

*Impact Assessment study of*  
***IPM Basmati Project for***  
***boosting Diversification***

***Process in Punjab***

***By***

***Dr Joginder Singh***

***Consultant, Sir Ratan Tata Trust, Mumbai***

***Data collection & compilation***

***Dr P.L.Mehra***

***&***

***Gurinderjit Singh***

***Navajbai Rata Tata***  
***Trust***

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### **Executive Summary**

- *A logical comparison of project and non-project farmers indicates that due to advice rendered under NRTT, excessive use of urea, DAP, pesticides, particularly padan and water has been curtailed to a great extent. Timeliness of operations causing higher input use efficiency not only reduced cost but also improved average yield. Thus the Impact of the project owing to increase in average yield, reduction in cost and improvement in quality of output was estimated to be Rs10095 per hectare.*
- *Nursery raised by the farmers was reported to be in excess of their requirements. This was due to apprehensions about poor germination and dense transplanting but results in wastage which could be avoided by making some farmers specialized on the basis of village demand.*
- *A number of varieties such as Hybrid 6129, CSR30, CSR60, HRK47 etc are sown by quite a number of farmers in the area which need to be tested by researchers for guiding the farmers.*
- *For livestock feed, Basmati 386 has highest preference, Pusa 1121 lesser and Sarbati least preferred. How and to what extent it should be fed to an animal? This needs to be probed by animal nutritionists.*
- *About one-third number of respondents were getting short duration third crop before basmati such as moong, jantar, fodders, vegetables, berseem seed etc. Efforts need to be made to explore this possibility which would encourage basmati cultivation further.*
- *However, some of the information centres were not located at places convenient to the farmers and only available place was selected for displaying visual material and conducting meetings. To make it more effective, suitable accessible place for an information centre is essential.*
- *Scope of m-Krishi needs to be broadened rather than keeping it a secret with some individual farmers.*
- *Adoption gaps still exist in raising dense nursery and low plant density while transplanting which need to be minimized.*
- *Market information system should be developed such that farmers get the quality-wise prices prevailing in major markets so that they can take rational marketing decision.*
- *Literature on basmati supplied to the farmers should be same in all areas and should be properly corrected before getting published.*

## **Impact Assessment study of IPM Basmati Project for boosting Diversification Process in Punjab**

### **1. Introduction**

Punjab agriculture, after showing rapid growth has shown slackening. The sector had witnessed 5.37%, 5.24%, 3.08%, 1.90% and 2.28% compound growth rate in 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> plan period respectively. It clearly indicates that due to plateau in cultivated area, technology fatigue, and ecological constraints; further growth is becoming rather difficult. Paddy crop was an important component of such an exemplary growth and the area under the crop increased from just 3.90 lakh hectares in 1970-71 to 27.35 lakh hectares in 2008-09. It is now considered to be the main enterprise responsible for the present turmoil of overuse of water, depletion of soil health and a cause of air pollution. One typical solution for rectification of emerging ecological imbalance is increasing genetic diversification within rice. Basmati rice varieties are known for using less water and soil nutrients, has high export potential and its straw is economically used for livestock feed, rather than burning in the field and creating atmospheric pollution.

Geographically Basmati is a crop of the foot area of entire Himalayan falling in Indian and Pakistan sub-continent as the area is blessed with producing aromatic extra-long slender aromatic grains that elongate at least twice of the original size with soft and fluffy texture upon cooking and has delicious taste. India produces more than 70% of the total world basmati rice production and the rest is produced by Pakistan. Haryana, Punjab, U.P, Uttarakhand, and J&K are the major basmati growing states in India. The area and production of basmati rice in India has

increased overtime touching 4.5 million tonnes during 2009-10. Apart from increase in area under the crop, there is significant genetic improvement resulting in boost in average yield. The recommended varieties in Punjab are Punjab Basmati 2, Super Basmati, Basmati 386, Pusa Basmati-1, Basmati 370, Pusa Basmati-1121, Punjab Mehak 1 but the major area in Punjab is under Pusa Basmati 1121 and Basmati 386.

Basmati is not a new crop of Punjab. Geographically, Amritsar, Gurdaspur and Tarn Taran districts of Punjab have been known for fragrant Basmati since long. Even in the life history of Guru Nanak Dev, cultivation of Basmati gets special mention. However, cultivation of non-basmati rice which spread throughout the state during green revolution has been responsible for the exit of Basmati even in this area. Basmati 370 was a stable aromatic basmati variety for quite a long time but lacked yield potential. It has now been improved to Basmati 386, apart from a number of other genotypes. In the meantime, Pusa 1121 rice variety in the basmati category in 2008, the farmers in Punjab are encouraged to put more and more area under this variety to increase their profit margin. It is largely this variety having long and slender grain with high yield potential though lacking fragrance has been widely accepted for cultivation not only in the traditional basmati belt but in other parts of the state as well. This has led to doubling of the export of basmati in the last one year (Table 7).

Yet one serious problem haunting basmati production is that of a number of serious pests such as stem borer, leaf folder and diseases like Sheath blight, Foot rot, Bacterial leaf blight (BLB) etc. The farmers have to be cautious about plant protection. In the process, they make indiscriminate use of pesticides and thus make extra expenditure without realizing gain in yield. Najbhai Ratan Tata Trust initiated 'Reviving the Green Revolution' (RGR) cell in Punjab in 2002 to address to the problem of stagnation of farm economy through accelerating the need based research and extension activities. To hasten the process, Punjab Agricultural University (PAU) and Department of Agriculture, Punjab has also been sharing the responsibility. In the light of success achieved by SRTT in integrated pest

management (IPM) cotton, the similar model has been tried for Basmati crop in the traditional basmati belt. Hence the project 'Promotion of Integrated Pest Management Technology in Basmati to boost Diversification in Punjab' was started. A matching grant was also provided by Government of Punjab. Ultimately the project covered 150 villages (75 by NRTT and 75 by the Government of Punjab) with an annual outlay of Rs5 million per year for three years viz. 2009-11. Three districts, namely, Amritsar, Gurdaspur and Tarn Taran are covered with equal number of villages from each district. In the process, it was hypothesized that about 45 thousand farmers would be benefited and 3 lakh ha area is to be covered and each farmer is expected to get a benefit of Rs15000 per hectare through yield improvement, cost reduction, particularly on fertilizers and pesticides and improve the quality of the produce with a motive of getting higher prices.

This exercise is to assess the impact of efforts made to achieve the above mentioned objectives. The specific objectives of this study were;

1. To assess the adoption level of recommended practices for production and marketing of basmati in the area.
2. To quantify the economic, social and environmental impact of the interventions concerning IPM technology.
3. To study the role and perceptions of scouts about the implementation of the project.
4. To suggest ways and means to improve the structure and improve the operational efficiency of the project.

In spite of efforts, it was not possible to get the exact area, yield and production statistics of basmati varieties in Punjab. Some crop cutting experiments are made but area and production figures are unavailable. One reason for this is that a large continuum from coarse to superfine and aromatic varieties exist which do not exactly get rated as basmati and non-basmati even by market committees and buyers. An estimate of area, yield and production of basmati by Department of Agriculture, Punjab during 2008-09 is presented in Appendix 1.

According to another estimate, the area under Basmati rice in Punjab was 3.5 lakh hectare and production 10 lakh tonnes in 2008-09 which increased to 5.5 lakh hectare and production to 15 lakh tonnes in 2009-10 and further expected to increase to 6.5 lakh hectares and production to 20 lakh tonnes in 2010-11. The corresponding area in Haryana increased from 5 lakh hectares to 6 lakh hectares and 7 lakh hectares during the same periods. Consequently, there was a oversupply of basmati rice in Indian market which lead to fall in prices during 2009-10.

