Research Article

Does IPM Based Production Significantly Different from Conventional Production: A Case Study of Punjab, Pakistan

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Abstract | Doubt about pesticides based agriculture productivity motivated agriculture departments to collaborate with international agencies to introduce sound agriculture practices like Integrated Pest Management (IPM) in Pakistan. In IPM technique natural parasites and predators are used to check pest growth instead of pesticides which reduces ecological and health damage. Pesticides are used at the last resort in IMP method so it reduces the cost of production and increases the farmers' profit. However, concerns about production may hinder widespread adoption of this technology by farmers. The aim of the study is to evaluate economic feasibility of IPM method in Punjab. The study consisted of 326 farmers (161 IPM producer and 165 NON-IPM producers) and compared input and output outcomes of IPM and NON-IPM farms and provided a detailed evidence of overall production of both farms. The results suggest that IPM farms yield 4.8 percent higher output/hectare than NON-IPM farms and used3.6 percent lower inputs.

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Introduction

Pesticide use has become a standard technology to protect crops from pests, diseases and other plant pathogens in the current crop growing's (Damalas, 2009; Damalas and Khan, 2015). Studies suggest that farmers get direct and indirect gains from pesticides use where direct gains are short run gain such as pesticides use reduces crop loss by eliminating insects and other pests (Kellogg et al., 2000). Whereas, Lower food prices, increase in jobs and rise in food supply is considered as indirect and long terms benefits of pesticides use (Damalas, 2009). On the contrary, less use or no use of pesticides has repercussions on crop production (Kuniuki, 2001).

However, at the opposite, this colossal swell in the use of pesticide has costs to human health and environment as well as costs of the development and research of new pesticides (Fantke, 2012). Studies have recognized that thorough utilization of pesticides is a main reason of several sensitive health effects on people who are exposed (U.S. EPA, 2007). Pesticides are responsible for simple irritation of the skin and eyes, affecting the nervous system, causing reproductive problems (male, female and animals) liver damage, cancer (skin, brain, stomach, kidney, lung, testicular, kidney), fetal death (U.S. EPA, 2006; Jurewicz et al., 2008; Weselak et al., 2007; Wigle et al., 2008; Mink et al., 2011; Sanborn et al., 2007; Sanborn, 2004). Azeem et al. (2004) reported that pesticide poisoning affected 1.08 million persons in the cotton growing areas. Pesticide use raises environmental concerns such as air and water pollution, reduces biodiversi-

ty, contributes to pollinator decline and endangers species and birds (Miller, 2004; Palmer et al., 2007). Continuous use of pesticides increases the pest resistance as well as pesticides cost which necessitating some new pesticides.

Use of pesticides that have the potential hazards for the human health and no use of pesticides have potential hazards for the crops. To overcome this dilemma, the government of Pakistan introduced a new onsite training program known as Farmer field Schools training approach (NARC, 2008). For this purpose, two provinces Punjab and Sindh were selected for IPM training program. Training module was designed to enable farmers to reduce biodiversity of crops and soil and inadequate use of pesticide but problem still has not met the solution. Scholars have the viewpoint that awareness alone may not motivate farmers to adopt IPM as technique to control pests (Ajayi, 2000). Along with intrinsic motivation it is dire necessary to instill extrinsic motivation i.e. economic profitability to promote IPM as crop protection strategy. Farmers will only accept IPM method by comparing its performance in comparison to pesticides based technique (Ajayi, 2000).

In Pakistan, such data is not adequate which provide appropriate evaluations of IPM's effect on farms yield, income, health and local ecosystems. This study used a survey data of 326 farmers (161 IPM adopters and 165 non IPM adopters) and compared production difference by using simple input and output method. The outcome of this research will be helpful for government and non-government agencies to formulate strategies to have better production of crops.

Materials and Methods

A sample of 161IPM producers and 165 NON-IPM producers were selected in the area of Bahawalpur as it covers 10% area under cotton farming and national IPM program was launched (Agriculture Census, 2013). For research 161 IPM producers and 165 NON-IPM producers were selected. The farmers' feedback form is modified form of World Bank study questionnaire done in Bangladesh (2003). A face-to-face interview of farmers was conducted because this method delivers the maximum reply rates and considered a good source for handling complex information (Khan et al., 2014). Data was collected in February 2011, for a period of May-November 2010.

Results and Discussion

Production by area

The production or output of cotton is measured in Tones. We asked farmers to report total output of cotton in current season. The reported yield was then divided by total hectares of land reported under cotton crop. This gives us output /hectare of cotton. Table 1 shows that the IPM farmers got more production i.e.1.71 Tones/hectare in comparison to NON-IPM growers of 1.63Tones/hectare. Under both production techniques producers having area more than 25 hectares were most productive producer.

Relationship between tenancy status and production

Tenancy status is another farm specific characteristic, which is related with the production/hectare to know the effect of tenancy status on the productivity of both types of farmers. Most studies on tenancy status have described that productivity of sharecropping is relatively less than sole ownership. In agrarian countries, the sharecropper agreements are so skewed that the major chunk of benefits of higher revenues go to landlord rather than tenants and this dispiritedshare cropper and lower their efficiency (Pearson et al., 1991).

