A Success story

on

Zero tillage Pea in rice fallow under climate change adaptation

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The Nongthymmai village in Ribhoi district of Meghalaya under the subtropical hill agro-climatic zone is a climatic vulnerable village mostly affected by acute scarcity of water during rabi season. The main occupation of the village population rests on agriculture and allied activities with around 1/3rdof cultivable area under *jhum* farming. The farmers of the village use to grow different type of crops like rice, maize, soybean, tomato, brinjal, ginger and turmeric etc. but with a low cropping intensity of hardly about 110-120%. Generally, most of the farmers in the village follow mono-cropping system of rice cultivation. Instead of taking up any second crop after kharif rice, the farmers of this village leave their rice field fallow during rabi season owing to release of excess moisture through seepage from surrounding hillocks immediately after rice followed by long dry spell of rainfall during November-March, lack of irrigation facilities, high run-off water loss etc. Cultivation of second rice becomes impossible due to onset of winter that results in spikelet sterility thus putting the socio-economic status of farmers of the village at a dismal state. Therefore, in order to enhance the cropping intensity of the village by exploring the best possible resource conserving technologies (RCTs) by using the local available resources like residual soil moisture and existing crop residues of kharif rice; ICAR Research Complex for NEH Region, Meghalaya introduced the zero tillage technology in Nongthymmai village under NICRA (Technology Demonstration) component.

The Nongthymmai village normally receives a rainfall period around eight months from March to October with maximum average rainfall of 400 mm spreading over four months i.e. during the month of mid May to mid August and the remaining four months receive no rain. But due to climate change there was shifting of rainfall period leading to acute scarcity of water and moisture stress during November to February and rise in temperature of the region with a maximum temperature of 320C and minimum temperature of 120C as compared to preceding years for which the farmers of the village keep their land fallow after harvesting of kharif rice by the end of November. The only solution to this problem is Zero tillage cultivation in rice-fallow, which is a resources conservation technology for enhancing the cropping intensity, farm income and livelihood status. It is an energy saving technology helps in building up of soil health due to non- tillage and enhances soil microbial activities.

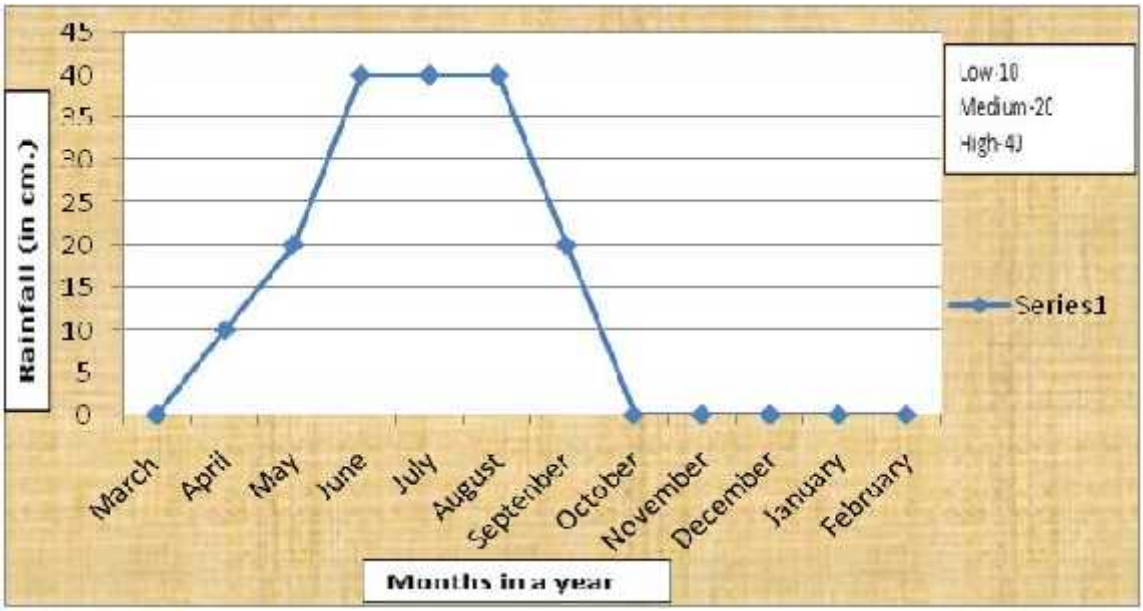


Fig: Frequency of rainfall in Nongthymmai village

In order to have a successful intervention of *Zero tillage technology* in Nongthymmai village as a climatic resilient technology; initially some capacity building programmes were organised on *Zero tillage technology* in which skill based knowledge on the technology was imparted to the farmers for augmenting the production and productivity of second crop after rice under soil-moisture stress condition by reduction in tillage, retention of adequate amount of crop residues for moisture conservation and soil organic matter maintenance thereby enhancing the cropping intensity that lead to increase in income and ameliorate the socio-economic status of the farmers of Nongthymmai village.