## 2. Methodology

The interventions made in IPM basmati were concentrated in Amritsar, Gurdaspur and Tarn Taran districts of Punjab. In each of these districts 50 villages were covered under the project. A random sample of 10 villages out of the covered villages during the current crop season was taken from these districts. A second stage sample of about 10 farmers from each of the selected villages was taken at random with probability of coverage of farmers from different farm size categories (Table 2). Thus in all, 318 farmers (103 farmers of Amritsar district, 106 farmers of Gurdaspur and 109 farmers of Tarn Taran district) were interviewed for the purpose of this study.

**Table 2: Sampling scheme of villages and number of respondents**

S. No	Village	Block	District	No. of respondents
1	Kohali	Chugawa	Amritsar	10
2	Khiala kalan	Chugawa	Amritsar	11
3	Salempur	Harsha Chhina	Amritsar	11
4	Bhagga	Harsha Chhina	Amritsar	11
5	Nasser	Ajnala	Amritsar	9
6	Nanoke	Ajnala	Amritsar	10

7	Harar	Ajnala	Amritsar	11
8	Bhakur kalan	Atari	Amritsar	10
9	Dhanoa khurd	Atari	Amritsar	10
10	Khallewal	Atari	Amritsar	10
11	Dugri	Dorangla	Gurdaspur	9
12	Pachhowal	Dinanagar	Gurdaspur	8
13	Rasoolpur	Dinanagar	Gurdaspur	15
14	Khokhar Rajputan	Gurdaspur	Gurdaspur	10
15	Dhoot	Gurdaspur	Gurdaspur	10
16	Lolenangal	Gurdaspur	Gurdaspur	10
17	Khokhar	Gurdaspur	Gurdaspur	11
18	Shahpurjajan	Gurdaspur	Gurdaspur	11
19	Behlolpur	Dera Baba Nanak	Gurdaspur	10
20	Kalanaur	kalanaur	Gurdaspur	12
21	Behla	Taran Tarn	Tarn Taran	10
22	Panjawar	Taran Tarn	Tarn Taran	12
23	Sohal	Gandiwind	Tarn Taran	15
24	Pringri	Patti	Tarn Taran	9
25	Kirtowal	Patti	Tarn Taran	12
26	Sanjnia	Patti	Tarn Taran	10
27	Jhamke	Taran Tarn	Tarn Taran	11
28	Harjindpura	Bhikiwind	Tarn Taran	10
29	Dall	Bhikiwind	Tarn Taran	10
30	Rajoke	Valtoha	Tarn Taran	10

A questionnaire covering farm inventory, farm practices followed, interventions made on basmati crop, socio-economic and ecological impacts visualized, operational problems faced and suggestions for further improvement of the project etc was prepared and pre-tested before administering to the respondents (Appendix 2). Another questionnaire for obtaining the views of the scouts of the selected villages, was also formulated with a motive of getting their responses about the operation of the project, problems faced and possible improvements needed (Appendix 3). The data were collected by personally interviewing the respondents. For comparison sake, another sample of farmers from 10 villages not covered under the project was taken from the area which formed baseline to quantify the impact of the project.

There are 4 villages in Basmati belt where m-Krishi is operational. The farmers of Nagkalan village were also interviewed to capture the impact of this exercise on farm economy.

### **3. Socio-economic background of area**

#### **3.1 Farm Size**

The average operational area was estimated as 12.51 acres of which 79% was owned and the rest about 21% was leased in on annual cash rent basis (Table 3.1). Land lease market was thus getting quite liberalized. The land rents have become quite remunerative to the landowners who having alternative employment opportunities shift out from agriculture sector. This has helped in increasing farm size and thus more rational utilization of farm resources. Leasing out land by these farmers was only negligible and was only in cases where land was fragmented and it was difficult to operate otherwise.

**Table: 3.1 Average farm size of basmati farmers in Punjab**

District	Number of respondents	Farm size (area in acres)			
		Owned	Leased in	Leased out	Operational
Amritsar	103	9.68	3.59	0.09	13.18

Gurdaspur	106	9.82	1.57	0.00	11.39
Tarn Taran	109	10.04	2.91	0.00	12.95
Overall	318	9.85	2.68	0.03	12.51
		(78.76)	(21.46)	(0.23)	(100.00)

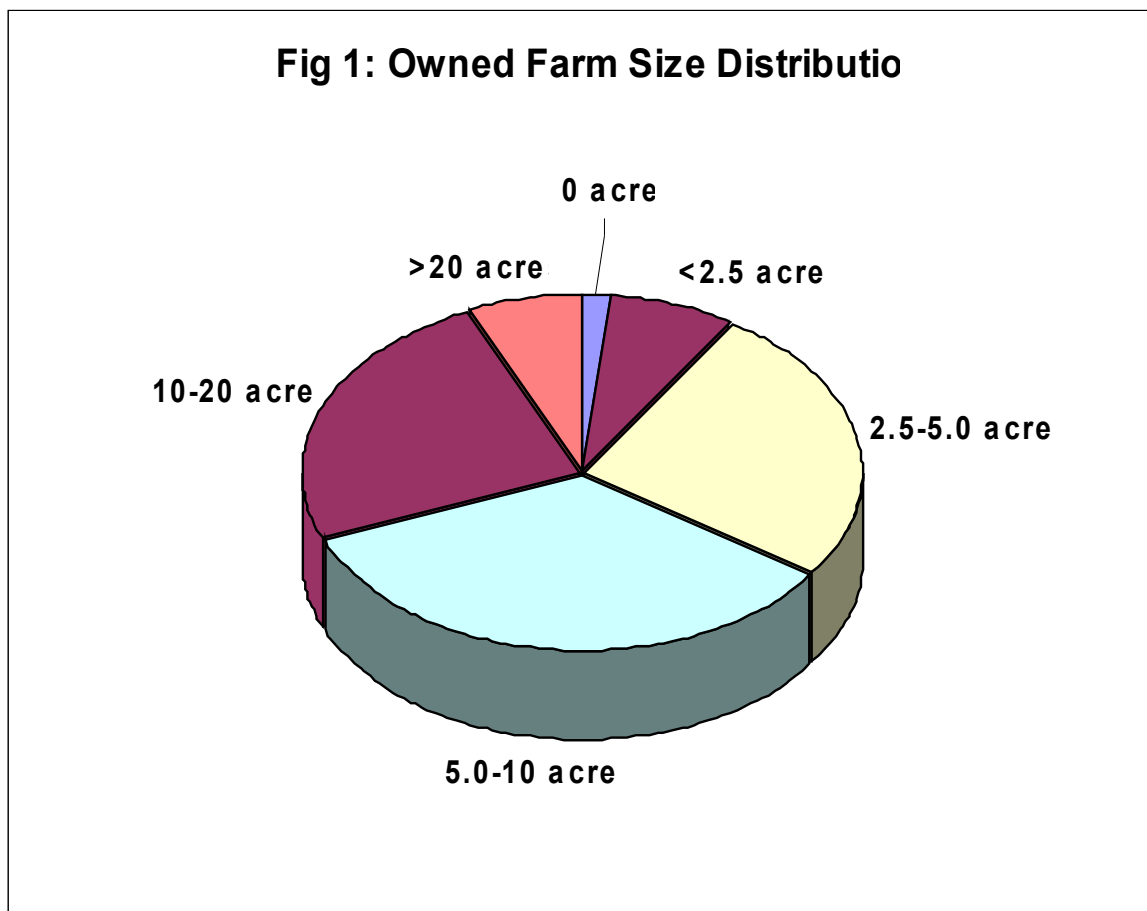
Figures in parentheses are percentages of operational area.

