The Pharma Innovation Journal 2021; SP-11(2): 748-751

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-11(2): 748-751

www.thepharmajournal.com
Received: 28-12-2021
Accepted: 30-01-2022

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Documenting the high value cash crops cultivation led adverse changes in the natural resource base

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Abstract
One-fifth of the households reported that pesticides were dangerous for people and animals followed by 61.20 per cent who said that it was not safe to bring young children to the field after pesticide application. In Jaipur district, 80 per cent of the households considered pesticides dangerous for people and animals followed by those who said that it was important to read instructions/warning labels on pesticides containers and that it was not safe to bring to bring young children to the field after pesticide application. Fifty per cent of the households opined that empty pesticide container should not be kept for reuse. The knowledge about precautionary measures was more among large farm households compared to their small counterparts in Sri Ganganagar. The pattern was just reverse in Jaipur district.

Keywords: pesticide impact, household management, IPM and precaution measures

Introduction
High value crops refer to non-traditional food crops such as vegetables, fruits, flowers, houseplants and foliage, condiments and spices. High value livestock and fishery products include products such as milk, beef, poultry, pork, eggs, and fish that are non-traditional sources of protein for most part of Sub Rajasthan. Most High Value Agricultural Products (HVAPs) have higher market values than traditional cereal grains and export crops A plethora of micro studies are available on different aspects like marketing, costs, returns, income, employment, ecological sustainability of the cultivation of high value cash crops. In net terms, these studies have shown that switching over to the cultivation of these crops from cereal crops has made a significant improvement in the economic status of the farmers in terms of their income and employment. More importantly, however, these studies have overlooked adverse impacts of the cultivation of these crops on the natural resource base, particularly soil and human health. Perhaps, this was also not required, *ab initio*, inasmuch as the policy makers and other development agencies were, primarily concerned with improving upon standard of living of the local people.

In brief, though environmental related issues have assumed importance, these aspects of the cultivation of high value cash crops have not been studied and looked into. In fact, we have not come across any study that did document and value the myriad of adverse impacts on the natural resource base and environment in those areas of the state where the cultivation of high value cash crops is in advanced stages. The present study is a modest attempt in this direction. Against this background, the present study aims at documenting the high value cash crops cultivation led adverse changes in the natural resource base, the strategies adopted by the local people to minimize the adverse impacts, monetary valuation of environmental costs, understand their implications for the livelihoods of the local people and suggest possible solutions. Such a study is essential in estimating the true cost of the cultivation of these crops.

Materials and Methods
Study area
Out of 33 districts of the state of Rajasthan, two districts namely Sri ganganagar and Jaipur were purposively selected for the study. The selection of the districts was influenced by two factors. First, in these districts the cultivation of high value crops namely kinnow and off-seasonal vegetable is being practiced since the late sixties and early seventies. Second, these two districts together account for more than three-fourths of the total area under fruits and more than two-thirds of the total fruit production.

Sampling design

Two blocks namely, Chomu block in Jaipur district and Sadulsahar block in Sri Ganganagar district were purposively selected for the study. Thereafter, a list of Panchayats falling in each of the two selected blocks was prepared. At the first stage of the sampling, one Panchayat from each of the two blocks was randomly selected.

Functional analysis

The logit regression was used to quantify the probability of different factors affecting human health in terms of body mass index being not normal. The following form of the model was used:

Where p = is the probability of the body mass index being not normal; xj denotes the independent variables like the age of the respondents, education, number of years since spraying, number of sprays, Integrated Pest Management, use of protective equipments and having clinic access.

Collection and preparation of soil samples

The soil samples were separately collected from the cultivated area of each of the 200 sample households. Since kinow was the most important crop in sriganganagar and vegetables in Jaipur, the soil samples were collected from kinow orchards in sriganganagar and vegetable fields in Jaipur. The representative soil samples were collected from 0-15 cm depth and tested under laboratory conditions. The samples were analyzed for soil PH (Jackson, 1967), Organic carbon (Walkley and Black, 1934), available P (Olsen *et al*., 1954), available K (Mervin and Peech, 1951) and micro nutrient cations (Cu, Fe, Mn and Zn by Lindsay and Norvell, 1978). The following formula was used to classify the soils into different status:

Overall Status of soil= (l*1+M*2+H*3)/100 The values used to classify the soils into low, medium and high through soil nutrient index are given below.

