Input Utilization for Sustainable Yields in Dryland Areas

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ABSTRACT

India's population touched 1.198 billion in 2009, second to China's 1.3438 billion. The challenge for the research system in the 21st Century is to evolve land productivity increasing farm technologies suited to the local environmental conditions of different agro-climate regions. Dryland farming will play an important role in increasing agricultural production of the country. Dryland farming is way of life for a majority of Indian farmers. It is characterized by the resource poor, small and marginal farmers, a poor infrastructure and low investments in technology and inputs. The average productivity in dry regions is low. Inputs are important resources in order to make the farm productive. The productivity depends upon the availability and proper utilization of inputs and adoption of appropriate technology.In this context a study was planned with the specific objective to measure the extent of input utilization by farmers for cultivation of crops under under dryland farming.The study highlighted that in cultivation of rapeseed and mustard the inputs such as seed-cum-fertilizer drill, high yielding variety seeds and men/women labour were utilized as per recommendation by 81, 75 and 56 per cent of farmers, respectively. The inputs, namely, knapsack sprayer, biofertiilzers and bullock pair, wheel hand-hoe, camel and insecticides/pesticides, farm yard manure were not utilized by 94, 87, 78, 75, 69 and 56 per cent of farmers, respectively. The inputs such as ridger seeder and battery operated low volume sprayer were not utilized by any of the rapeseed and mustard growers. For cultivation of gram, the inputs such as camel, men/women labour and nitrogenous fertilizer were utilized as per recommendation by 63, 54, 53 per cent of farmers, respectively. The inputs such as Bavistin, bullock-pair, biofertilizers, Chlorphyriphos 25 EC, phosphatic fertilizers, insecticides/pesticides and seed-cum-fertilizer drill and high yielding variety seeds were not utilized by 98, 96, 85, 80, 79, 71, 66 and 47 per cent of gram growers, respectively. Whereas, pheramone traps and light traps were not utilized by any of the gram growers for integrated pest management.For cultivation of bajra crop, the inputs, namely, high yielding variety seeds, seed-cum-fertilizer drill and men/women labour were utilized for cultivation of bajra as per recommendation by 67, 61 and 51 per cent of farmers, respectively. The inputs like farm yard manure as mulching and ridger seeder were not utilized by any of the bajra growers, whereas, bullock-pair, biofertilizers, wheel hand-hoe and camel were not utilized by 97, 86, 85 and 77 per cent of farmers, respectively.The utilization level of inputs with a majority of farmers was low to medium in cultivation of rapeseed and mustard, gram and bajra crops.

Key words: *Input utilization; Rapeseed and mustard; Gram; Bajra; Dryland farming*

In India, 70 percent of the farming is rainfed which accounts for only 42 per cent of the foodgrains produced. Even with the full utilization of irrigation potential, agriculture could be practised in around 50 per cent of the net cultivated area and thus leaving 50 per cent of the net cultivated area under rainfed condition.The net cultivated area is stabilised during the previous years. There is very little scope of increasing it beyond 150 million hectares without adverse effect on the fragile eco-system. However, the cultivated area can be increased by using the rainfall which is a most important natural resource. Out of net area sown of country (143 million hectares), 51 million hectares each falls in dry rainfall area (less than 750 mm) and medium rainfall area (750-1150 mm) and remaining 41 million hectares is in assured rainfall area (more than 1150 mm). India's population touched 1.198 billion in 2009, second to China's 1.3438 billion. The challenge for the

