

Success Story

Enhancing Lentil production for nutritional security and sustainable rice-based production system in Garo Hills districts of Meghalaya

Tanmay Samajdar, Mokidul Islam, Tarun kumar Das, N. Arun Kumar Singh and Rashmi Hajong

Introduction:

West Garo Hills is one of the largest district of Meghalaya located in the western part of the State. The district is situated between the latitudes 90° 30' and 89° 40' E, and the longitudes of 26° and 25° 20' N. The West Garo Hills district was further divided into two administrative districts of West and South West Garo Hills on 7th August, 2012. Tura is the district headquarters of West Garo Hills and Ampati is the district head quarter of South West Garo Hills district. The West Garo Hills district has six development blocks with an area of 2,93,400 ha and population of 4,70,796 (2011 census). The South West Garo Hills district is divided in two development blocks with a population of 1,46,705. The districts are pre-dominantly inhabited by the Garos, a tribe with a matrilineal society belonging to the Bodo family of the Tibeto-Burman race tribes. Other indigenous inhabitants are the Hajongs, Rabhas, Koches, Rajbansis, Meches, Kacharis, Dalus and other minority caste. Both the district falls under the subtropical Agro- Climatic Zone condition. The main crops grown are paddy, maize, pumpkin, ginger, turmeric, chillies, cashewnut, arecanut, pineapple and tuber crops followed by black gram, ground nut during kharif and mustard, winter vegetables during rabi season.

Back ground of operational area:

Agriculture and allied fields are the major income generating sources for more than 70% of population in the districts. According to 2011 census, agriculture provides full time employment to 13.56 per cent of total workers. The total geographical area of both the district is 367700 Sq.km and its net sown area is 95644 ha. Out of total land holdings 70 -75% comes under small and marginal farmers. The climate of the district is largely controlled by South-West monsoon and seasonal winds. The West Garo Hills and South West Garo Hills district being relatively lower in altitude to the rest of Meghalaya, experiences a fairly high temperature for most part of the year. The average rainfall is 2800-3300 mm of which more than two-thirds occur during the monsoon, winter being practically dry. The district shows different types of soil as the provenance differs widely. Red Gravelly Soil and Red Sandy Loam in the hilly slopes and Clayey Loam in the plains are the common soil types. The soils are acidic in nature and comparatively rich in organic matter and nitrogen but poor in phosphorous and low to medium potash. The district experienced drought

situation from last decades but the agricultural productivity is sustaining due to adoption of improved agricultural technological interventions.

Table 1: Area, production and productivity of lentil

Year	Meghalaya			West Garo Hills		
	Area (ha)	Production (T)	Productivity (q)	Area (ha)	Production (T)	Productivity (q)
2009-10	332	274	825	299	250	840
2010-11	339	280	826	305	255	840
2011-12	356	296	831	320	269	840

Source: Directorate of Economics & Statistics MoA GoI, 2012-13, District Statistical Officer, Tura

The area and production of lentil crop in West Garo Hills, Meghalaya has been increased from 2009-10 to 2011-12. However, the productivity remains stagnant in three years.

Problem Diagnosed:

Lentil is one of the important pulse crop consumed daily by every household of Garo Hills districts of Meghalaya but the farmers are unaware about the scientific cultivation practices of the crop. Krishi Vigyan Kendra, ICAR, West Garo Hills is implementing NFSM Pulse Project for nutritional



security and sustainable rice-based production system in various parts of Garo Hills districts of Meghalaya. Due to unavailability of suitable varieties and lack of knowledge about the scientific cultivation, productivity of lentil crop is stagnant over the years. The problem of moisture stress during flowering and pod formation stage of crop is the main issue of the operational villages. Krishi Vigyan Kendra, West Garo Hills addressed this issue during survey and group discussion with farmers.

Table 2: Major problems in lentil production (ranking wise) based on PRA

Problem	Rank
Unavailability of quality seed	1
High seed price	3
Infestation of Insect-pest attack and Diseases	5
Water deficiency	4
Unavailability of fertilizers & other inputs on time	2
Marketing problem of the produce	6
Others like, problem of wild animals and not suitable agro-climatic conditions	7

*Scoring is done on a 1 to 7 scale, where 1=lowest score and 7 = highest score

KVK Interventions

In view of the above facts, KVK, Tura has intervened with the suitable varieties such as HUL- 57, PL-06, PL-08, NDL-1, VL Massor-126 of lentil. Two awareness cum training programme in 2013-14 with 95 participants and four awareness cum training programme in 2014-15 with 161 participants were organized to make the farmers aware of the different improved varieties and cultivation practise of lentil. Four method demonstration in 2013-14 and five method demonstration in 2014-15 at farmers' field were organized. The technological interventions through full package demonstration of four lentil variety (PL06, PL08, HUL-57, and NDL-1) was undertaken in 23 different villages covering an area 70.05 ha in 255 farmers field in West Garo Hills district of Meghalaya during rabi 2013-14. 5 field days were organized in different villages for better spread of the technology.



