopted by 100 per cent farmers. These results are in line with the results obtained by Chander and Mukherjee (1994) observed various indigenous manuring practices followed by farmers of Kumoun hills. Fuel wood ash is used as an important organic fertilizer supplement. Farmers broadcast ash in ploughed field with FYM, as this ash is rich in potassium, which improves the yield of crops like garlic, ginger, turmeric and other such crops. Singh and Srivastava (1994) found that the tribal farmers of the Bihar have been in practice since ages of applying animal dung with ash, dirt and other refuges of their fields after decomposition without knowing the benefits of bulky organic manures. Dried dung is mixed well with the soil during land preparation. Farmers also use to mix fresh cow dung with water in standing rice crop. Gaur (1998) found that farm women broadcast farm manure (made of animal wastes) in the field to make land fertile. Manjunath *et al.* (1998) revealed that most of the farmers (94.44%) under the study were using FYM as per the recommendation, as they perceived this practice as cheap, not risky, triable, useful and with the conviction that it improves the soil fertility. Wanjau *et al.* (1997) found that, under favorable condition leguminous green manure crops can provide a particular way of securing nitrogen supply via biological nitrogen fixation and are therefore genuine supplies on farm. There is however, evidence that several non-leguminous plants accumulates as much nitrogen in their leaves or legumes and that they also have very high levels of phosphorous. This is most probably become these, after indigenous species are better adopted to the area have greater root volume and a special ability to recover scarce nutrients from the soil. When their biomass is transferred from where it has been produced to where it can be used it provide extra nutrients input of great benefit to crop producers.

### Conclusion

Earthen bunding and field bunding, vegetative crops, stone bunding, compartment bunding and bench terrace were the ITKs related to soil conservation adopted by farmers in the order of preference, while among ITKs related to water storage farm pond, percolation tank, earthen checkdam, run off storage structure, were adopted by farmers followed by run off storage. Application of Farm Yard Manure and sheep and goat manure and application of tank silt were the ITKs related to improve the soil health which were practiced by farmers. Preparatory tillage was also being practiced by all the farmers as an ITK on soil health management.

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