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## Cultivation patterns of small millets in the tribal belts of Chhattisgarh state: An in-depth study

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### Abstract

Millet is one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. The study was conducted in Bastar Plateau Zone of Chhattisgarh state. This agro-climatic zone was purposively selected because the maximum area under small millets exists in this agro-climatic zone. Out of Six small millet crops, three important ones were selected and a total of 270 tribal farmers growing them were selected as respondents. The study revealed that a little less than half of the respondents were belonging to small farmers' category possessing less than one third of total land while nearly one fourth of them belonged to marginal farmers category possessing less than one tenth of the land. Nearly one third of the land was *Vertisol (gabhar)* while less than one third was *Entisol (tikra)*. Among the three major small millets, little millet was cultivated by nearly 84 per cent of the respondents on 3 per cent of the total Kharif cultivated area. Kodo millet was cultivated by 69 per cent of them on nearly 5 per cent of the land, while finger millet was cultivated by 60 per cent of them on nearly 5 per cent of the cultivated area.

**Keywords:** Small millets, cultivation, Bastar, tribal

### Introduction

Millet is one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. Today millet ranks as the sixth most important grain in the world, sustains  $\frac{1}{3}$ <sup>rd</sup> of the world's population and is a significant part of the diet in Africa, India, northern China, Japan, Manchuria and various areas of the former Soviet Union and Egypt.

Small millets are unique to Indian agriculture even though their contribution is only about 2.50 per cent to the grain production in the country. The importance lies in the ecological niche they occupy where no other food crop can be profitably grown (Gowda *et al.*, 1997) <sup>[2]</sup>. These crops with much longer history of cultivation than major food grains were rated highly in the past, playing an important role in our traditional food culture and farming systems (Gowda and Seetharam, 2007) <sup>[1]</sup>.

Chhattisgarh has 5.88 million hectares of cultivable land. Rice is the principal crop of the region. In 2006, Chhattisgarh occupied 248.5 thousand hectares of land (which is 21.18% of India's 1173.5 thousand ha) under small millets with total production of 52.1 thousand tons (which is only 10.22% of total national production of 509.8 thousand tons) and yield of 210 kg ha<sup>-1</sup> against national productivity of 434 kg ha<sup>-1</sup> ([www.dacnet.nic.in](http://www.dacnet.nic.in)).

Chhattisgarh is very aptly called the *rice bowl*. However, paddy alone would not bring prosperity and food security. It is high time to promote and secure other crops, the most prominent ones being the small millets. In earlier times millets were grown on large areas especially in the tribal belts. But now they are very rapidly being replaced by other crops or being pushed to less remunerative soils, in lack of motivation and market support.

Till now no systematic effort have been taken to study the existing cultivation pattern of millets in the country in general and in the State, in particular. In this context, the present study was carried out in Bastar Plateau Zone of Chhattisgarh State, with the following objectives:

1. To study the Socio-economic traits of the small millets growers in study area,
2. To find-out the existing cultivation patterns among the farmers regarding selected small millets production technology.

### Research Methodology

The study was conducted in Bastar Plateau Zone of Chhattisgarh state. This agro-climatic zone was purposively selected because the maximum area under small millets exists in this agro-climatic zone.

Out of the total six small millet crops, only three important crops viz., Little millet, Kodo millet and Finger millet were selected purposively for this study as they were having the

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maximum area under coverage as compared to other millets. Out of the total 25 blocks of Bastar Plateau Zone comprising of Bastar, Dantewada, Narayanpur and Bijapur districts, only one third of the total blocks i.e., 9 blocks were selected purposively on the basis of maximum area under selected small millets for the purpose of the study.

Out of the selected 9 blocks, a total of 18 villages (2 villages from each block -  $9 \times 2 = 18$ ) were selected purposively on the basis of area under small millets for collection of data.

From the total small millet growers of the each selected village, 15 farmers (who were growing at least two crops out of the selected three small millet crops) were selected randomly as respondents for the study. Thus, in this way, a total of 270 farmers ( $18 \times 15 = 270$ ) were considered as respondents for collection of data.