Technological Intervention through KVK

Sl. No.	Description	Technology
1.	Seed rate	Normal Cultivation: 30-40 kg/ha Relay cropping: 50-60 kg/ha
2.	Variety	HUL- 57, PL-6, PL-8, NDL-1, VL Massor-126
3.	Seed inoculation with biofertilizer	<i>Rhizobium</i> inoculation (20g/kg of seed)
4.	Sowing time	Ideal sowing time for Meghalaya is 15 th October to 15 th November (Normal). 15 th November to 15 th December is the ideal sowing time under Rice fallow situations(Relay)
5.	Spacing	30 cm(row to row) x 10 cm (plant to plant)
6.	Fertilizer application	20 kg N, 40 kg P ₂ O ₅ , 20 kg K ₂ O, 20 Kg S/ha (10 – 15 Kg/ha ZnSO ₄) when surface seeding is done.
7.	Weed management	Pre-emergence application of 0.75 kg/ha pendimethalin + Hand weeding at 45 DAS.
8.	Plant protection measures	Fungicide treatment with Thiram/Bavistin 2g/kg of seed before sowing.
9.	Water management	Light irrigation at flower initiation stage or pod formation stage
10	Foliar spray	Foliar application of 2% urea at flowering and pod formation significantly enhances yield of lentil.
11	Harvesting	The full season varieties can be harvested by mid March while the early season varieties become ready for harvest by mid February