The distributions of respondents on the basis of owned area and operational area are presented in Table 3.1.1 and Table 3.1.2 respectively. There were 1.6% landless farmers who leased in land for fodder, basmati and vegetable cultivation. About 7% farmers owned land holding of less than 2 acres. Yet another 26% were having 2.5 to 5 acres of land. Therefore, more than one-third farmers were small and marginal. Majority of the farmers had 5-10 acres of owned land (Fig 1). The distribution in terms of operational holding was somewhat comfortable as compared to ownership. The land rents are rising overtime at a faster rate touching a level of 34 thousand per acre. Except in Gurdaspur where due to low crop productivity the land rents were lower, it varied from Rs23000 to Rs34000 per acre. The main reason for this is that of competition between farmers leasing in land and need to utilize fixed resources such as family labour and farm machinery having low opportunity cost.

**Table 3.1.1: Owned Farm Size distribution of respondents**

Farm size (acres)	Number of respondents				Per cent farmers
	Amritsar	Gurdaspur	Tarn Taran	Total	
0	1	1	3	5	1.57
<2.5	8	14	1	23	7.23
2.5-5.0	30	28	24	82	25.79
5.0-10	35	38	36	109	34.28

10-20.	20	18	40	78	24.53
>20	9	7	5	21	6.60
<b>Overall</b>	<b>103</b>	<b>106</b>	<b>109</b>	<b>318</b>	<b>100.00</b>



**Table 3.1.2: Operational Farm Size distribution of respondents**

Farm size (acres)	Number of respondents				Per cent farmers
	Amritsar	Gurdaspur	Tarn Taran	Overall	
<2.5	6	11	2	19	5.97
2.5-5.0	28	21	15	64	20.13
5.0-10	32	37	32	101	31.76

10-20	20	28	45	93	<b>29.25</b>
>20	17	9	15	41	<b>12.89</b>
Overall	103	106	109	318	<b>100.00</b>

### 3.2 Source of power

As may be seen from Table 3.2, there were 73 per cent farmers having owned tractor for performing various farm operations. About 60% in Amritsar and Gurdaspur and virtually all farmers of Tarn Taran had their own tractors. About 17% farmers had one bullock and cart to carry out some light operations while 36% farmers depended on tractor hiring or supplemented their draught power with hired tractors.

The source of irrigation is relevant for paddy crop. The main source of irrigation was electric tubewell mentioned by all the respondents. Only 10% were supplementing electric tubewells with diesel power as electricity supply was not regular. Only 5% reported canal water also available at certain times. Interestingly, all the tubewells were submersible due to poor quality water having high salts in the upper aquifer. The depth of borewell varied from one area to the other and it was mostly 200-300 ft in Tarn Taran, 150-250 ft in Amritsar and only 50-100 ft in Gurdaspur.

In Dinanagar block of Gurdaspur some farmers had automatic pressure borewells, which keep on running creating problem of water-logging. There is need to channelize this water for economic use in the area.

**Table 3.2: Source of power and water by % respondents**

District	Source of power			Source of irrigation		Water Table (Ft)
	Owned Tractor	Bullock	Hired Tractor	Electric tubewell	Canal	
Amritsar	59.2	28.2	42.7	100.0	0.0	150-250
Gurdaspur	58.5	3.8	40.6	100.0	1.9	50-100
Tarn Taran	100.0	18.3	25.7	100.0	11.9	200-300

<b>Overall</b>	<b>73.0</b>	<b>16.7</b>	<b>36.2</b>	<b>100.0</b>	<b>4.7</b>	

### 3.3 Livestock

Another typical characteristic of the area is that more number of animals is kept for supplementing their income from sale of milk. Some commercial dairy farms are also maintained. The simple logic is that basmati straw is used as animal feed as it is less toxic than non-basmati straw. The farmers were of the view that when basmati straw is available from November onwards, when the price of wheat straw is very high and thus the farmers rely on paddy straw for about 3 months without much additional cost for dairy animals. It was also reported by feeding basmati straw the milk yield goes up as unthreshed grains get fed with straw.

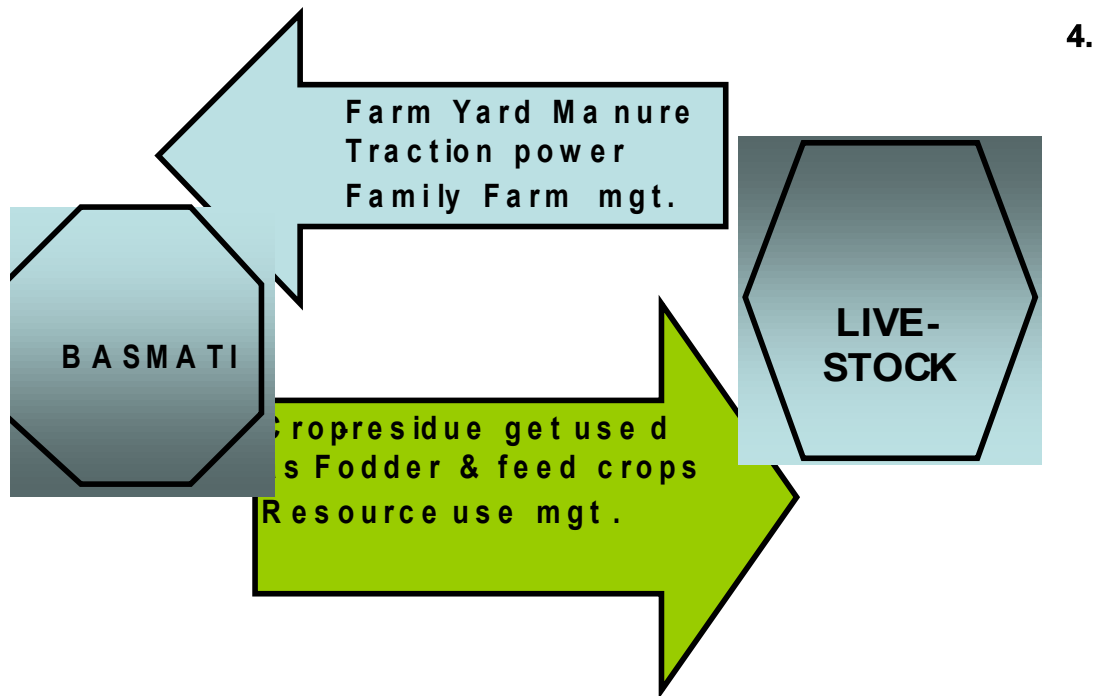
As may be viewed from Table 3.3, an average number of 5 milch animals along with young stock and dry animals were kept by the respondents and about 12 litres of milk daily was sold at a rate varying from Rs16 to Rs22 per litre depending upon the species of animal and location of village from city market.

The livestock is useful for the crops as sufficient quantity of Farm yard manure is available to meet the meet their soil nutritional requirements (Fig 2). That is why about 6.3% farmers did not use chemical fertilizers for basmati crop. Male animals are also used by some farmers for draught purposes in paddy crop.

**Table 3.3: Average number of milch animals kept by basmati farmers**

<b>District</b>	<b>Cows</b>	<b>Buffaloes</b>	<b>Total</b>	<b>Milk sold (Lt/day)</b>
<b>Amritsar</b>	<b>1.4</b>	<b>4.1</b>	<b>5.5</b>	<b>12</b>
<b>Gurdaspur</b>	<b>1.1</b>	<b>1.7</b>	<b>2.8</b>	<b>4</b>
<b>Tarn Taran</b>	<b>2.0</b>	<b>4.4</b>	<b>6.5</b>	<b>21</b>
<b>Overall</b>	<b>1.5</b>	<b>3.4</b>	<b>4.9</b>	<b>12</b>

**Fig 2: Basmati-livestock interactions**



#### **Basmati Cultivation practices**

For basmati cultivations, the farmers followed varied practices. On the basis of survey data, the following information outcome was arrived at

#### **4.1 Varietals picture**

Unlike other areas of Punjab, this is the traditional basmati belt and still maintaining major area of kharif season under basmati varieties. Therefore, this area does not present the average picture of the state. Further, the respondents taken for this study were purposively basmati farmers and thus true varietals picture of even these districts is also not reflected in the data compiled here.