In this study, Socio-personal variables which were supposed to be associated with the dependent variables were undertaken. Little more than half of the respondents were literate, although only up to primary level of education with no one above high school level. A little more than half of them were residing in the nuclear family, showing the increasing trend of fragmentation of families. More than half of them were having up to five members in the family and about two third of them were having up to five working members in their family. About two third of them were having a rich farming experience of up to 30 years. A little less than half of them were members of one organization only (Table 1).

**Table 1:** Distribution of the respondents according to their Socio-personal Characteristics (n=270)

Characteristics	Frequency	Percentage
<b>Education</b>		
Illiterate	115	42.59
Primary	132	48.89
Middle	18	06.67
High School	05	01.85
Above High School	00	00.00
<b>Type of Family</b>		
Joint	131	48.52
Nuclear	139	51.48
<b>Size of Family</b>		
Up to 5 members	146	54.07
6 – 10 members	119	44.07
Above 10 members	05	01.86
<b>Working Members</b>		
Up to 5 members	181	67.04
6 – 10 members	87	32.22
Above 10 members	02	00.74
<b>Farming Experience</b>		
Up to 10 years	06	02.22
11 – 30 years	175	64.82
31 – 50 years	87	32.22
Above 50 years	02	00.74
<b>Social participation</b>		
No Participation	06	02.22
Member of one organisation	126	46.67
Member of two organisation	61	22.59
Member of more than two organisations	56	20.74
Office bearer	21	07.78

Socio-economic variables which were supposed to be associated with the dependent variables were included in the study. A little less than half of the respondents were belonging to small farmers' category possessing less than one third of total land while nearly one fourth of them belonged to

marginal farmers category possessing less than one tenth of the land. Nearly one third of the land was *Vertisol* (*gabhar*) while less than one third was *Entisol* (*tikra*) (Table: 2).

**Table 2:** Distribution of the respondents according to their land holding (n=270)

Category of farmers	Respondents		Area	
	Frequency	Percent	ha	Percent
Marginal (up to 1.0 ha)	67	24.81	48.10	09.56
Small (1.1-2.0 ha)	130	48.15	158.15	31.42
Medium (2.1-4.0 ha)	58	21.48	186.48	37.06
Large (above 4.0 ha)	15	05.56	110.49	21.96
Total	270	100.0	503.22	100.0

### Major crops and their area

The frequency and area of the respondents growing different Kharif and Rabi crops have been compiled and presented in the Table 3. The data shows that all the respondents were growing paddy on nearly 77 per cent Kharif cultivated area. They grew more than two millet crops on an average in about 15 per cent of their area. Maize was grown on 8 per cent of area by nearly 40 per cent of the respondents. Nearly 9 per cent of the respondents were growing other crops like lentil, kulthi, vegetables, etc. on nearly 1 per cent area. Rabi crops like gram, onion, vegetables, etc. were taken by 9 per cent of the respondents on 3 per cent of the area.

Cropping intensity was 105.94 per cent as reported by the respondents. The cropping intensity of Chhattisgarh state is 135 per cent but in Bastar plateau region it is nearly 110 per cent. Purposively, the millet grower respondents were selected for this study. Lack of fertile soil and irrigation facility has restricted them from growing other more remunerative crops. This may be the reasons for low cropping intensity.

**Table 3:** Major crops and their area among the respondents during Kharif and Rabi season (n=270)

Season / Crop	Frequency	%	Area (ha)	%
<b>Kharif crops</b>				
Paddy	270	100.0	385.55	76.62
Millets	270	100.0	73.45	14.60
Maize	107	39.63	39.56	07.86
Others	25	09.26	04.66	00.92
Total	672	248.89	503.22	100.0
Rabi crops	32	11.85	29.88	5.94
Cropping Intensity (%)			105.94	

Data on frequency and area of different millet crops as reported by the respondents has been collected, compiled and presented in Table 4 and Figs 1 and 2. Among the three major small millets, little millet was cultivated by nearly 84 per cent of the respondents on 3 per cent of the total Kharif cultivated area. Kodo millet was cultivated by 69 per cent of them on nearly 5 per cent of the land, while finger millet was cultivated by 60 per cent of them on nearly 5 per cent of the cultivated area.

The rest three small millets namely, foxtail millet, proso millet and barnyard millet were cultivated by 12 per cent of the respondents on a little more than one per cent of the Kharif cultivated area. Thus, total of 15 per cent of the Kharif cultivated land was covered with millets and every farmer was taking more than two millet crops on their land.