Fig: Training –cum- field demonstration on Zero tillage cultivation of peas by ICAR Scientist in Nongthymmai Village

Initially the zero tillage cultivation technology was adopted by one progressive farmer Mr. Stephan Shadap in Nongthymmai village during 2011-12. Mr. Stephen Shadap is the President of Nongthymmai Development Society in Umsning block of Ribhoi district of Meghalaya. Thirty five years old Mr. Shadap is a progressive farmer of the village with about 1.0 ha of land holding. Apart from involving himself in various developmental activities in the village, he practises improved agricultural production technology of rice, maize, ginger, tomato etc. as per the recommendation of ICAR Research

Complex for NEH Region, Meghalaya. Till November, 2011; he was following only mono-cropping system of cultivation. His rice field was lying fallow after the harvesting of kharif rice with very low cropping intensity. Since, the village was facing acute shortage of water during rabi season (November-March), zero tillage technology was introduced to access the adaptability of second crops during that moisture stress condition. A training-cum-demonstration programme on **"Zero Tillage Pea Cultivation"** was taken up in Nongthymmai village.

After the training the leader of the Nongthymmai village Development Society, Mr. Stephen Shadap came forward along with four other farmers of Nongthymmai village to take up the zero tillage method of cultivation on garden pea covering around 1.5 ha. ICAR provided all the critical inputs like seeds fertilizer, FYM etc. for successful demonstration on Zero Tillage Cultivation of Peas. Thereafter, regular monitoring of the demonstration programme was made by scientists and project staff through frequent village visits and timely advisory services.

A good crop of pea under zero tilage


Delighted Mr. Shadap with zero tillage technology


Harvesting of peas under Zero tillage cultivation

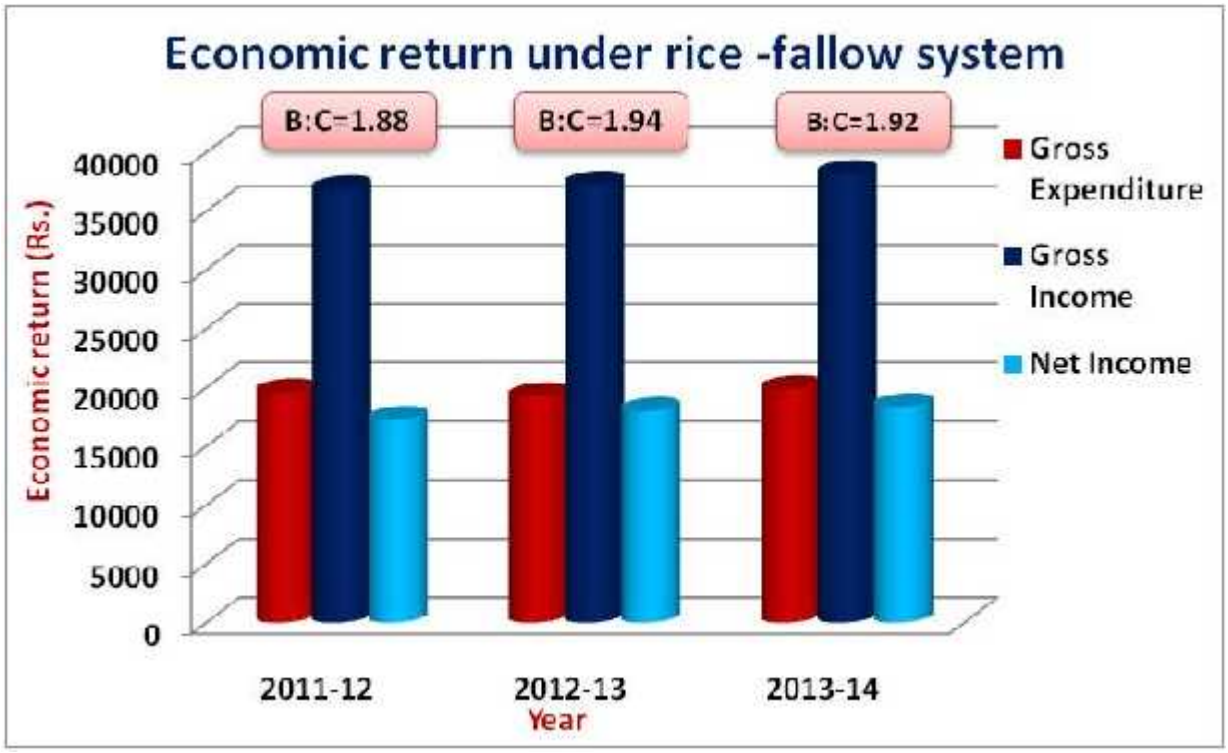
Effect of the technology:

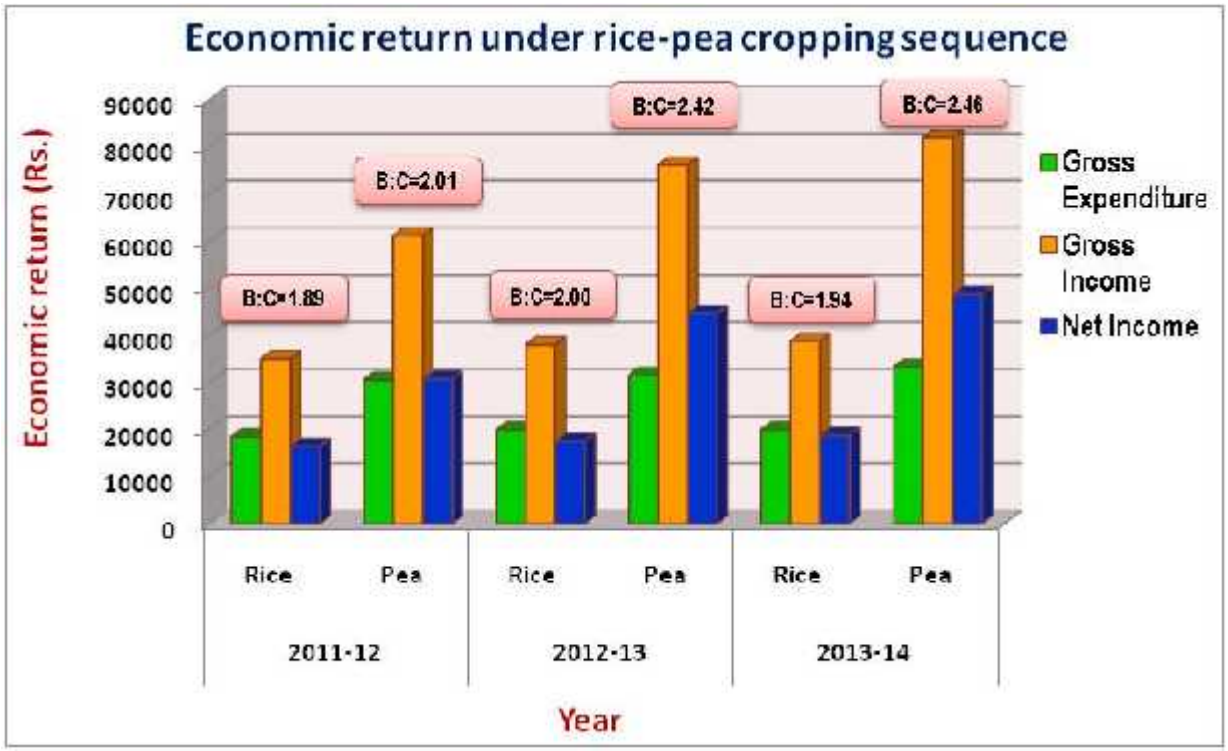
The demonstration on ***Zero tillage cultivation of Peas*** was conducted in Nongthymmai village continuously for three consecutive years from 2011-12 to 2013-14. Initially during the year 2011-12, this zero tillage cultivation of peas was demonstrated in Nongthymmai village with the involvement of 5 farmers under the leadership of Mr. Stephan Shadap covering about 1.5 ha. of land. It revealed that in all the demonstrations of rice-pea cropping system under zero tillage cultivation the combined gross return of the farmers were Rs. 96,200/- (2011-12), Rs. 1,14, 125/- (2012-13) and Rs. 1,20, 700/- (2013-14) earning a remunerative income of Rs. 47,200/- (2011-12), Rs. 62, 625/- (2012-13) and Rs. 67,450/-

(2013-14) which was much higher as compared to rice-fallow mono-cropping under conventional tillage (3-4 ploughing) as shown in table. In course of time the area and the number of farmer participants under this technology were increased to 10 farmers covering 4.5 ha. of land during 2012-13 and again in the third year (2013-14) it was further extended to 25 farmers with area coverage of 7.25 ha which indicated that this technology has been adopted successfully in Nongthymmai village. The average yield in case of demonstrated rice-pea cropping sequence under zero tillage cultivation was also very encouraging than that of rice-fallow cropping system (monocropping) implying increase in cropping intensity under zero tillage. In all the cases the rice-pea cropping sequence under zero technology was found to earn more net income with impressive B:C ratio of 1.96, 2.22 and 2.27 as compared to 1.88, 1.94 and 1.92 under rice-fallow (monocropping) system during the year 2011-12, 2012-13 and 2013-14, respectively.

