

Full Length Research Paper

Effective use of technology in production of quality wheat to achieve export standards and demands in Pakistan

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The aim of this study is to look into the effectiveness of the technology in the production quality of wheat which can meet export standards and also the demands within and outside the country. Presently, there is a wide yield gap in wheat that needs to be bridged. The major reasons for low productivity and instability includes lack of good quality seed, delayed harvesting of kharif crops like cotton, sugarcane and rice, and consequently, late planting of wheat, low quality and inefficient use of fertilizers etc. The root cause of all these problems is unawareness of farmers about modern technologies. This study will focus on the methods to achieve good quality seeds, modern harvesting techniques, effect of the use of modern technology in the agricultural sector and a comparison between traditional wheat farming and harvesting methods, keeping in view the use of modern technology.

Key words: Technology, wheat, production, maintenance, standards, requirement, demands.

INTRODUCTION

In Pakistan, wheat being a staple diet is the most important crop and cultivated on a large scale in almost every part of the country. It contributes significantly in value addition of agriculture thus, increasing the overall GDP. Over the past three decades, increased agricultural productivity took place primarily due to the development of technology especially, in high-yielding cultivars and fertilizers (Ahmad et al., 2010).

Wheat is a worldwide cultivated crop originated from the fertile crescent region of the near East. It is the third most-produced cereal after maize and rice. Wheat grain is a staple food chiefly used to produce flour for leavened, flat and steamed breads, biscuits, cookies, cakes, breakfast cereal, pasta, noodles and biofuel.

Wheat is the largest grain crop of Pakistan. Technological advancements in soil enrichment, seed placement, utilization of crop rotation, fertilizers to improve plant nourishment and modernization of harvesting techniques have all combined to promote wheat as a value added crop. Traditional methods of cultivation using horse collar leveraged plows (about 3000 BC) entailed initial innovations that increased productivity. This was followed by the use of seed drills in the 18th century thus, achieving a quantum jump resulting in enhanced productivity. Later on, due to the introduction of crop rotation and fertilizers, wheat per unit area yield increased productivity manifold. Improved agricultural gadgetry has more recently included thrashing machines

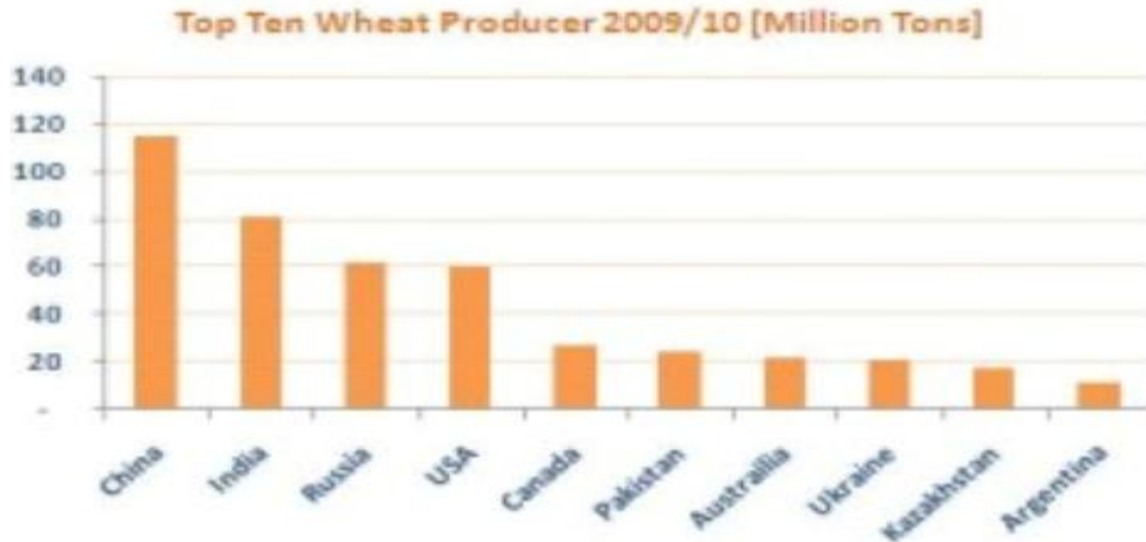


Figure 1. Agriculture Corner, (Tanveer et al., 2006).

in addition to reaping machines besides tractor-drawn cultivators and planters. Revolution in the field of wheat production occurred as new arable land was farmed in America and Australia during the 19th and 20th centuries. In 1977 to 1978, an epidemic disease of yellow rust inflicted significant damage to the wheat production sector worldwide. Consequently, the need of strengthening the agricultural research and development was identified (Mansoor et al., 2006). Therefore, Pakistan Agricultural Research Council (PARC) was reactivated as the coordinating outfit for developing agricultural research programs pertaining to major crops in Pakistan. In the world, advanced technologies are being used to achieve good quality of seeds, plant breeding and harvesting methods to improve the overall wheat productivity. But despite being an agricultural country, having a large fertile area and suitable weather conditions for wheat production, we have failed to meet the national needs besides producing quality standard wheat for export. This study will focus on the following problem statement. "What are the effects of technology in production of quality wheat meeting export standards and demands in Pakistan".