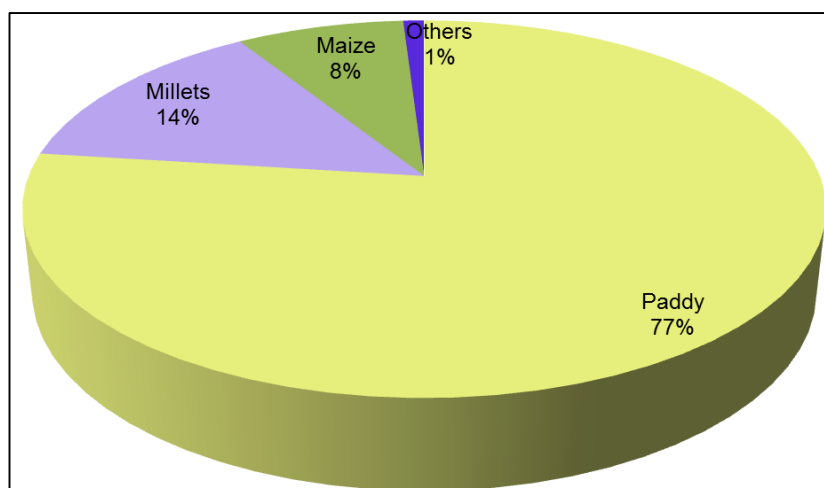
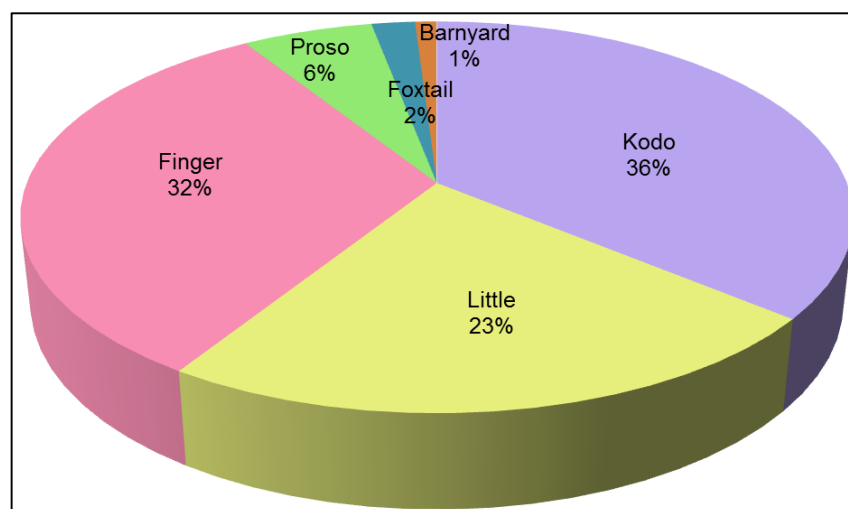
**Table 4:** Area under different small millets among the respondents (n=270)

Crops	Frequency*	%	Area (ha)	%
Kodo Millet	187	69.26	26.12	5.19
Little Millet	228	84.44	17.02	3.38
Finger Millet	161	59.63	23.49	4.67
Foxtail Millet	07	02.59	01.32	0.26
Proso Millet	19	07.04	04.42	0.88
Barnyard Millet	06	02.22	01.08	0.21
Total	608	225.2	73.45	14.60

\* Data are based on multiple responses

Although the area under the millets may be less but they are cultivated by a higher frequency of the farmers. They are

cultivating millets for domestic consumption only even on a very small piece of land.

**Fig. 1:** Share of small millets in Kharif cropping amongst the respondents**Fig. 2:** Share of selected different small millet crops in the respondents total millet area

#### Perception of farmers about selected aspects of small millets cultivation

The profile of the respondents according to the selected aspects of small millets production was collected and analysed, and is presented in Table 5. As far as involvement in millets cultivation was concerned, majority of the farmers were cultivating little millet along with kodo millet (40.37%) or finger millet (30.74%). About 17 per cent of them were cultivating kodo millet and finger millet, while nearly 12 per cent of them were cultivating all the three millets, i.e., kodo millet, little millet and finger millet. As far as overall involvement in millets cultivation is concerned, nearly 88 per cent of them were involved in two millet cultivation and rest 12 per cent in more than two millet cultivation.