research system in the 21st Century is, therefore, to evolve land productivity increasing farm technologies suited to the local environmental conditions of different agro-climate regions. Dryland farming will play an important role in increasing agricultural production of the country. Dryland farming is way of life for a majority of Indian farmers. It is characterized by the resource poor, small and marginal farmers, a poor infrastructure and low investments in technology and inputs. Although, the average productivity in dry regions is low. However, it contributes nearly half of the produce to the food basket of the nation and supports the life of a substantial chunk of the population. It is inevitable that the second green-revolution has to come from the dryland farming and accordingly the application of technology, inputs and investments has to be tailored to converts these so-called *"grey areas into green"*.Dryland farming means cultivation of crops purely under rainfed conditions where soil moisture is limited for crop growth.Sustainable agriculture involves the integrated use of inputs and appropriate technologies. Inputs are important resources in order to make the farm productive. The productivity depends upon the availability and proper utilization of inputs and adoption of appropriate technology. Rapeseed and mustard, gram; and bajra are the major crops of Rabi and Kharif season, respectively, in dryland farming zone of South-West of Haryana. There are no suitable alternative crops other than rapeseed and mustard and gram (Rabi crops) and bajra (Kharif crop) for dryland farming in this zone. It can not be denied that production and productivity of rapeseed and mustard, gram and bajra have increased considerably under dryland conditions.Although, the average productivity of rapeseed and mustard, gram and bajra is quite low at farmers' fields and it does not match the yields what the scientists are obtaining at the research stations. There is a big challenge before the nation to sustain the present yield levels of these crops. With this background, the study entitled "Sustainability of dryland farming in South-West Haryana" was planned with the specific objective to measure the extent of input utilization by farmers in dryland farming.

METHODOLOGY

The study was conducted in dryland farming zone of South- West Haryana. Considering the highest percentage of dry farming area in net cultivated area, districts, i.e.Gurgaon, Mahendergarh and Bhiwani were selected for the study. One block each from the three selected districts was selected randomly. Further, from each block, two villages were selected randomly. Thus, six villages formed the sample of the study. From each village, 25 farmers who were practicing dryland farming were selected randomly. Thus, 150 farmers constituted the sample of the study .The recommended inputs required for the selected crops under dryland farming were identified separately based on the discussion with concerned scientists working in CCSHAU,Hisar and also from available package of practices for rabi and kharif crops of the University. In order to know the extent of utilization of inputs, the respondents were categorised into 4 groups, namely, input not-utilized, input utilized below recommendation; input utilized as per recommendation and input utilization more than recommendation. A score of Zero was assigned separately for non-utilized input; a score of One, for utilization of input below recommendation; Two, for utilization of input as per recommendation and Three, for utilization of input more than recommendation for each of the input of selected crops.

Extent of utilization of recommended inputs: There were 14 recommended inputs for cultivation of Rapeseed and Mustard and the score ranged from 0 to 42. The minimum score of an individual for input utilization was 8 and maximum was 12 with mean of 9.12 and standard deviation 1.18. There were 14 inputs recommended for cultivation of Gram crop and the score ranged from 0 to 42. The minimum score of an individual for input utilization was 3 and maximum was 7 with mean of 5.70 and standard deviation 1.03. There were 11 inputs recommended for cultivation of Bajra crop and the score varied from 0 to 33. The minimum score of an individual for input utilization was 5 and maximum was 8 with mean of 7.42 and standard deviation 1.06.

Category	Input utilization score		
	Rapeseed & Mustard	Gram	Bajra
Low (<X-SD)	<7.94	<4.67	<6.36
Medium (X-SD to X+SD)	7.94 to 10.30	4.67 to 6.73	6.36 to 8.48
High (>X+SD)	>10.30	>6.73	>8.48

Considering the mean and standard deviation as a measure of check, the respondents were grouped into

low, medium and high categories based on the level of input utilization for selected crops under dryland farming.

Data were collected from the dryland farmers through personal interview method. The statistical tests used for analysis of data included frequency, percentage, mean and standard deviation.