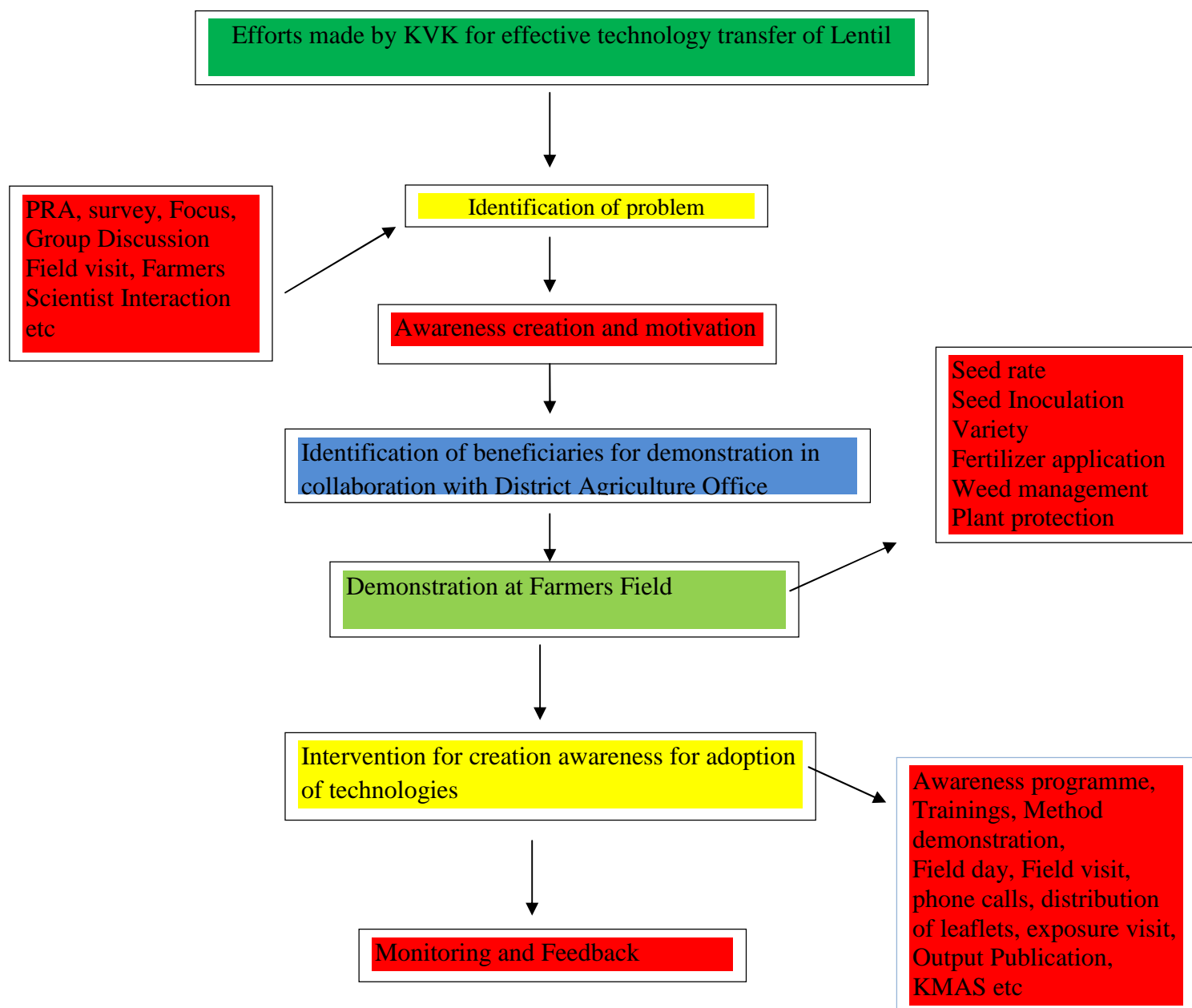


Fig 1: Flow chart for implementation of Lentil technologies into farmers' field

Output

Table 4: Performance of lentil varieties under normal sowing during Rabi 2013-14

Variety	Seed Yield (kg/ha)	% increase over farmers local
PL 06	647	5.20
PL 08	670	8.94
HUL 57	1050	70.73
NDL-1	850	38.21
Farmers Local	615	-
Total/ Average	804	-

During the year 2013-14, four varieties shown in table 2 were evaluated at the selected farmers' field. From the observation, productivity of the variety HUL 57 recorded the highest seed yield of 1050 kg/ha as against the other varieties. Hence, in the year 2014-15, HUL 57 was demonstrated in 36 villages covering an area of 70 ha in 265 farmers' field along with some acres of land sown with VL Masur 126.



Table 5: Performance of lentil varieties under normal sowing during Rabi 2014-15

Variety	Area	No. of beneficiaries	Seed Yield (kg/ha)	% increase over farmers local	Cost of cultivation (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C ratio
HUL 57	58	202	986	70.73	22444	49300	26856	2.19
VL Masur 126	3.33	7	850	38.21	22444	42500	20056	1.89
Farmers Local	-	-	689	-	19750	34450	14700	1.74
Total/ Average	61.33	209	-	-				

Productivity of lentil under HUL 57 variety recorded of 986 kg/ha as against 689 kg/ha under traditional variety. There was 70.73 % yield increased under variety HUL57 over farmers' variety. The higher net return of Rs.26856/ha as against of Rs.14700/ha under farmers practice was recorded. B: C ratio received under HUL 57 variety is 2.19.

Outcome

Table 6: Extent of coverage and spread of technology

Name of Village(s)	Area covered (ha) (2013-15)	Farmers involved (2013-15)	Number of farmers (2015-16)			Area covered (ha) by the farmers (2015-16)		
			Old/Adopted farmers continued the crop	No. of New (Indirect) Farmers)	Total farmers	Area covered by old farmers	Area covered by new farmers	Total area
Sathigre	2.75	10	8	4	12	2.64	1.1	3.74
ChilsongApal	3.3	12	9	7	16	3.69	1.78	5.47
Belbari	4.67	17	13	9	22	5.98	2.1	8.08
Charbalapara	2.2	8	7	3	10	3.01	0.5	3.51
Solairtek	4.94	18	14	13	27	5.6	1.24	6.84
Haripur	30.76	95	91	63	154	43.75	27.3	71.05
Namabilla	4.67	17	16	11	27	5.76	1.12	6.88
Silkata	4.4	16	13	12	25	7.67	1	8.67
Fesharkandi	4.4	16	12	10	22	7.56	2	9.56
Rimrangpara	2.47	9	7	3	10	1.61	1	2.61
Gambegre	2.2	8	7	2	9	2.87	0.4	3.27
Amindagre	3.57	13	9	7	16	2.07	1.2	3.27
Dilnigre	3.3	12	9	9	18	3.87	0.6	4.47
Bogadoll	0.82	3	1	1	2	0.43	0.36	0.79
Haribanga	1.65	6	4	2	6	1.72	0.24	1.96
Bogularbhita	4.4	16	13	13	26	9.98	6.75	16.73
Daigre	1.37	5	3	2	5	1.29	0.62	1.91
Jugirjhar	2.2	8	6	3	9	2.58	0.2	2.78
Hatogaon	0.82	3	2	1	3	0.86	0.31	1.17
Dorambokgre	0.82	3	2	1	3	0.86	0.28	1.14
Asimgre	1.37	5	3	1	4	1.29	0.2	1.49
Dengasi	0.55	2	1	1	2	0.43	0.16	0.59
Garobadha	3.85	14	11	9	20	2.75	0.75	3.5
Modelgre	0.80	4	3	6	9	1.35	2.36	3.71
Gadarugre	0.65	4	2	2	4	0.98	0.68	1.66
Bolchugre	0.32	2	2	0	2	0.86	0	0.86
Jubingre	0.42	3	3	8	11	1.25	6.36	7.61
Adinggre	0.42	3	2	3	5	0.39	1.21	1.6
Bandangre	1.2	5	5	8	13	1.65	2.32	3.97
Napakgre	1.4	8	7	12	19	1.92	1.45	3.37
Salhegre	0.32	2	0	0	0	0	0	0
L/Wategre	0.8	4	4	8	12	1.0	1.65	2.65
U/Wategre	1.4	9	6	13	19	0.98	1.76	2.74
Nengkapara	0.7	4	4	7	11	0.82	1.23	2.05
Raksangre	0.42	5	5	8	13	0.55	1.05	1.6
Ajusigre	0.85	7	6	14	20	0.65	0.75	1.4
Angasipara	0.52	5	5	11	16	0.60	1.10	1.7
Kasaripara	3.8	15	12	8	20	4.0	2.50	6.5
Sialkandi	2.8	5	5	7	12	3.0	2.25	5.25