Majority (58.15%) of the respondents were having more than 20 years of experience in millets cultivation. Experience in millets cultivation was 11– 20 years to 30 per cent and up to 10 years to 11 per cent of the respondents.

Majority of respondents (91.48%) were cultivating millets regularly, while some cultivating during alternate year (7.78%) or at two years interval (0.74%). Majority (87.78%) of the farmers preferred less fertile land for millets cultivation while some preferred least fertile land (10.37%) or even high fertile land (01.85%) for millets cultivation. Similar preference of land for millets cultivation was reported by Kumari *et al.* (2004) [3] while surveying the millet growers in Nainital District of Uttaranchal.

They cultivated millets for domestic consumption only (92.96%), while some cultivated millets (07.04%) for domestic consumption as well as for marketing but none of them were cultivating millets exclusively for sale purpose.

**Table 5:** Perception of the respondents about selected aspects of small millets production (n=270)

Characteristics	Frequency	%
<b>Involvement in Millets Cultivation</b>		
Kodo millet + Little millet	109	40.37
Kodo millet + Finger millet	45	16.67
Little millet + Finger millet	83	30.74
Kodo millet + Little millet + Finger millet	33	12.22
<b>Experience in Millet cultivation</b>		
Up to 10 years	31	11.48
11-20 years	82	30.37
More than 20 years	157	58.15
<b>Interval in Millet Cultivation</b>		
Regular	247	91.48
Alternate year	21	07.78
Two year interval	02	00.74
<b>Preference of land for Millet Cultivation</b>		
High fertile Land	05	01.85
Less fertile Land	237	87.78
Least fertile land	28	10.37
<b>Purpose of Cultivation</b>		
For consumption only	251	92.96
For consumption + Sale	19	07.04
For Sale only	00	0.0

#### Existing cultivation practices of small millets among the respondents

Existing cultivation practices of millets adopted by the

respondents in the study area was recorded. This will form the basis for the future strategy and also the guideline for improvement. As far as the existing cultivation practices of small millets are concerned, data was collected from the respondents and is compiled, analysed and presented in Table 6.

Depending upon the availability of land and other resources, and need of the final product, the farmers decided the area for different crops. As it is well aware fact that millets are presently having low market value and are solely cultivated for domestic consumption only, the area of millets are also very small in magnitude. On an average, two-third of respondents were cultivating the millets, on 0.1-0.2 ha of land, while 1/4<sup>th</sup> to 1/3<sup>rd</sup> of respondents were cultivating on less than 0.1 ha of land and only 8 per cent were cultivating on more than 0.2 hectare of land.

Usually farmers have tendency to apply high seed rate, which leads to high crop competition. In case of kodo millet, nearly 44-45 per cent of respondents were applying 10 -15 kg seed ha<sup>-1</sup>. One third of the respondents growing little millet were applying less than 10 kg seed ha<sup>-1</sup>, while, 37 and 31 percent of them were using 10-15 and more than 15 kg seed ha<sup>-1</sup>, respectively. In finger millet, majority of the respondents (94%) were using 10-15 kg or more seed ha<sup>-1</sup>.

Seed born diseases can be controlled by seed treatment. It is a cheap, simple and effective method, but due to lack of information and awareness, it is not in practice in the study area.

Broadcast seeding is prevalent in the study area. Line sowing is advocated by the extension officials because it improve crop yield and helpful in inter culture operations, but it is practiced in 1-2 per cent area of millets.