RESULTS AND DISCUSSION

Utilization of recommended inputs in cultivation of rapeseed and mustard: The utilization of recommended inputs in cultivation of rapeseed and mustard are presented in Table-1. The inputs such as seed-cum-fertilizer drill, high yielding variety seeds and men/women labour were utilized as per recommendation by 81, 75 and 56 per cent of farmers, respectively. The men/women labour were also utilized below recommendation by 44 per cent of farmers. The inputs such as nitrogenous and phosphatic fertilizers were utilized as per recommendation by 47 and 41 per cent of farmers, respectively. The inputs, namely, knapsack sprayer, biofertiilzers and bullock pair, wheel hand-hoe, camel and insecticides/pesticides, farm yard manure were not utilized by 94, 87, 78, 75, 69 and 56 per cent of farmers, respectively. The inputs such as ridger seeder and battery operated low volume sprayer were not utilized by any of the rapeseed and mustard growers.

Table 1. Extent of utilization of recommended inputs in cultivation of Rapeseed and Mustard (N-32)

Name of Input	Extent of utilization of inputs								
	Recommended input per acre	Input not utilized		Input utilization below		Input utilization recommendation as per recommendation		Input utilization more than recommendation	
	No.	No.	%	No.	%	No.	%	No.	%
1. Bullock pair*	1	28	87.50	0	00.00	4	28.13	0	00.00
2. Camel*	1	24	75.00	0	00.00	8	25.00	0	00.00
3. Seed-cum-fertilizer drill*	1	6	18.75	0	00.00	26	81.25	0	00.00
4. Ridger seeder*	1	32	100.00	0	00.00	0	00.00	0	00.00
5. Man/Women labour for mechanical weeding (6), dusting (1), harvesting (5) and threshing (2)	14	0	00.00	14	43.75	18	56.25	0	00.00
6. High yielding variety seeds 2kg	0	00.00	8	25.00	24	75.00	0	00.00	
7. Farm yard manure	6 tonnes	18	56.25	0	0.00	14	43.75	0	00.00
8. Nitrogenous fertilizers	40 kg	12	37.50	5	15.63	15	46.87	0	00.00
9. Phosphatic fertilizers	20 kg	12	37.50	7	21.87	13	40.62	0	00.00
10 Bio-fertilizers (Azotobactor)	250 gm	28	87.50	0	00.00	4	12.5	0	00.00
11. Wheel hand hoe for mechanical breeding	1	25	78.12	0	00.00	7	21.88	0	00.00
12. Khap sack sprayer	1	30	93.75	0	00.00	2	6.25	0	00.00
13. Battery operated low volume sprayer	1	32	100.00	0	00.00	0	0.00	0	00.00
14. Insecticides/pesticides	400 ml	22	68.75	6	00.00	4	12.5	0	00.00

* Input utilized more than one acre.

Utilization of recommended inputs, in cultivation of gram : The data in Table 2 indicate the utilization of inputs in cultivation of gram crop. The inputs such as camel, men/women labour and nitrogenous fertilizer were utilized as per recommendation by 63, 54, 53 per cent of farmers, respectively. The inputs such as

Table 2. Extent of utilization of recommended inputs in cultivation of Gram (N =118)

Name of Input	Recommended input per acre	Extent of utilization of inputs: Input not utilized		Input utilization below		Input utilization recommendation as per recommendation		Input utilization more than recommendation	
	No.	No.	%	No.	%	No.	%	No.	%
1. Bullock pair*	1	114	96.61	0	00.00	4	3.39	0	0.00
2. Camel *	1	44	37.29	0	00.00	74	62.71	0	0.00
3. Seed-cum-fertilizer drill*	1	78	66.11	0	00.00	40	33.89	0	0.00
4. Ridger seeder*	1	118	00.00	0	00.00	0	00.00	0	0.00
5. Man/Women labour for spraying (1), harvesting and collection of bundles (6), threshing and winnowing	9	16	13.26	39	33.05	63	53.39	0	0.00
6. High yielding variety seeds	14-18 kg	55	46.61	28	23.73	35	29.66	0	0.00
7. Bavistin for seed treatment for control of Wilt.	2.5g/kg seed	116	98.31	0	00.00	2	1.69	0	0.00
8. Chlorpyriphose 25 EC for seed treatment for termite control	95	80.51	8	6.78	15	12.71	0	0.00	
9. Nitrogenous fertilizers	40kg	46	38.98	10	8.47	62	52.54	0	0.00
10. Phosphatic fertilizers	20kg	93	78.81	7	5.93	18	15.26	0	00.00
11. Biofertilizer (Azotobactor)	250gm	101	85.59	0	0.00	17	14.41	0	00.00
12. Insecticides/pesticides for insect pest control	200ml-400ml	84	71.19	18	5.25	16	13.56	0	00.00
I*ntegrated Pest Management*									
13. Pheramonetraps	5	118	100.00	0	00.00	0	00.00	0	00.00
14 Light traps	5	118	100.00	0	00.00	0	00.00	0	00.00