<b>Basmati 386</b>	101 (98.1)	8.41 (63.8)	11.3	34 (32.1)	1.21 (10.6)	9.8	49 (45.0)	1.84 (14.1)	11.8	184 (57.8)	3.74 (30.0)	10.9
<b>Pusa 1121</b>	78 (75.7)	2.91 (22.1)	14.6	100 (94.3)	4.03 (35.4)	12.8	100 (91.7)	5.77 (44.6)	16.2	278 (87.4)	4.26 (34.1)	14.7
<b>Sarbati</b>	7 6.8)	0.02 (0.15)	16.1	32 (30.2)	0.75 (6.6)	16.4				39 (12.3)	0.26 (2.1)	16.4
<b>Punjab Basmati 2</b>	1 (1.0)	0.04 (0.3)	16.0				14 (12.8)	0.53 (4.1)	13.0	15 (4.7)	0.19 (1.6)	13.2
<b>Pusa44</b>	1 (1.0)	0.03 (0.2)	17.0	1 (0.9)	0.03 (0.3)	10.0				2 (0.6)	0.02 (0.2)	13.5
<b>HRK127</b>	1 (1.0)	0.04 (0.3)	5.8	1 (0.9)	0.04 (0.4)	25.9	4 (3.7)	0.08 (0.6)	27.4	2 (0.6)	0.05 (0.4)	21.8
<b>PR114</b>							4 (3.7)	0.14 (1.1)	25.6	4 (1.3)	0.05 (0.4)	25.6
<b>Pusa47</b>	10 (9.7)	0.41 (3.1)	24.3	68 (64.2)	4.29 (37.7)	23.2	24 (22.0)	1.18 (9.1)	25.5	102 (32.1)	1.97 (15.7)	23.8
<b>Others</b>	2 (1.9)	0.04 (0.3)	18.6				4 (3.7)	0.14 (1.1)	22.7	6 (1.9)	0.06 (0.5)	21.8

Figures in parentheses are percentages

#### 4.2 Crop sequence

Normally, Basmati 386 was transplanted in the first fortnight of July. It is ready in first fortnight of November. If transplanted early, it has more vegetative growth and is more prone to lodging. However, Pusa 1121 was transplanted about a fortnight earlier than Basmati 386. After basmati, wheat crop was sown even

though it gets late. In Gurdaspur, *berseem* fodder crop was generally sown after basmati. The farmers take 2-3 cuttings of fodder and then keep it for seed production. Yet quite a number of farmers were having practice of third crop after wheat following crop rotation such as *kharif* fodder-basmati-wheat to produce fodder for the livestock.

The major crop rotations with basmati followed by the respondents are presented in Table 4.2. It would be helpful if some Self Help Groups (SHGs) for the intervening catch crops such as berseem seed, moong, vegetables etc are formed to facilitate marketing of produce.

**Table 4.2: Crop sequences followed with Basmati**

S. No	Crop rotation	Per cent farmers
1	Fallow-Basmati-wheat	66
2	Basmati-Berseem fodder & seed	9
3	Moong-basmati-wheat	6
4	Fodder-basmati-wheat	11
5	Vegetable-basmati-wheat	2
6	<i>Jantar</i> -basmati-wheat	6

#### 4.3 Source of seed

Generally the farmers were keeping a part of the produce as seed or got it from fellow farmers as reported by about 77% farmers. As many as 21% purchased seed from the market. Only 2% reported that they got the seed from PAU/Department of agriculture.

#### 4.4 Raising Nursery

Land is well prepared by the farmers before sowing seed in the nursery. Seed at the rate of 1½ to 2 kg per *marla* was used and total of 5-6 kg seed/acre was kept for transplanting an acre. Thus 2-3 *marlas* were considered enough for raising

one acre nursery against the recommended size of 6 *marlas*. The seed rate was relatively less than recommended level of 8 kg/acre and less area was kept under nursery. The reason advocated by the farmers was that the labour transplants thinner population with only one in stead of two seedlings per hill. Thicker nursery was believed to keep the weeds under control. As an NRTT intervention, seed was treated with streptomycin and Bavistin and even roots of uprooted seedlings were also treated with Bavistin solution. With demonstration for about one acre, the farmers got the entire seed treated and some other farmers followed this practice. Generally 4-7 kg of urea and 2-3 kg DAP were applied and about 5 kg Zinc sulphate was used for nursery of one acre by 38.5% farmers. About 38% farmers used herbicides to control weeds. The number of irrigations to nursery varied from 5-12.

Invariably, all farmers had sown nursery from end May to early June. The seedlings are ready for transplanting in about one month. Due to inclement weather in 2010, transplanting of nursery in some areas of Punjab and Haryana was transplanted for the second time and thus excess area put under nursery was sold out at a price of about Rs250/marla or Rs600 for nursery of an acre. Even otherwise, sale of paddy nursery became an increasing trend which is useful for buyer and seller both and thus would minimize wastage. Nursery was stated to be ready in 30-35 days.

#### **4.5 Land preparation**

Before transplanting, land was well prepared with 2-3 ploughings and 2 puddlings costing Rs750 and Rs800 on custom hiring basis respectively. The transplanting was invariably done by manual labour. Most of the labour for transplanting was local labour. However, migrant labour at certain places was also there. The cost of transplanting did vary from village to village depending upon supply of labour. The average cost worked out to Rs1220, Rs1540 and Rs1380 per acre in Amritsar, Gurdaspur and Tarn Taran respectively. In spite of efforts of farmers to have closer transplanting, the estimated average number of plants was

reported as 25 per square meter against the recommended number of 33. Invariably one seedling was planted per hill.

#### **4.6 Plant protection**

To control the weed plants, herbicides such as Butachlor/ Machete/ Anilophos/ Rifit/ Stomp etc were used by majority of farmers. About 3.5% farmers reported that they did not use any herbicide and rather controlled the weeds manually. The average cost of herbicide plus labour was estimated as Rs200/acre.

Plant protection is an area requiring high stress under IPM. The farmers are used to making higher and indiscriminate use of pesticides for this crop. To control the common pests like plant hopper, hispa, leaf folder 2-3 applications of monocrotophos, chlorpyriphos, confidor etc were given. Attack of stem borer, false smut, sheath blight etc was felt in certain specific pockets. Such farmers used Padan/ Tilt. Attack of aphid was there more to Basmati 386 and much less to Pusa 1121. Rodents remained a typical problem for basmati. Late availability of fungicides for seed treatment was a problem reported in this context. Effort to minimize the use of pesticides helped in lowering the cost. Tilt was reported to be used for luster in grains as well.

#### **4.7 Lopping**

Lodging is a serious problem in case of Basmati 386. Quite a number of farmers do lopping of crop to reduce its height to check lodging, increase plant vigour and more tillering. The foliage was fed to the livestock. Lopping of Pusa 1121 was not done because of its hardy stem and comparatively less height.

#### **4.8 Irrigations**

Although it was not possible to get exact number of irrigations applied by the farmers and intensity of water per irrigation, but broadly 12-15 irrigations were

given to the basmati crop. As the crop season coincides with rainy season, basmati requires less water as compared to non-basmati. Therefore, any shift in the paddy varieties from non-basmati to basmati has significant positive impact on water saving.