**Table 6:** Existing cultivation practices of selected Small Millets adopted by the respondents

Existing Practices	Kodo Millet (n=187)		Little Millet (n=228)		Finger Millet (n=161)	
	F	%	F	%	F	%
<b>Area under cultivation</b>						
Up to 0.1 ha	48	25.67	72	31.58	59	36.65
0.1 - 0.2 ha	125	66.84	136	59.65	88	54.66
> 0.2 ha	14	07.49	20	08.77	14	08.70
<b>Seed rate</b>						
< 10 kg ha <sup>-1</sup>	20	10.70	74	32.46	10	06.21
10-15 kg ha <sup>-1</sup>	82	43.85	84	36.84	77	47.83
>15 kg ha <sup>-1</sup>	85	45.45	70	30.70	74	45.96
<b>Seed Treatment</b>	00	0.0	00	0.0	00	0.0
<b>Method of Sowing</b>						
Broadcasting	185	98.93	226	99.12	158	98.14
Line Sowing	02	01.07	02	0.88	03	01.86
<b>Fertilizer &amp; Manure</b>						
Nitrogen						
No Use	164	87.70	211	92.54	140	86.96
Up to 10 kg ha <sup>-1</sup>	23	12.30	17	07.46	21	13.04
Phosphorus						
No Use	185	98.94	226	99.12	159	98.76
Up to 3 kg ha <sup>-1</sup>	02	01.06	02	0.88	02	01.24
Potash						
No Use	186	99.47	226	99.12	159	98.76
Up to 5 kg ha <sup>-1</sup>	01	0.53	02	0.88	02	01.24
FYM						
No Use	92	49.20	123	53.95	78	48.45
Up to 1.0 cartload ha <sup>-1</sup>	86	45.99	98	42.98	72	44.72
Above 1.0 cartload ha <sup>-1</sup>	09	04.81	07	03.07	11	06.83
<b>Weed Control</b>						
Manual	130	69.52	132	57.89	120	74.53
Chemical	00	0.0	00	0.0	00	0.0
No Control	57	30.48	96	42.11	41	25.47

Plant Protection Measures						
No use of chemical	187	100.0	228	100.0	161	100.0
Occasional use	00	0.0	00	0.0	00	0.0
Harvesting						
Cutting the plant	113	60.43	157	68.86	97	60.25
Uprooting the plant	71	37.97	65	28.51	52	32.30
Picking the spike	03	01.60	06	02.63	12	07.45
Storage						
In Gunny bag	87	46.52	98	42.98	77	47.83
In bamboo basket	58	31.02	68	29.82	43	26.71
In cow dung clad bamboo basket	23	12.30	36	15.79	27	16.76
In earthen pot	19	10.16	26	11.41	14	08.70

Application of chemical fertilizer in the millets were not in practice in the study area. Majority of the respondents (87-93%) were cultivating the millets without application of fertilizers. About half of the respondents were applying 0.5 - 1.0 cartload ha<sup>-1</sup> organic manure. As per previous discussion, the millets are grown in poor soils under rainfed condition; even then, farmers are not using fertilizer as well as FYM.

The respondents did weed management by manual weeding in kodo millet (70%), little millet (58%) and finger millet (75%). Weeding operation was not performed by some of the respondents and they grew the crop with full of weeds. No respondents were found to be using chemicals for controlling weeds, insect pest and diseases. Thus, the produce is organic in nature and could be utilised for popularising the millet in the market.

To harvest the crop two third of the respondents used to cut the plants whereas, uprooting the plant was followed by nearly one third of the respondents. Picking the spikes is not a common practice but followed by 2% respondents in kodo millet, 3% respondents in little millet and 8% respondents in finger millet.

Storage of produce after harvesting and primary processing was done in gunny bags (43- 48%), in bamboo baskets (27-

31%), in cow dung clad bamboo baskets (12 - 17%) and in earthen pots (9-11%).

### Popular varieties of small millets

Variety is one of the most important components of yield. Traditional varieties are still being adopted by the respondents, which have low production potential. Negligible area is under new improved varieties. Seed replacement of millets is one of the options for introduction of high yielding varieties and ultimately increasing the production and productivity of millets in the region.

Generally, the farmers are not aware about the name of millets varieties, which they are cultivating (Table 7). They just call it as *desi* or traditional variety. New generation have least interest in millet cultivation and they are diverting to remunerating crops. Traditionally, all the respondents grew kodo without differentiating as varieties. Almost all the farmers were not able to tell the name of any kodo variety. They just term as *kodo* and didn't give any specific name as variety. Only two farmers were able to partially identify the variety as JK 62 of the kodo that they are growing.