Low < 1.67, Medium 1.67 to2.33 and high >2.33 (Muhr *et al*. 1963).

The status of the availability of micro nutrients was considered sufficient if the availability was more than the following critical limits in mg per kilogram. If availability was less than these limits, the status was considered as deficient (Nayyar and Chhibba, 1995).

Zinc = 0.60 Copper = 0.20 Iron = 4.50 Manganese = 1.00.

Results and Discussion

Table 1: Farmers' perception about the effect of prolonged use of pesticides

Particulars	Sriganganagar			Jaipur		
	Small	Large	All	Small	Large	All
Yes	81.11	100.0	81.34	71.43	66.67	70.69
No	18.29	0.00	18.66	28.57	33.33	29.31
Degree of effects						
Very little	5.56	0.00	5.49	11.43	0.00	9.66
High	22.22	20.00	22.20	74.29	16.67	65.34
Very high	72.22	60.00	72.07	14.29	76.67	23.97
Extremely high	0.00	20.00	20.00	0.00	6.67	6.67

Farmers' perception about the effect of prolonged use of pesticides

Table 1 presents response of the farmers about the effect of prolonged use of pesticides on health. The table shows that 81.34 per cent of the farmers in sriganganagar were aware of fact that prolonged pesticides use can effect health. The proportion of such households was 70.69 per cent in Jaipur. In Sriganganagar block, on overall farms, 72.07 per cent of the farms reported that pesticides had very high effect on their health followed by 22.20 per cent of households who reported high effect of pesticide use

Table 2: Pesticide poisoning: symptom of pesticides

Symptom	Sriganganagar			Jaipur		
	Small	Large	All	Small	Large	All
Eye irritation	84.44	100.0	86.00	74.29	85.00	77.50
Headache	58.89	60.00	59.00	75.71	80.00	77.00
Dizziness	20.00	40.00	22.00	8.57	10.00	9.00
Vomit	55.56	60.00	56.00	51.43	16.67	41.00
Back pain	58.89	60.00	59.00	75.00	83.33	77.50
Skin irritation	64.44	20.00	66.00	30.00	66.67	41.00
Eye flu	0.00	10.00	1.00	30.00	33.33	31.00
Fatigue	80.00	90.00	87.00	77.00	78.00	77.30
Availing clinic facilities						
Yes	82.22	100.00	82.44	74.29	80.00	75.17
No	17.56	0.00	17.78	25.71	20.00	24.83

Table 3: Changes in productivity as result of changes in natural resource base

Particulars	Sriganganagar			Jaipur		
	Small	Large	All	Small	Large	All
Productivity						
Increased	11.11	30.00	11.83	42.86	16.67	38.80
Decreased	88.89	70.00	88.66	57.14	83.33	61.20
Cost of production						
Increased	94.44	100.00	94.51	85.71	90.00	86.38
Decreased	5.56	0.00	5.49	14.29	10.00	13.62
Factors affecting productivity						
Climate	100.0	100.0	100.0	100.0	100.0	100.0
Disease and pest	33.33	30.00	33.00	28.57	33.33	30.00
Lack of pollination	100.0	100.0	100.0	21.43	16.67	20.00

Pesticide poisoning: symptom of pesticides

The response of farmers to questions on problems in kinow productivity has been summarized in Table 2. The table shows that in sriganganagar block 88.66 per cent of the farmers felt that productivity was decreasing while 11.83 per cent felt that it was increasing. Similarly in Jaipur, 38.8 per cent farmers felt that the productivity of kinow was increasing and 61.20 per cent farmers responded by saying that it was decreasing. Further, 94.51 per cent of the farmers reported that the cost of production had increased while 5.49 per cent felt that it was decreasing. In Jaipur block, 86.38 per cent of the households responded by saying that cost of production had increased while the 13.62 per cent opined that it had not. In both blocks, it was important to note that all sample households felt that change in climate and degradation of natural resource base was mainly responsible for decrease in productivity of different crops.