#### **4.9 Fertilizer use**

In some areas where leguminous crops such as peas, beans, moong, *berseem* are included in the crop sequence, the use of urea gets decreased. Yet green manuring with *jantar* was done by 6.1% farmers. The area has a larger number of livestock as discussed earlier due to which adequate FYM was available. About 25% farmers used FYM at the time of land preparation depending upon the availability. The average use of urea, Diammonium Phosphate, Superphosphate and Muriate of potash worked out to 43 kg, 6.3kg, 0.9kg and 1.2kg/acre respectively. Urea was put in two split doses viz. at sowing and about a month after transplanting. Farmers were aware of the fact that for Basmati 386 less nitrogen is to be used to avoid excessive foliage growth and pest and disease problems. It has drastically gone low in case of basmati 386 but was higher for Pusa 1121 variety. Zinc sulphate was applied to nursery by 38.5% farmers apprehending zinc deficiency at later stage. To the crop zinc sulphate was applied at the rate of 5-8kg/acre by 12.9%, 10 kg/acre by 43.7% and 15-20kg/acre by 11.9% basmati growers.

#### **4.10 Harvesting & threshing**

In general non-basmati varieties were harvested with combines. Basmati 386 was harvested manually by paying Rs1800-2500/acre and only 3% farmers got Pusa 1121 harvested partly manually and partly by combine at Rs1200/acre while vast majority of farmers used manual labour for this purpose. Contract harvesting and threshing of basmati was also done by foregoing straw in lieu of

harvesting & threshing charges. Difficulty in threshing of basmati 386 was also reported by some farmers.

#### 4.11 Straw Management

Basmati 386 straw was stated to be sold at the rate of Rs1500-2500/acre and that of 1121 at Rs1500 per acre or Rs 750/ trolley. The straw of non-basmati was burned *in situ* creating problems of air pollution and soil health. In Gurdaspur surplus basmati straw was sold to the Gujjars at the price equivalent to harvesting & threshing cost. The basmati straw was used as feed by 55%, sold out by 42% and 3% burned after getting harvested with combine.

#### 4.12 Problems of basmati cultivation

An exhaustive list of problems faced by basmati growers based on past studies was prepared and administered to the respondents. As presented in Table 7, marketing of basmati was the most serious problem realized by 50% farmers. The market price was vibrant this season. In the post-harvest period, the price was lower than that of last year. So the farmers stored the produce. But later on it further declined making it still less remunerative. Further, they had to incur heavy expenditure for transporting the produce to markets. The average cost of transportation was worked out Rs25/qt or Rs500/trolley. Due to tall plants and inclement weather at times, lodging was reported more by Basmati 386 and less in case of Pusa 1121. About 27% respondents faced this problem. Associated with this was the rodent problem which became serious on lodged crop. The other problems reported were lack of reliable and quality seed, frequent disruptions in power supply for irrigation source, plant protection material, water-logging and soil salinity.

**Table 4.12: Problems faced by farmers regarding basmati crop**

S. No.	Problems	Number of respondents	Per cent of total

i)	Lodging	87	27.4
ii)	Seed quality & availability	39	12.3
iii)	Irrigation water availability & cost	28	8.8
iv)	Plant protection	9	2.8
v)	Marketing problem	159	50.0
vi)	Soil salinity	7	2.2
vii)	Rodents	20	6.3
viii)	Water logging	9	2.8

On the basis of foregoing discussion, it is obvious that adoption of IPM has made headway but still there are some adoption gaps which need to be plugged to make the crop more profitable. Higher density of plants in nursery and lesser at field level, marketing problems, varietal aspect, proper utilization of wheat-basmati gap period etc need to be looked into.

## **5. Project Interventions & their impact**

### **5.1 Interventions made**

For the sake of demonstration, one acre of basmati of every selected farmer of the village was taken and inputs such as one ml of streptocycline and 20g bavistin were provided for seed treatment. Another, effort was made to provide and demonstrate them with treatment of nursery roots with bavistin before transplanting. Information about IPM was provided and almost every respondent was aware of information centre in the village. They also reported that they visit the information centre regularly and feel the displayed material useful. Invariably every farmer reported that they can adopt the practices from the displayed material. They also emphatically replied that they were in touch with village scout and are attending regular meetings and found such information supplied was of immense use for basmati crop.

However, some of the information centres were not located at places convenient to the farmers and only available place was selected for displaying visual material and conducting meetings. To make it more effective, suitable accessible place for an information centre is essential. Location of information centre in the village is a crucial point for dissemination of knowledge. On the basis of varied set-up locations in the villages, it can be concluded that those located near Gurduara, office of cooperative society, bus stop, *panchayat ghar* etc attracted more number of visitors. It would not be out of place to mention that on the day of 'sangrand' (first day of a *desi* month) almost every farmer pays visit to Gurduara. If scout puts up main visuals at a convenient place near its gate on this day, it can work better.

In basmati belt four villages namely Nagkalan and Jahangir in Amritsar and Daburgi and Rataul in Tarn Taran were covered under m-Krishi (mobile based agro advisory service). During interview with scout and farmers of Nagkalan village, it was revealed that the handsets and software, provided to the farmers at subsidized rates, had significant impact on fast diffusion of technology, particularly for cultivation of vegetable crops such as potato, cauliflower, peas, tomato etc. They stated to have realized the solution about the day to day problems faced by them. However, it was realized that system can be still better workable if;

- a) Other Field Officers of the area working under NRTT should be in touch with this system
- b) The response is sometimes quite late due to problems including network failure which needs to be looked into.
- c) Other farmers of the village were not aware and thus remained deprived of such benefit. Even regular surveillance by scout should be transmitted specifying problems if any.

## **5.2 Impact of project**

### **5.2.1 Economic impact**

Demonstration of seed treatment and information about IPM technology was considered important by farmers for improving yield and reducing cost. The farmers stated to have made balanced use of fertilizers and other inputs. Application of less urea and higher seed rate was discernible. Less nitrogen application reduced to attraction for pests and diseases. This helped in increasing yield and lowering cost of cultivation. Increasing plant density, seed and seedling treatment, use of only effective pesticides and appropriate quantity helped in improving the crop profitability. On an average, per acre yield improved by 113 kg/acre worth Rs2818 and cost was minimized by Rs860/acre (Table 5.2 & Fig 3). Since the crop is sold in the open market, quality parameter gets due consideration. It was reported by the respondents that an average increase in price of basmati was realized as Rs24/qt amounting to Rs360/acre. These three parameters impacted the farmer's income by Rs4038/acre or Rs10095/ha. It varied from Rs606/acre in Gurdaspur to Rs1229/acre in Tarn Taran district.