Study found that that the fear of uncertainty and financial severity discourage sharecroppers to adopt

Table 1: *Production by area (hectare).*

Farm size	IPM				NON-IPM			
	Total yield (tons)	Cotton cultivated area (hectare)	Yield per hectare	SampleSize (%)	Total yield (tons)	Cotton cultivated area (hectare)	Yield per hectare	SampleSize (%)
Upto 5.0	61	38	1.60	3	68	41	1.66	4
5.1 to 12.5	301	186	1.62	17	400	255	1.57	25
12.6 to 25.0	365	231	1.58	20	439	281	1.56	28
Above 25	1083	607	1.79	60	680	396	1.72	43
Total	1811	1061	1.71	100	1586	973	1.63	100

Table 2: *Production by ownership.*

Ownership	IPM				NON-IPM			
	Total yield (tons)	Cotton cultivated area (hectare)	Yield per hectare	Sample-Size (%)	Total yield (tons)	Cotton cultivated area (hectare)	Yield per hectare	Sample-Size (%)
Own the farm	669	410	1.63	37	586	400	1.47	37
Rental arrangement including lease from govt	622	353	1.76	35	838	490	1.71	53
Sharecropping	520	298	1.75	29	163	83	1.95	10
Total	1811	1061	1.71	100	1586	973	1.63	100

Table 3: *Production by education level.*

Level of Education	IPM				NON-IPM			
	Total yield (tons)	Cotton cultivated area (hectare)	Yield per hectare	SampleSize (%)	Total yield (tons)	Cotton cultivated area (hectare)	Yield per hectare	SampleSize (%)
Illiterate	11	6	1.97	1	93	51	1.83	6
Primary	354	195	1.81	20	611	373	1.64	39
Middle	471	254	1.85	26	181	119	1.52	11
Secondary	561	355	1.58	31	370	227	1.63	23
Higher Secondary	414	251	1.65	23	331	203	1.63	21
Total	1811	1061	1.71	100	1586	973	1.63	100

better-quality agricultural methods. They do not take interest in the activities which are crucial for improvement in land and enhance their decision-making skills. They accomplished that owner- control farms were more proficient than both tenant and owner cum-tenant control farms because relyon their domestic capitals such as labor (Giannakas et al., 2001; Rahman, 2003). Some study found that sharecroppers are less productive because they apply fewer inputs than landowners (Eswaran and Kotwal, 1985). This claim is only expected when sharecroppers are considered risk neutral.

However, the study results reported by Hassan et al. (2016) concluded that the existence of the sharecropping agreements has positive effect on the production efficiency of wheat crop in arid zone of Rawalpindi because the owner operators were earning 16.4 percent less net revenue than sharecroppers. The obvious reason for the result may be that the sharecroppers depend on the family resources like seed, family labor and farm yard manure or sharecropper are risk lover.

So, we also related the tenancy status with the productivity or production/hectare of cotton in the study area to explore this relationship. Table 2 discloses that per hectares output of sharecropper of both the IPM and NON-IPM producers are greater than the farmers who have mixed arrangement and the owner operated farmers. The finding of the study is also in line with the study results reported by Hassan et al. (2016).

Nexus between education level and production

Although education does not directly contribute to agricultural yields, there is evidence to suggest that higher level of education contributes significantly to increase agricultural production. For knowing whether or not education has any impact on farmers' ability to produce we related output/hectare of both the producers with their education level. In case of IPM, a somewhat positive trend was observed between IPM-adopters' education and yield per hectare but no exact association was witnessed between NON-IPM-adopters and their education level. (Table 3).

Conclusions and Policy Implications

Study results revealed that IPM is economically superior to NON-IPM cropping technique. The result indicates that the production/hectares of IPM adopters 1.71 Tones/hectare compared to 1.63tones/hectare of NON-IPM adopters. IPM is a large landholder technique. Study revealed that output/hectare of sharecropper of both the IPM and NON-IPM pro-

ducers are greater than the farmers who have mixed arrangement. Somewhat positive trend was observed between IPM-adopters' education and yield/hectare but no exact association was witnessed between NON-IPM-adopters and their education level. This technique will not only increase the profitability of the farmers in future but also safer for their health and environment. This will ensure the sustainability of raw cotton growth and will flourish Pakistan textile industry. Pakistan will fetch more foreign earning and its Balance of Payment will be improved.

The results of the study are helpful to make robust policies for promoting IPM because it mitigates the negative health and environmental externalities related to the indiscriminate use of pesticides. On the basis of study result government should promote sharecropping as IPM is a large-scale technique. Furthermore, promotion of agriculture based secondary education in the rural areas will also enhance the productivity of farmers.

Author's Contribution

Saima Akhtar Qureshi presented the original idea for conducting this research and was responsible for data collection. Asim Anwar, Saima Akhtar Qureshi and Ather Maqsood carried out the analyses. Asim Anwar drafted the manuscript and all the authors approved the final draft.

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