Table 4: Farmers' perception about change in different parameters of climate

Particulars	Sriganganagar			Jaipur		
	Small	Large	All	Small	Large	All
Temperature						
Increase	77.78	60.00	77.56	57.14	33.33	53.45
Decrease	0.00	0.00	0.00	0.00	0.00	0.00
Fluctuation	22.22	40.00	22.44	42.86	66.67	46.55
Rainfall						
Increase	8.89	0.00	8.78	14.29	6.67	13.10
Decrease	22.22	40.00	22.44	28.57	66.67	34.68
Fluctuation	68.89	60.00	68.78	57.14	26.67	52.41
Humidity						
Increase	11.11	0.00	10.98	7.14	6.67	7.07
Decrease	66.67	80.00	66.83	64.29	66.67	64.66
Fluctuation	22.22	20.00	22.20	28.57	26.67	28.28
Snowfall						
Increase	0.00	0.00	0.00	0.00	0.00	0.00
Decrease	100.0	100.0	100.0	100.0	100.0	100.0
Fluctuation	100.0	100.0	100.0	100.0	100.0	100.0

Table 3 summarizes the response of farmers with respect to their perceptions about the change in different parameters of climate which had contributed towards change in climate. Table shows that 77.56 per cent of the households reported that there was an increase in the temperature while 22.44 per cent reported that there were fluctuations. Further, 8.78 per cent of farmers responded by saying that there was an increase in temperature and 22.44 reported that there was decrease in it. The increase, decrease and fluctuation in humidity were reported by 10.98 per cent, 66.83 per cent and 22.20 per cent of the households, respectively. All sample households reported that there was a decrease in snowfall. In Jaipur, an increase in temperature was reported by 53.45 per cent, a fluctuation in temperature was reported by 46.55 per cent. The fluctuation in rainfall as a reason of climate change was reported by 52.41 per cent, followed by 34.48 per cent who reported decrease in rainfall and 13.10 per cent who reported an increase in rainfall. The decrease in humidity was reported by 64.66 per cent followed by fluctuations in humidity 28.28 per cent and increase in humidity by 7.07 per cent.

Strategies adopted by the farmers

The farmers of the study areas have adopted different strategies like soil management, pollination management and orchard management to cope up with the adverse effects on soils and problems of decreasing productivity. Table 4.40 shows that under soil management practices all farmers had resorted to Manuring in both the blocks. On overall farms, use of crop residue and droppings of sheep and goat were resorted to by 23 per cent of the households each in Sriganganagar block but it was done by 43 and 35 per cent of the respondents respectively, in Jaipur block.

The practice of sloping land agricultural technology was being adopted by only 9 per cent of farmers in Sriganganagar block where as in Jaipur block it was adopted by 50 per cent of the farmers. It was also noticed during the survey that only 2 per cent of the farmers of Sriganganagar block used vermi-compost fertilizers. None of the farmers used vermicompost in Jaipur block.

Table further shows that the extent of adoption of these technologies was higher on large farms in comparison to small farms in both the blocks. To overcome the problem of

pollinator, it was found during the survey that few farmers (5 per cent) of the small families in Sriganganagar block and 12 per cent in Jaipur block were rearing honey bees. But their sole emphasis was on honey extraction. Table also shows that a small proportion of large farm households (10 per cent) were hiring honey bees from commercial beekeeping entrepreneurs in Sriganganagar, but no such farm household was found in Jaipur block. In pollination management, the technique of bouquet pollination was reported by 75 per cent of the households in Sriganganagar block. This technique was not being used by the respondents of Jaipur block. In orchard management, the pruning of plants and basin preparation was done by all the farmers in both blocks. On overall farm situation, mulching was done by 23 per cent of the households, where as in Jaipur block it was done by 100 per cent of the households.

Conclusion

The study shows that the majority of the farmers in both areas are not adopting most of available strategies to maintain soil health, conserve water resource and to minimize the adverse impact of climate change. Therefore, the farmers need to be trained and educated in the use of such strategies.

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