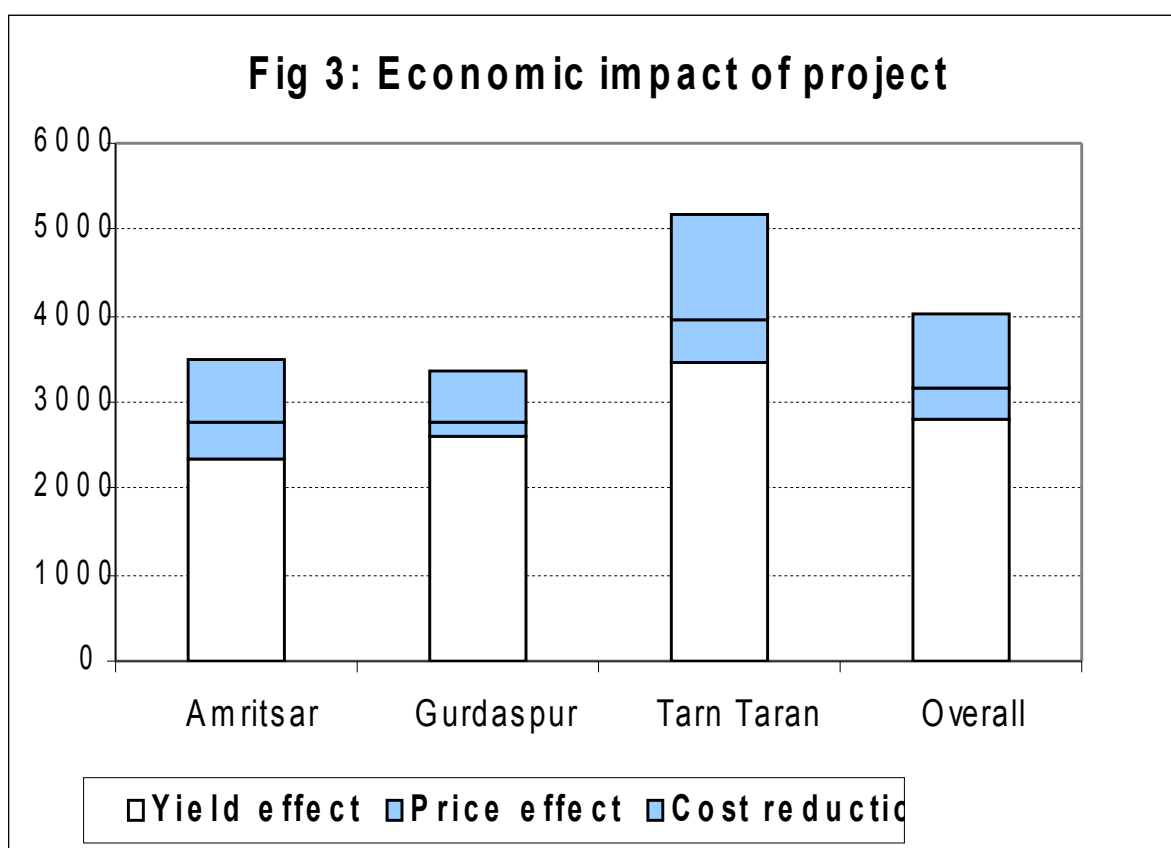
A vivid comparison of profitability between project and non-project farmers presented in Table 6.2 leads us to conclude that on the basis of advice rendered under NRTT, excessive use of urea, DAP and pesticides, particularly use of padan has been curtailed. The number of irrigations was also less. Timeliness of operations causing higher input use efficiency not only reduced cost but also improved average yield. Proper threshing and cleaning of produce also improved price realization by farmers.

The impact has multiplier effect as at least the entire basmati crop of the selected farmers with an average of 8.30 acres has similar effect. Therefore, the net farm income was estimated to have increased by Rs33512. The impact on non-basmati and other crops such as vegetables, fodders, pulses, wheat etc was also stated. Therefore, the farm size, cropping pattern and level of adoption of recommended technology were the sole determinants of gain to individual farmers.

**Table 5.2: Net Economic benefit of the project realized by an average respondent**

District	Yield effect	Price effect	Cost	Total	Average	Total
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					reductio n	Benefit	Area under basmati	benefit per farm
	Qt/ac	Rs/ac	Rs/qt	Rs/ac	Rs/ac	Rs/ac	acres	Rs
<b>Amritsar</b>	0.94	2352	29	405	730	3487	11.34	39538
<b>Gurdaspur</b>	1.04	2593	14	178	606	3377	5.99	20228
<b>Tarn Taran</b>	1.39	3477	29	470	1229	5176	7.60	39338
<b>Overall</b>	<b>1.13</b>	<b>2818</b>	<b>24</b>	<b>360</b>	<b>860</b>	<b>4038</b>	<b>8.3</b>	<b>33512</b>



### 5.3 Prioritizing the use of additional income

It is relevant to understand the priorities of making use of net gains. As presented in Table 5.3, it was reported that repayment of loan is the major concern

of the farmers for utilizing the additional gain. As many as 68.6% farmers were under such obligations and showed keenness to repay it. Investment in farm machinery such as tractor, its allied implements, pumping sets, diesel motors etc was the main item of investment reported by 52.5% farmers. Purchase of livestock and investment in land (purchase, improvement and renting in) was reported by 32% and 26% respondents respectively. Various family and social obligations, education of children and construction and repair of house were the other important areas of spending by the farmers.

**Table 5.3: Priority setting for utilization of additional income**

(Per cent farmers)

<b>Purpose</b>	<b>Amritsar</b>	<b>Gurdaspur</b>	<b>Tarn Taran</b>	<b>Overall</b>
Repayment of debts	78.6	79.2	48.6	68.6
Purchase of livestock	22.3	28.3	45.0	32.1
Investing in farm machinery	48.5	45.3	63.3	52.5
Purchase and leasing in land	25.2	20.8	32.1	26.1
Others investments	1.9	0.9	1.8	1.6
Social obligations	48.5	41.5	35.8	41.8
Education of children	60.2	71.7	51.4	61.0
House construction	39.8	42.5	75.2	52.8
Enjoyment	1.0	4.7	1.8	2.5
Others consumptions	1.0	0.0	0.0	0.3

#### **5.4 Social and Environmental Impacts**

The farmers were enquired about the implications of NRTT interventions on ecological parameters of the area. Size of livestock herd was increased by 12.6% farmers due to paddy straw being available. A vast majority (93.7%) were of the view that water is being saved significantly by restricting its overuse for the crop. In general, water table was reported to be falling. As many as 63.2% farmers indicated that based on crop yields the soil health has improved. Decrease in air pollution due to safe use of basmati straw was reported by 58.2% respondents. Pest problem gets addressed as reported by 44.7% farmers. The average score of pest control was estimated as 66%, 82% and 76% in Amritsar, Gurdaspur and Tarn Taran districts respectively.

### **5.5 Organizational performance**

The behaviour of scouts and other officials was rated as excellent by 92.8% respondents. Their knowledge due to trainings and timely guidance was also reported as very good. As many as 41.5% farmers expressed some delay in demonstration as they had already sown the crop, particularly Pusa 1121. It was suggested that more crops be covered (89.6%), more services such as supply of seed and other crucial inputs and services (71.4%) and more number of farmers should be covered (43.4%). All the respondents reported that the farmers of selected villages were benefited while 64.5% stated that benefit even percolated to the farmers of neighbouring villages as well. About 81% farmers would continue with all the recommended practices as impressed upon in the project while contact with extension agencies would be maintained by about 46.5% respondents even when the project period is over.

### **5.6 Views of scouts**

The views of the scouts of the selected villages about the project were also taken. They perceived that the project has been very useful to uplift the farm economy and for them as well. The training module provided to them was satisfactory and helpful in carrying out project activities. The use of agro-chemicals has gone down significantly without negative effect on crop yield. However, trend of IPM has set in but it would take some more time for its complete diffusion to all

farmers of the village. For example, although transplanting was somewhat delayed but was still earlier than recommended time. Some of the suggestions which emerged from discussion with them were more training camps and at appropriate time should be held, crops other than basmati should also be covered under the project, providing market information and strengthening the information centres with more material and capacity.

## 6. Crop Economics

As may be seen from Table 6.1 basmati 386 and Pusa 1121 were almost at par with each other as far as profitability is concerned except a little edge of Pusa1121 over Basmati386. On the other hand, sarbati was lagging much behind basmati varieties. Similarly, HRK 47 another non-basmati but quite popular with the farmers of the area showed only Rs14 thousand net return per acre as compared to Basmati varieties promising Rs26 thousand per acre. Similarly, comparative picture of cost-return analysis of Basmati 386 on project farms and non-project farms, presented in Table 6.2 indicates that higher profit on project farms by about Rs4 thousand per acre.