**Table 7:** Popular varieties of selected small millets grown by the respondents

Crops / Varieties	Frequency	%
<b>Kodo Millet (n=187)</b>		
JK 62	02	01.07
Traditional / not identified	185	98.93
<b>Little Millet (n=228)</b>		
JK 8	01	00.44
Traditional / not identified	155	67.98
Os Kosara	28	12.28
Bade Kosara	26	11.41
Rikki Kosara	18	07.89
<b>Finger Millet (n=161)</b>		
RAU-8	02	01.24
Traditional / not identified	124	77.02
Chhota / Saan / Turia / Nani Bitti Madia	17	10.56
Bade Madia	09	05.59
Laal / Laad Madia	06	03.73
Bakari kaan Madia	03	01.86

Little millet don't have high production potential but popular among the tribes. It is a short duration crop and harvested early, even than early duration rice. Only one farmer was able to tell the JK 8 variety of little millet cultivation.

Nearly 68 per cent of the respondents reported that they are growing traditional or unidentified variety of little millet. Nearly 12 per cent of them were growing the *Os Kosara* variety, which is harvested in shorter duration than others. Majority of the farmers have the opinion that this variety does not require much water and can ripe in dewdrops only. *Rikki*

*Kosara* is a medium duration spreading spike type of variety and grown by 8 per cent of the farmers. *Bade Kosara* is a late duration high yielding variety. It is grown by 11 per cent of the farmers.

Amongst the small millets, finger millet is the most important crop and much work has been done on finger millet in India. It has many diverse uses, the most important one being consumed in summer period as '*Pej*', which is very soothing and important beverage drink of the tribes. Nearly 77 per cent of the farmers growing finger millet reported that they grow

traditional or unidentified variety. Only two of the farmers were able to identify that they are growing RAU 8 variety of finger millet. Nearly 11 per cent of them were cultivating *Chhota / Saan / Turia or Nani Bitti Madia*. It matured 10-15 days earlier than other varieties. Its harvesting is usually done by picking up the spike by hand. Nearly 06 per cent of them were growing *Bade Madia*, which is relatively higher yielder, taller and longer duration variety over other varieties. Nearly 4 per cent of the respondents were growing *Laal or Laad Madia variety*. Its inflorescence is not in typical finger shape but is in cluster. *Bakari Kaan Madia* variety is having the spikes resembling the ears of goat, which is grown by 2 per cent of the respondents.

#### Reasons for regular cultivation of small millets

The millets are not remunerative crops but these crops perform better in soils where other crops can't be grown. The farmers have reduced area of the millets but didn't leave the cultivation of millets. They will continue to grow millets, even on a small bit of land for their domestic consumption. An effort was made to probe the circumstances and reasons for the regular cultivation of small millets by the respondents. Results obtained are presented in Table 8.

When the social or cultural reasons are concerned, almost all of the respondents reported that millet is important and essential crop for domestic consumption. Nearly 61 per cent respondents reported millets as common traditional crop of the area. Nearly half of them were of the opinion that millets are suitable crop for less fertile soils. Nearly 42 per cent of them gave reasons for regular cultivation that millet grains can be stored for long time without any loss of their quality. Nearly 38 per cent respondents were cultivating millets because it required less care and inputs. 37 per cent of them reported that millets' straw is a precious fodder for cattle, while, early maturity of crop was preferred by 34 per cent of the respondents. One third of the respondents were of the opinion that millets' grains are essential for preparation of traditional food items on various local rituals. While, one fourth of them strongly believed that finger millet yield / harvest are never stolen and if somebody stolen, he would have to suffer and would have to go through heavenly curse. Other reasons given for its regular cultivation by the respondents were efficient use of fallow land (7.4%), lack of irrigation (1.9%) and assured harvest up to some extent in drought and flood situation (1.9%).

**Table 8:** Perception of the respondents about regular cultivation of small millets (n=270)

Reasons	Frequency	%	Rank
Important and essential crops for domestic consumption	266	98.52	I
Common traditional crop in area	165	61.11	II
Millet grains are essential for preparation of traditional food items on various local rituals	91	33.70	VIII
It is strongly believed that finger millet yield is never stolen and if somebody does it he will have to suffer.	67	24.81	IX
Suitable crop for less fertile soils	129	47.78	III
Millet grains can be stored for long time without loss of their quality	114	42.22	IV
Requires less care and inputs	103	38.15	V
Straw is precious fodder for cattle	101	37.41	VI
Early maturity of crop	93	34.44	VII
For efficient use of fallow land	20	07.41	X
Lack of irrigation resources	05	01.85	XI
Assured harvest up to some extent in drought and flood situation	05	01.85	XII

\* Data are based on multiple responses

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