Rajabala	3.5	9	8	15	23	4.50	7.15	11.65
Bhanalgaon	4.0	10	8	7	15	5.10	3.75	8.85
Benabazar	3.3	12	12	4	16	4.50	3.00	7.5
Garodubi	2.4	10	10	18	28	3.0	5.0	8
Kalogaon	1.85	9	9	6	15	2.50	1.75	4.25
Rakhaldubi	0.42	3	3	7	10	0.5	0.75	1.25
Dahagolipara	1.5	7	6	5	11	1.75	1.50	3.25
Phuljuri	1.6	7	7	14	21	1.70	2.75	4.45
Bhoirakupi	3.55	13	13	9	22	4.00	2.50	6.5
Zigitalpara	0.55	2	2	1	3	1.0	0.35	1.35
Mahendraganj	1.2	5	5	7	12	1.5	1.5	3
Magurmari	1.0	4	4	12	16	1.25	3.0	4.25
Rongkaigre	0.42	3	3	7	10	0.5	0.95	1.45
Ulubari	4.55	16	15	8	23	6.0	3.0	9
Kalegaon	0.32	2	2	2	4	0.5	0.35	0.85
Silbari	0.65	3	3	2	5	0.75	0.50	1.25
Murikhuti	0.55	2	2	5	7	0.50	0.35	0.85
Samati	0.42	2	2	1	3	0.50	0.15	0.65
Kumli	0.42	3	3	3	6	0.75	0.50	1.25
Total	140.5	523	449	435	884	179.07	116.68	295.75

Table 7: Effect of Training and Demonstration on Knowledge Skill and Attitude of the lentil farmers

Variable	Before and After	No of Farmers	Mean Score	SD	SE
Knowledge	Before	40	5.95	1.87	0.34
	After	40	10.4	2.02	0.32
Attitude	Before	40	16.7	3.99	0.63
	After	40	25.0	3.62	0.57
Skill	Before	40	2.58	1.24	0.20
	After	40	5.75	1.08	0.17

Table 8: Result of Paired t-test

Variable	No of Farmers	Mean Score (Difference)	SD (Difference)	SE (Difference)	df	Paired t value
Knowledge	40	4.45	2.24	0.35	39	12.56***
Attitude	40	8.30	4.18	0.66	39	12.58***
Skill	40	3.18	1.39	0.22	39	14.41***

i. *** Significant at $p < 0.01$ level of significance

The pair t-test result clearly showed that the mean score knowledge attitude and skills of the participating farmers on Lentil production has significantly increased after the programme.

Suggestions for policy initiatives

- (i)** Incorporating high yielding varieties of pulses in the cropping system, particularly promotion of lentil cultivation in rice-fallows,
- (ii)** Seeds of short duration varieties of lentil which are tolerant to drought and heat stresses should be made locally available to the farmers,
- (iii)** Coordination of research, extension and farmers through institutional innovations for effective technology dissemination and input delivery mechanisms
- (iv)** Extension service should be strengthened for higher diffusion of lentil technology.
- (v)** Reduction of storage losses through improved infrastructures and improved market information and
- (vi)** Marketing forecast to protect farmers from wide price fluctuations that will incentivize farmers to adopt new technology