**Table 6.1: Economics of Basmati & Non-basmati rice crop in Punjab, 2010-11**

Operation	Basmati 386		Pusa 1121		Sarbati		HKR47	
	No	Cost/acre	No	Cost/acre	No	Cost/acre	No	Cost/acre
Nursery raising		600		600		600		600
Ploughing & planking	3	750	3	750	3	750	3	750
Puddling	2	800	2	800	2	800	2	800
Transplanting	1	1380	1	1380	1	1380	1	1380
Weed control	1	200	1	200	1	200	1	200

FYM/GM		200		250		300		250
Urea	45	225	100	500	50	250	100	500
DAP	10	100	15	150	25	250	50	900
Zinc sulfate	8kg	320	8kg	320	10kg	400	10kg	400
Irrigations	12	500	14	600	14	600	14	600
Plant protection	2	400	3	600	3	600	3	600
Harvesting & threshing		1850		1850		1850		1850
Transportation		250		400		500		300
Total cost		7575		8400		8480		9130
Yield	11.5	@2700	14.7	@2300	16.4	@1350	23	@1030
By-product	15	@130	15	@100	8	@80	15	0
Gross return		31650		35310		22780		23690
Net return		24075		26910		14300		14560

**Table 6.2: Economics of Basmati 386 variety with project vs. non-project farmers**

Operation	Project farmers		Non-project farmers	
	No	Cost/acre	No	Cost/acre
Nursery raising		600		600
Ploughing & planking	3	750	3	750
Puddling	2	800	2	800
Transplanting	1	1380	1	1380
Weed control	Butachlor	200	Butachlor	200
FYM/GM		200		150
Urea	45	225	65	330

DAP	10	100	20	200
Zinc sulphate	8kg	320	10kg	400
Irrigations	12	500	15	600
Plant protection	2-3 sprays	400	4-5 sprays plus Padan	800 +200
Harvesting & threshing		1850		1850
Transportation		250		250
Total cost		7575		8510
Yield	11	@2700	10	@2675
By-product	15	@130	15	@130
Gross return		31650		28700
<b>Net return</b>		<b>24075</b>		<b>20190</b>

## 7. Marketing and export

Sale was affected in the market rather than in the village. Non-basmati paddy was sold at closely located procurement centres at Rs1030 per quintal the minimum support price (MSP) and payment to the farmers was made immediately after sale while basmati does not get price support by the government and thus faces some marketing problems. It has to be sold in the regulated market yards located at quite far off areas and thus transportation cost of about Rs500/ trolley load was to be incurred. Late availability of sale proceeds and price cuts due to quality were also reported in some cases. Unlike last year, the prevailing market price of Basmati 386 was not much higher than that of Pusa 1121. It resulted in a net loss to the farmers for adoption of Basmati 386. With the apprehension of rise in price in the coming few months, farmers are storing on a large scale the basmati varieties output as prevalent market price is low. Basmati harvested manually fetched Rs200-250/qt higher price as compared to that of harvested by combine.

As an experiment if a SHG of farmers is formed and the members are asked to put together a small part of their basmati produce at a common place (may be in cooperative society). Shelling, polishing, grading should be done jointly and consumer's convenient packaging under the banner of SHG be made followed by some efforts to connect them to local city centres for disposal of the produce. It may be a turning point for cooperative value addition.

### **7.1 International scene**

Global market of basmati like other crops is the outcome of a large variety of factors such as domestic surpluses and deficits, prices, demand, carryover stocks etc. The export of basmati rice from India has increased significantly during the past one decade. It was only 667 thousand tones in 2001-02 which increased to 1556 thousand tones in 2008-09 and expected as 3.2 million tonnes during 2009-10 (Table 7). Similarly, non-basmati rice showed still faster increase i.e. from 1541 thousand tones to 5286 thousand tones in 2007-08. However, recently export of non-basmati has been banned due to fear of domestic shortfall in production as compared to demand. The demand for Indian aromatic basmati rice is likely to rise by nine percent touching 3.5 million tonnes in the 2010-11 as crop damage in flood hit Pakistan rice by about 2 million tonnes than otherwise expected 6.5 million tonnes.

Saudi Arabia is the biggest importer of Indian Basmati rice followed by U.A.E. and Kuwait, U.S.A, and U.K. It is also exported to other West Asian and European nations. Iran is considered as biggest buyer of PUSA 1121, a rice variety commands almost 50% of basmati exports from India.

The US Department of Agriculture expects that increase in the export demand for Indian basmati rice may be balanced by the expected higher domestic supply due to increase in area and production during 2010-11. According to India Rice Exporters Association, the carryover stock for current year is around 3 lakh tonnes but for the next year it is estimated to be five times higher at 1.5 million tonnes. Basmati rice price is getting quoted between US\$ 975-1125 per tonne quite

above the minimum export price of US\$ 900. Pakistani, the only competitor of India, is exporting approximately 80000 tonnes per month with its basmati prices getting quoted at US\$ 850. The domestic price of basmati paddy in important markets in Punjab remained between Rs2400-3400 during Oct-September, 2008-09 and between 1700-2400 during 2009-10. According to Agricultural & Processed Food Products Export Development Authority (APEDA), export of the premium aromatic rice increased by a hefty 44% to 2.3 million tonnes in 2009-10 from 1.6 million tonnes achieved in 2008-09.

**Table 7: Export of basmati and non-basmati rice from India**

Year	Basmati		Non-basmati	
	Quantity (000tonnes)	Value (Rs crores)	Quantity (000tonnes)	Value (Rs crores)
2001-02	667	1843	1541	2058
2004-05	1163	2824	3615	3945
2007-08	1183	4345	5286	7410
2008-09	1556	9477	950	1691
2009-10	3200			

Source: Agricultural Statistics at a glance, 2009

## 8. Summary

In the traditional basmati belt of Punjab, non-basmati varieties assumed greater importance a few years back due to increasing serious attack of insect pests and diseases, particularly rice stem borer which enhanced out of proportion. However, due to recent genetic improvement of basmati rice and increasing domestic and global demand, area under basmati has witnessed fast increase. The indiscriminate use of agro-chemicals based on the past practice, has been realized as a matter of serious concern as it adversely affects the market acceptability, crop profitability and ecology of the area. Therefore, NRTT initiated an effort to revive the

potential of the crop by educating farmers about IPM technology. This study was carried out to assess the impact of it.

A sample of 30 villages was selected - 10 villages from each of the three districts viz. Amritsar, Gurdaspur and Tarn Taran. A second stage a random selection of 10 farmers representing all farm size groups was made from each village. Detailed information regarding farm inventory, farm practices of basmati crop, impact of NRTT interventions etc was collected and compiled.

The study brought out that livestock formed a crucial significant part of the basmati farming due to its high economic complementary relationship with basmati crop. In spite of various recommended varieties, Basmati 386 and Pusa 1121 dominated the scene which have distinct characteristics and capture distinct global markets. Variety Pusa 1121 has edge over Basmati 386 in terms of farm level profitability. A number of other unrecommended varieties are being tried by the farmers themselves. Various gaps in adoption level of production technology were also identified.

***A logical comparison of project and non-project farmers indicates that due to Timeliness of operations causing higher input use efficiency not only reduced cost but also improved average yield.*** The interventions made by NRTT was regarding treatment of seed and seedlings of basmati, monitoring of crop, providing guidance to the farmers about IPM technology with an effort to improve yield, minimize cost and improve the ecology of the area. About one-third of the number of farmers were taking three crops in rotation making full use of unemployed resources during mid April to mid July. It was estimated that on account of gain in yield by timely farm operations, reduction in cost in terms of optimizing *use of fertilizers, pesticides and water* and fetching higher price of produce due to efforts in the project, additional gain was realized as Rs10095/ha. Recycling of crop residue through livestock, increase in employment due to labour intensive operations of the crop is the major environmental and social advantages stated to have occurred.

