

System of Millet Intensification:

In order to provide a boost to cultivation of finger millet which is a nutritious, climate resilient local crop, we decided to apply the principles of SRI (older seedling, spaced planting) to finger millet.

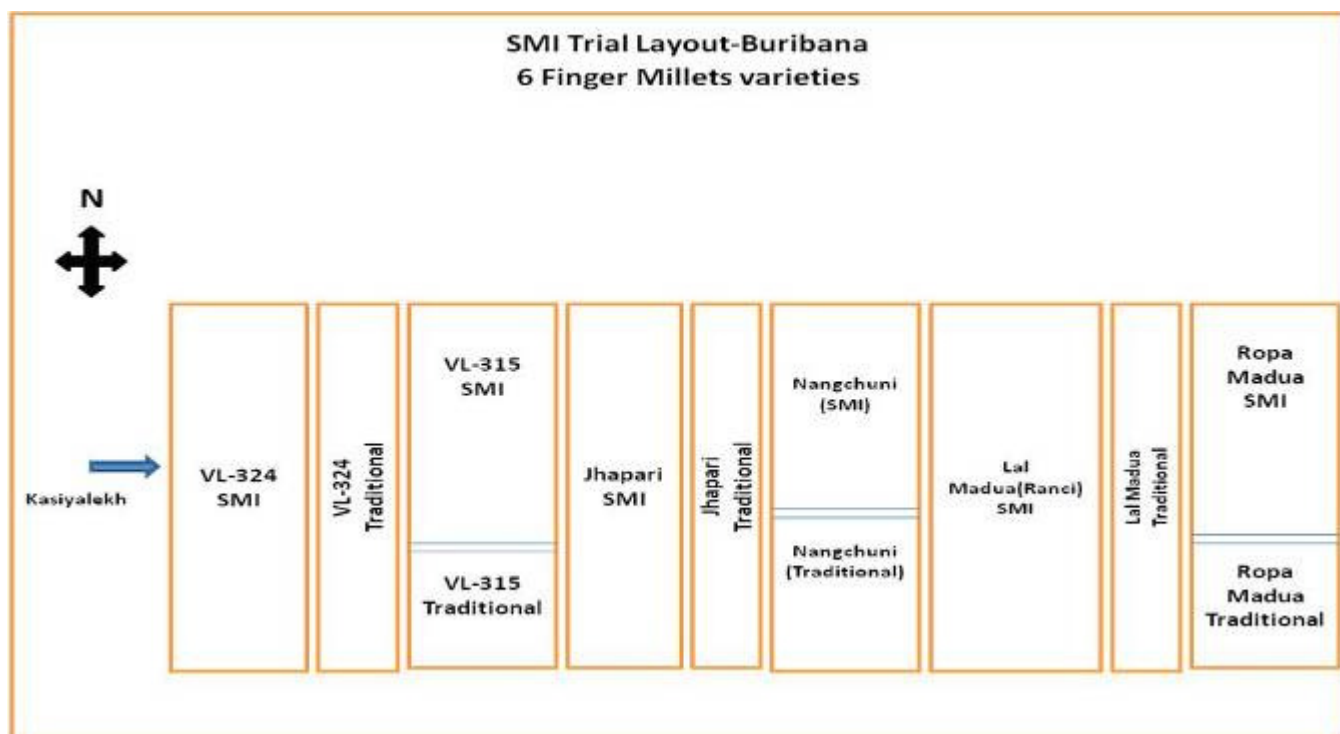
Trials of SMI (System of Millet Intensification) were conducted in two different locations in the Ramgarh and Dhari blocks of Nainital district.

Methodology:

Two traditional varieties of finger millet from Uttarakhand (Jhapri and Nangchuni), two traditional varieties from Jharkhand (Lal madua, Ropa madua) and two improved varieties bred at the VPKAS research station in Almora were selected for trials under SMI conditions.

Varieties	Source
Jhapri	Farmers Uttarakhand
Nangchuni	Farmers Uttarakhand
Lal Madua	Farmers Jharkhand
Ropa Madua	Farmers Jharkhand
VL-315	VPKAS, Almora
VL-324	VPKAS, Almora

Trial layout



SMI Trial Layout-Kilore
6 Finger Millets varieties



→
Kilore
Village



→
Paddy
trial



SMI trial field



SMI trial field



Increased tillering in SMI plants

Results

Kilore- SMI Data Summary Sheet (2013)

Six Verities																
Varieties name	Average plant height	Effective tillers		Culm branches		Average Panicle length of main panicle (in Cm)	finger no main pannicle			Average pannicle weight (in gram)	Avera ge root length (in Cm)	% increa se in SMI	1000 grain seed weight in gram	% incr ease in SMI	yeild(1 square meter area)	% incre ase in SMI
		Range	Mean	Range	Mean		Range	Mean	% increa se in SMI							
Jhagri(SMI)	83	9 to 13	11	11 to 20	15.5	10	8 to 10	9		4.5	27		4.30		262.6	
Jhagri(Control)	72	1 to 2	2	2 to 9	5.5	8	6 to 8	7	29	3	22	23	3.10	39	190.5	38
Nangchuni(SMI)	77	8 to 12	10	14 to 26	20	6.5	6 to 9	7.5		4	32		3.20		198.8	
Nangchuni(Control)	68	1 to 4	2.5	2 to 7	4.5	5	4 to 7	5.5	36	3	21.5	48	2.60	23	151.2	31
VL-315(SMI)	65	11 to 14	12.5	18 to 32	25	5.5	6 to 8	7		3.6	33		3.80		179.7	
VL-315(Control)	59	1 to 4	2.5	3 to 9	6	4.8	4 to 6	5	40	2.4	23.5	40	2.90	31	128.6	40
VL-324(SMI)	85	6 to 13	9.5	11 to 26	18.5	7	5 to 10	7.5		5.8	28		3.40		204.3	
VL-324(Control)	74	1 to 3	2	2 to 7	4.5	5	5 to 7	6	25	4.6	23.5	19	2.40	42	132.6	54
Lal Madua Ranchi(SMI)	75	8 to 12	10	10 to 21	15.5	6	6 to 8	7		3.5	27		2.90		57.4	
Lal Madua Ranchi(Control)	64	1 to 3	2	2 to 6	4	4.5	4 to 6	5	40	2.1	21	29	2.30	26	46.7	23
Ropa Madua Ranchi(SMI)	68	5 to 8	6.5	8 to 13	10.5	5.3	6 to 8	7		2.9	32		2.70		57.2	
Ropa Madua Ranchi(Control)	61	1 to 2	1.5	2 to 4	3	4.2	5 to 8	6.5	8	2.3	27	19	2.10	29	42.3	35