* Input utilized more than one acre

Bavistin, bullock-pair, biofertilizers, Chlorphyriphos 25 EC, phosphatic fertilizers, insecticides/pesticides and seed-cum-fertilizer drill and high yielding variety seeds were not utilized by 98, 96, 85, 80, 79, 71, 66 and 47 per cent of gram growers, respectively. Whereas, pheramone traps and light traps were not utilized by any of the gram growers for integrated pest management.

Utilization of recommended inputs in cultivation of bajra: The Table 3 reveals the utilization of recommended inputs in cultivation of bajra crop. The inputs, namely, high yielding variety seeds, seed-cum-fertilizer drill and men/women labour were utilized as per recommendation by 67, 61 and 51 per cent of farmers, respectively. The inputs like farm yard manure as mulching and ridger seeder were not utilized by any of the bajra growers, whereas, bullock-pair, biofertilizers, wheel hand-hoe and camel were not utilized by 97, 86, 85 and 77 per cent of farmers, respectively.

Level of utilization of recommended inputs in cultivation of selected crops: It is evident from Table 4 that the utilization level of inputs in cultivation of rapeseed and mustard was medium with 47 per cent of farmers followed by low (41 per cent) and high (12 per cent). In case of gram, the utilization level of inputs was low with 70 per cent of farmers followed by 28 and 2 per cent of farmers with medium and high level of input utilization.The utilization level of input in cultivation of bajra was medium with 69 per cent of

Table 3. Extent of utilization of recommended inputs in cultivation of Bajra (N =150)

Name of Input	Recommended input per acre	Input not utilized		Input utilization below		Input utilization recommendation as per recommendation		Input utilization more than recommendation	
	No.	No.	%	No.	%	No.	%	No.	%
1 Bullock pair*	1	146	97.33	0	00.00	4	2.67	0	00.00
2 Camel*	1	115	76.67	0	00.00	35	23.33	0	00.00
3 Seed-cum-fertilizer drill*	1	58	38.67	0	00.00	92	61.33	0	00.00
4 Ridger seeder*	1	150	100.00	0	00.00	0	00.00	0	00.00
5. High yielding variety seeds	1.5-2.0kg	16	10.67	33	22.00	101	67.33	0	00.00
6. Nitrogenous fertilizers	40kg	37	24.67	61	40.67	52	34.66	0	00.00
7. Phosphatic fertilizers	20kg	59	39.33	43	28.67	48	32.00	0	00.00
8. Wheel hand hoe for mechanical weeding	1	128	85.33	0	00.00	22	14.67	0	00.00
9. Biofertilizer (Azotobactor)	250gm	129	86.00	0	00.00	21	14.00	0	00.00
10 Farm yard manure as mulching	1.6 tonnes	150	100.00	0	00.00	0	00.00	0	00.00
11. Man/Women labour for various practices**	21	0	00.00	74	49.33	76	50.67	0	00.00

* Input utilized more than one acre

** thinning and gap , filling (1), mechanical,weeding (5), harvesting (8), threshing & winnowing (3), pickingof earheads (4)

Table 4. Extent of level of utilization of recommended inputs in cultivation of selected crops under dryland farming.