On the basis of this study, it was suggested that nursery raising should be developed as a specialized enterprise to be taken up by some farmers to avoid

wastage, un-recommended varieties popular in the area need to be tested by researchers for guiding the farmers, research on use of basmati straw as livestock feed needs to be strengthened, efforts are required to explore the potential and possibility of third crop in rotation, information centres should be at accessible place, scope of m-Krishi needs to be broadened and market information system should be developed.

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### Appendix 1

#### District-wise Area, Yield & Production of Basmati crop cutting experiment year 2008-09

District	Area (000ha)	Yield (Kg/ha)	Production (000 tonnes)
Hoshiarpur	6	3803	23
Jalandhar	6	2879	17
Nawanshahr	1	2187	2

Ludhiana	13	2435	32
Ferozpur	12	3146	38
Amritsar	25	1953	49
Gurdaspur	12	2280	27
Kapurthala	12	2885	35
Bathinda	1	1482	1
Patiala	7	2879	20
Sangrur	12	3081	37
Ropar	3	2217	7
Fardkot	1	3037	3
Moga	-	-	-
Mukatsar	1	2733	3
Mansa	-	-	-
Fatehgarh Sahib	6	2994	18
Mohali	3	1330	4
Tarn Taran	38	2003	76
Barnala	-	-	-
<b>State</b>	<b>159</b>	<b>2463</b>	<b>392</b>

Source: Department of Agriculture, Punjab

## Appendix 2

### Farmer's Schedule

#### Socio-economic study of Impact Assessment study of IPM Basmati Project in Punjab

Name of the farmer ..... s/o ..... Village.....

Block..... District..... Education level.....

#### 1. Farm size

Owned .....acres                      Leased in.....acres                      Leased out.....acres

Operational.....acres                      Land rent Rs...../acre

**2. Source of power**

Own Tractor.....                      Bullock.....                      Custom hiring.....

**3. Source of Irrigation**

Source	Nos.	Area covered (acres)	HP	Depth of bore (ft)
Mono-bloc				
Submersible				
Diesel operated				
Canal	X		X	

**4. Number of milch animals**

Cows.....                      Buffaloes.....                      Bullock.....                      Others.....

Quantity of milk sold..... lit                      Rate Rs/lit .....

**5. Area & average yield of Paddy crop**

Crop	Current year 2010		
	Area (acres)	Production (qt)	Price (Rs/q)
Paddy basmati Variety <b>Pusa1121</b> Variety.....			
Paddy non-basmati Variety <b>Pusa 44</b> Variety.....			

Crop rotation with basmati (For eg. Moong-basmati-wheat).....

Change in varietal pattern over the past three years if any.....

### 6. Practices for nursery raising of Basmati crop

Particulars	Input name & quantity	Cost
Area under nursery		X
Seed used		
Source of seed		
Seed treatment		
Sowing time		X
Manures & Fertilizers		X
FYM (trolleys)		X
Urea (kg & number of doses)		X
DAP (kg)		X
M o P (kg)		X
Zn (kg)		X
.....(kg)		
Plant protection		
Insects		
Diseases		
Weeds		
Rodents		
Number of Irrigations		
Age of nursery at transplanting		X

### 7. Transplanting & other operations

Input/Practice	Number/ Input name & quantity	Cost
Ploughings & Plankings		
Puddlings		
Transplanting method & cost (Rs/acre)		
No. of plants /sq m		X
Weed control		
<b>Manures &amp;Fertilizers</b>		
FYM (tonnes)		
Green manure		

Urea (kg & number of doses)		X
S Ph (kg)		X
M o P (kg)		X
Gypsum (kg)		X
Zinc Sulphate (kg)		
Mn Sulphate (kg)		
<b>Plant protection (against insects which pests, name the pesticide, its quantity &amp; no. of time used)</b>		
Stem borer		
Leaf folder		
Hoppers		
Hispa		
<b>Diseases</b>		
BLB		
Blast		
Sheath blight		
False Smut		
Irrigations		
Lopping		
Harvesting & threshing		
Transportation & Marketing cost		

**8. Use of basmati straw and its market Price (Rs/acre)**

**9. Specific problems of basmati faced concerning**

- a. Lodging
- b. Seed quality & availability
- c. Irrigation water availability & cost
- d. Plant protection
- e. Marketing problem
- f. Soil salinity
- g. Rodents
- h. Water logging
- i. Any other, specify

**10. Facilities availed under NRTT**

- a) Seed treatment material
- b) Pesticide supply
- c) Any other input, specify

**d) Information about pest control**

- i) Are you aware of information centre in the village? Yes/No
- ii) Do you visit the information centre regularly Yes/No
- iii) Do you feel the displayed material useful? Yes/No

- iv) Can you adopt the practices from the displayed material? Yes/No
- v) Are you in touch with village scout? Yes/No
- vi) Are you attending regular meetings? Yes/No
- vii) Were these meetings useful? Yes/No

**11. Socio-economic Impact of the project**

**A. Economic impact**

Item	Impact
Yield improvement (q/acre)	
Price increase (Rs/qt)	
Cost reduction (Rs/ac)	
By-product use	

**B. How would the increase in income be utilized?**

- a. Repaying debts
- b. Investment in
  - i. Livestock
  - ii Machinery
  - iii Land
  - iv Others, specify
- c. Increase in consumption expenditure, please tick
  - i. Social ceremonies
  - ii Education of children
  - iii House building
  - iv Higher liquor use
  - v Others, specify

D. Changes in Livestock farming due to area under basmati, please give details Increased/Same/decreased.....

**E. Impact of project on environment**

Parameter	Tick most appropriate	If yes, how?
i. Water saving	Yes/No	
ii. Water table in the area	Rising/Constant/Falling	
iii. Soil health	Positive/ No impact/Negative	
iv. Air pollution	Positive/ No impact/Negative	
v. Human health hazards	Positive/ No impact/Negative	
vi. Pest problem	Positive/ No impact/Negative	

F. Helped in access of inputs if any.....

G. Employment of resources

a. Use of Family labour

i. Male Increased/No Change/ Decreased How? .....

ii. Female Increased/No Change/ Decreased How? .....

b. Farm machinery Increased/No Change/ Decreased How? .....

c. Other resources: Increased/No Change/ Decreased How? .....

H. To what extent was the pest problem solved? Give score.....

(If completely solved score=10, if not solved at all score=0)

I. Specify the problems in the operation of the project

i) Behaviour of staff

ii) Knowledge of scout

iii) Timeliness of input and guidance

iv) Any other problem, please specify.....

J. Suggestions for improvement of the project

i) May be extended to other crops as well

ii) Other services such as soil testing be provided

iii) Other farmers should also be covered

iv) Special lectures on other crops as well

v) Lectures on social evils, sanitation, human diet etc.

vi) .....

K. Would you continue with the new adopted practices?

i) If subsidy is withdrawn

ii) If information system is discontinued

L. How were the other farmers benefited as a result of such information?

a. Within the village

b. Outside village

c. Landless labour

d. Women in general

M. Do you feel that there should be Self Help Group to improve marketing of basmati?

If yes, specify.

.....

**Appendix 3**

**Schedule for Information from Scout**

Name of scout.....

Village you belong to.....

Type of training received..... Place..... Duration.....

**Problems faced in operation of project and Suggestions to improve**

<b>S. No.</b>	<b>Problems faced</b>	<b>Suggestions</b>
1		
2		
3		
4		

Impact of project on your own farming.....

After this project how would you use this experience?

If this village is selected under M-Krishi, experience of farmers and scout about that and its impact on information system be highlighted