Buribana- SMI Data Summry Sheet (2014)

Six Varities

Varieties name	Average plant height	Effective tillers		Culm branches		Average Panicle length of main panicle (in Cm)	finger no main pannicle			Average panicle weight (in gram)	Aver age root lengt h(in Cm)	% incre ase in SMI	1000 grain seed weigh t in gram	% increas e in SMI	yeild(1 square meter area)	% incre ase in SMI
		Range	Mean	Range	Mean		Rang e	Mean	% incre ase in SMI							
Jhapri(SMI)	81	8 to 12	10	12 to 20	16	11	8 to10	9		5	25		4.80		257.3	
Jhapri(Control)	74	1 to 2	1.5	2 to 6	4	8	5 to 7	6	50	3	20	25	3.60	33	198.4	30
Nangchuni(SMI)	74	7 to11	9	12 to 22	17	6	6 to 8	7		3.5	30		2.90		181.4	
Nangchuni(Control)	65	1 to 3	2	2 to 6	4	4	3 to 6	4.5	56	2.3	22	36	2.30	26	136.0	33
VL-315(SMI)	64	12 to 16	14	21 to 38	29.5	5	5 to 8	6.5		3	31		3.20		185.6	
VL-315(Control)	57	1 to 3	2	3 to 8	5.5	4	4 to 5	4	63	2	25	24	2.40	33	132.4	40
VL-324(SMI)	87	8 to 14	11	13 to 27	20	6	6 to 11	8.5		4.5	30		3.20		199.0	
VL-324(Control)	72	1 to 2	1.5	2 to 5	3.5	5	5 to 8	6.5	31	3.7	25	20	2.00	60	119.3	67
Lal Madua Ranchi(SMI)	70	8 to10	9	12 to18	15	5	6 to 7	6.5		3	24		3.30		52.3	
Lal Madua Ranchi(Control)	62	1 to 2	1.5	1 to 4	2.5	4	4 to 6	5	30	1.5	19	26	2.70	22	43.9	19
Ropa Madua Ranchi(SMI)	71	6 to 8	7	9 to 11	10	5.4	6 to 7	6.5		2.5	30		3.00		54.1	
Ropa Madua Ranchi(Control)	60	1 to 1	1	1 to3	2	4.5	5 to 6	5.5	18	1.8	24	23	2.30	30	39.6	37



Tillers and Culm Branches in SMI and control plants



Difference in panicle size between SMI and control plants



Difference in root size and shape between SM and control plants

Trials on System of Millet Intensification

Applying the principles of SRI (System of Rice Intensification) which we refer to as System of Millet Intensification (SMI), includes spaced planting and transplanting older seedlings, to the cultivation of finger millets showed very positive results. This was seen across all four traditional varieties and the two improved varieties tested, though to differencing extents.

Trials were conducted in 2013 and 2014 in two different locations. The results from the two trials appear to be convergent, leading in the same direction.

The finger millet varieties from Jharkhand which are adapted to a vastly different ecosystem grew satisfactorily in Uttarakhand although somewhat less vigorously than local Uttarakhand varieties. They also showed an improved response to SMI conditions when cultivated in Uttarakhand. This indicates the great climate resilience and large cultivation window of this versatile and important crop. *The results of this study highlight the importance of finger millet in climate adaptation strategies to stabilize food production. Finger millet has the additional advantage of being a hardy crop and a highly nutritious cereal.*

Highlights of study

1. SMI plants showed vigorous growth with tiller numbers increasing by as much as 4 to 5 times.
2. Culm branching also showed significant increase, with SMI plants showing 3 to 4 times as much branching as the non SMI control plants.
3. Roots were somewhat longer though not significantly so and much more bushy with many more secondary and tertiary roots in SMI plants compared to control plants. The changed root architecture is similar to what is seen in rice and almost all crops that have been tested under the principles of SRI .The larger, bushy root system is a key factor in ensuring efficient uptake of water and nutrients leading to vigorous plants which show yield increases to varying extents.
4. In SMI plants, vigorous growth extended to the length of the panicles, which showed higher number of fingers in some cases.
5. 1000 gram weight was also higher in the SMI plants, the increase ranging from 22 to 60 %.
6. The maturity period appears to be delayed in plants grown under SMI conditions. This is likely because the large, stronger plants finish their vegetative growth later and seed setting is hence delayed.
7. Yield was measured from the grain output of 1 sq mt. plots. Yield in the case of all varieties was higher under SMI conditions. The best response to SMI conditions was consistently seen in the improved variety VL 324 which showed a yield increase of 54 % in Killore and 67% in Buribana. These are very high figures and derived from very small plots. They are indicative but must be tested in large areas over a few cropping seasons.