Utilization level of inputs	Rapeseed and Mustard (N = 32)		Gram (N = 118)		Bajra (N = 150)	
	No.	Per cent	No.	Per cent	No.	Per cent
Low	13	40.62	83	70.34	42	28.00
Medium	15	46.88	33	27.97	103	68.67
High	4	12.50	2	1.69	5	3.33
Total	32	100.00	118	100.0	150	100.0

farmers followed by low (28per cent) and high (3 per cent) level of input utilization. The results observed in their studies by *Ray (1990), Kandiannam and Rangaswamy (1994), Gautam and Pant (2001)* and *Jaggi et al. (2001)* are in line with the observation of this study.

CONCLUSION

The inputs such as seed-cum-fertilizer drill, high yielding variety seeds, men/women labour and nitrogenous and phosphatic fertilizers were utilized as per recommendation by all the rapeseed and mustard growers. The inputs, namely, knapsack spryer, wheel hand-hoe, bullock-pair, camel, farm yard manure and insecticides/ pesticides were not utilized by the farmers in cultivation of rapeseed and mustard crop. The inputs like ridger seeder and battery operated low volume sprayer were not utilized by any of the rapeseed and mustard growers. In cultivation of gram crop, the inputs such as camel, men/women labour, quantity of nitrogenous fertilizers were utilized by all the farmers as per recommendation. The inputs such as Bavistin, Chlorpyriphos 25 EC, insecticides /pesticides, biofertilizers, seed-cum-fertilizer drill and high yielding variety seeds were not utilized by majority of gram growers. Whereas, pheramone and light traps for integrated pest management were not utilized by any of the gram growers.In cultivation of bajra crop, the inputs such as high yielding variety seeds, seed-cum-fertilizer drill and men/women labour were utilized as per

recommendation by all the farmers. The inputs, namely, bullock pair, camel, wheel hand-hoe and biofertilizer were not utilized by majority of bajra growers, whereas, the inputs like ridger seeder and farm yard manure as mulching were not utilized by any of the bajra growers. The inputs such as high yielding variety seeds in cultivation of rapeseed & mustard and bajra; seed-cum-fertilzier drill, men/women labour, camel, nitrogenous and phosphatic fertilizers were utilized by a majority of dryland farming farmers in cultivation of rapeseed and mustard, gram and bajra crops. The possible reason for this trend of utilization of inputs is the availability of these inputs with the farmers in sufficient quantity. The inputs such as nitrogenous and phosphatic fertilizers were advocated for cultivation of rapeseed & mustard, gram and barja long back. This was sufficiently diffused among the dryland farming farmers and might have enhanced the knowledge of the farmers about the use of these inputs for increased yield. The inputs like seed-cum-fertilizer drill was more utilized for sowing of rapeseed & mustard and bajra by majority of farmers because the farmers had good knowledge about the use of seed-cum-fertilizer drill for sowing of these crops and they could easily get this on hire from fellow farmers. The inputs such as ridger seeder, battery operated low volume sprayers, knapsack sprayer and wheel hand-hoe were not utilized by a majority of dryland farming farmers because of high cost of these improved implements and lack of information and knowledge of these inputs. The inputs, namely, Bavistin, Chlorpyriphos 25 EC, insecticides / pesticides biofertilizers were not utilized by a majority of dryland farming farmers because of high cost of inputs, adulteration in chemicals, lack of knowledge about the use and non-availability of these inputs in the local market. The inputs like bullock pair and camel were utilized by majority of gram growers for sowing purpose. This might be due to that most of the gram growers think that by sowing the crop with desi plough leads to a better germination and gives higher yield. None of the gram growers had utilized the inputs like pheramone and light traps for integrated pest management in gram because of lack of information and knowledge about the use of integrated pest management practices and non-availability of these inputs locally.The utilization level of inputs with a majority of farmers was low to medium in cultivation of rapeseed and mustard, gram and bajra crops.

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