Table : Economic return from different cropping sequences rice –fallow(monocropping) *VS* rice-pea (zero tillage)

Year	No. of farmers involved	Area covered (ha)	Cropping sequence		Av.yield (q/ha)	Gross Expenditure (Rs./ha)	Gross Income (Rs./ha)	Net Income (Rs./ha)	B:C ratio
2011-12	-	-	**Rice-fallow** (var. Shasarang) *(Monocropping)*		**36.85**	**19,600**	**36,850**	**17,250**	**1.88**
	5	**1.5 ha**	**Rice- Pea** *(Zero tillage)*	**Rice** (var.Shasarang)	35.00	18,500	35,000	16,500	1.89
				Pea (var. Vikash)	29.25	30,500	61, 200	30,700	2.01
				Rice+Pea	**64.25**	**49,000**	**96,200**	**47,200**	**1.96**
2012-13	-	-	**Rice-fallow** (var. Shasarang) (*Monocropping*)		**37.25**	**19,250**	**37,250**	**18,000**	**1.94**
	10	**4.5 ha**	**Rice- Pea** *(Zero tillage)*	**Rice** (var.Shasarang)	38.00	20,000	38,000	18,000	2.00
				Pea (var. Arkel)	31.65	31,500	76,125	44,625	2.42
				Rice+Pea	**69.65**	**51,500**	**1,14,125**	**62,625**	**2.22**
2013-14	-	-	**Rice-fallow** (var. Shasarang) (*Monocropping*)		**38.15**	**19,850**	**38,150**	**18,350**	**1.92**
	25	**7.25 ha**	**Rice- Pea** *(Zero tillage)*	**Rice** (var.Shasarang)	38.80	20,000	38,800	18,800	1.94
				Pea (var. Arkel)	32.75	33,250	81,900	48,650	2.46
				Rice+Pea	**71.55**	**53,250**	**1,20,700**	**67,450**	**2.27**





Horizontal spread of the technology:

The successful demonstration of this climate resilient Zero tillage cultivation technology under NICRA (Technology Demonstration) component of ICAR Research Complex for NEH Region, Meghalaya was realised by following the principles of *"learning by doing"* and *"seeing is believing"*. Prior to the intervention of this technology; the rice fields in Nongthymmai village usually remain

fallow without growing any second crop after rice. But after the successful intervention of this technology, farmers of the village could think of growing rabi pulses like pea successfully after kharif paddy instead of keeping the rice field fallow during rabi season. The successful adoption of this zero tillage cultivation of peas could create an impact among the members of the Nongthymmai Development Society to go for extensive adoption of the technology for better income generation from agriculture. The farmers of the village used to sell their produce in local mandi and Shillong Bara Bazaar that fetched a good market price of their produces. The impressive performance of ***Zero tillage demonstration of Peas*** conducted in Nongthymmai village awakened the farmers, farm women, rural youths of the same village as well as neighbouring villages namely *Klew, Nongpyrdet, Mawnohsynrum and Mawkyrdep* to adopt this resilient technology under climate change adaptation and mitigation to go for second crop after paddy as it helps to increase the cropping intensity and elevate net income. Moreover, this technology was also found to be a better reconciliation under the climatic stress condition.

Impact of the Zero tillage cultivation:

The rice- pea cropping sequence under zero tillage system enhanced the cropping intensity of the area to the tune of 150-155% with a substantial income enhancement of Rs. 29,995/- (2011-12), Rs. 44,625/- (2012-13) and Rs. 49,100/- (2013-14) over the rice- fallow (monocropping) system, respectively. The successful diffusion of this technology adorned Mr. Stephan Shadap with ***Innovative Farmer Award*** by ICAR Research Complex, Meghalaya and many other recognitions in different forums.

Acceptance of the technology by the farmers:

The farmers of Nongthymmai village were highly impressed and motivated by the zero tillage cultivation practices due to its cost effectiveness, less labour consuming, high energy saving increasing cropping intensity (%) and higher net income with efficient utilization of available resources in the village. In fact, the success of zero tillage technology empowered the farmers of the Nongthymmai village to put their demand before the state line department for cultivation of rabi pulses like pea, lentil and oilseed crops like mustard/ toria in addition to off-season vegetables in the rice fallow as second crops. Realising the potential of zero tillage pea cultivation in rice fallow, most of the Krishi Vigyan Kendras in the state started popularising the technology in the farmers' field.