Pakistan, being an agricultural country primarily relies on the export of cotton, wheat, leather and textile products. Wheat, being one of the major exports over a period of time has been grossly overlooked and neglected. The quality of wheat produced have been one of the most critical factor resulting in reduced export along with ignorance at the lowest level coupled with lack of infrastructure and effective policy on the part of the government. Therefore, keeping in view the ever increasing demand and importance of wheat, an endeavour has been made to analyze the grey areas in wheat production process along with some pertinent recommendations (Mujahid et al., 2000).

WHEAT PRODUCTION IN NATIONAL AND GLOBAL PERSPECTIVE

Geographical variation

In the present era, there are significant variations with regards to wheat farming methods, trading tactics, policies, growth environments and implied uses in different regions of the world. In EU and Canada, there is considerable consumption of wheat as part of animal feeds but this is comparatively lesser in the case of USA. The two biggest wheat producers are China and EU, followed currently by India and USA. Developed countries like USA, Canada, Australia, EU and increasingly Argentina are the major exporters of wheat whereas, developing countries being at the receiving end are the main importers, although, both India and China are close to being self-sufficient in wheat. In the rapidly developing countries of Asia, Westernization of diets associated with increasing prosperity is leading to growth in per capital demand for wheat at the expense of the other food staple crops (Figure 1 and Table 1) (Tanveer et al., 2006).

Historic overview of agricultural production in Pakistan

The economic history of Pakistan has been profoundly dominated by the superior performance of its powerful agricultural sector. The growth of agricultural production significantly accelerated since independence in 1947 coupled with a sluggish take off in the early years. On average over the entire period till present, the rate of growth can be estimated to almost 4.0 percent per annum, despite appreciable drop in recent years especially since around 1990 (Mujahid et al., 2000);

Table 1. Ten biggest wheat producing countries -2009/10 (Million tons).

Country	Million tons
China	115
India	81
Russia	62
USA	60
Canada	27
Pakistan	24
Australia	22
Ukraine	21
Kazakhstan	17
Argentina	11
EU-27	138
World	682.00

Tanveer et al., 2006).

The environment of agricultural innovation

The inherent capacity of Pakistan's agriculture setup to feed a large and burgeoning population is not provided by nature itself. The country has an arid climate coupled with a precarious rainfall pattern thus enhancing tendency of being unreliable. The incumbent natural conditions by themselves make agriculture an extremely risky affair. Although the supply of irrigation water permits multiple cropping, yet so many associated factors have led to a significant drop in desired outputs.

PRODUCTION OF WHEAT IN PAKISTAN

Wheat - an important edible crop of Pakistan

Keeping in view the agro-ecological areas, cropping patterns and climatology, Pakistan has been bifurcated into ten production zones where primarily, wheat is cultivated (Mujahid et al., 2000). Wheat is cultivated in a classical sequence evolved over a period of time such as; cotton to wheat, rice to wheat, sugarcane to wheat, maize to wheat, and fallow to wheat. 60% of the total wheat area entails cotton to wheat and rice to wheat systems. Wheat is the most important grain and a staple food for more than one third of the world's population. Pakistan ranks 10th in terms of area (8.5 million hectares) and 59th in terms of yield (21.0 m tons) annually among the wheat producing countries. The overall production of the wheat per acre varies, keeping in view the area, farming methods and other supporting factors which have to be considered for calculating the yield. Another pertinent factor which significantly contributes to the yield is weather and the availability of the irrigation water through

canals. A value range from 20 to 25 maunds is the average per acre wheat yield in Pakistan. The major areas of wheat in Pakistan lies in Punjab followed by Sindh.

Wheat growth trends with regards to production and area

Wheat production evolution in Pakistan can be segregated into three distinct phases:

1. 1976 to 1965, prior to the release of semi-dwarf wheat.
2. 1966 to 1976, the so-called "Green Revolution" period when High Yielding Varieties (HYVs) were rapidly implemented on about two third of total wheat area.
3. 1976 to date, post green revolution period when HYVs continued to spread over the major wheat area.

Presently, wheat is produced in the country worth Rs. 220 billion and one percent gain or loss in wheat production is equivalent to Rs. 2.20 billion (Figure 2; Mujahid, 2010). It is pertinent to highlight that a bumper wheat crop was harvested in 2006 to 2007 in Pakistan owing to appropriate weather during the growing season, adequate supply of fertilizers, use of better technology and timely price support announcement by the government.

Pakistan-full of natural ingredients for better yield

To attain self sufficiency in wheat production, Pakistan has all the required fundamental ingredients such as rich soil, ample irrigation water, hard working farmers, multiple pesticides and certified seed varieties of local and foreign origin. Nevertheless, Pakistan has not been able to produce the desired quality of wheat even with the application of the latest technology due to certain inherent drawbacks and flaws in the overall process from seed plantation till harvesting. No devoted or sincere effort has been made at national or provincial level to address these issues in a befitting manner.

Requirement of increased yield of wheat

Weak wheat crop warrants an urgent need to speed up and boost its production in Pakistan either by increasing the area under cultivation or by enhancing the productivity per acre through the implementation of modern production technology. Wheat crop is primarily cultivated in widely irrigated and high rain fall areas of the country. Pakistan is basically an agricultural driven country, where 70% of the population directly depends on it whereas, 16% is indirectly dependent on agricultural means. The wheat crop production is confronted with a host of problems from seed plantation to harvesting

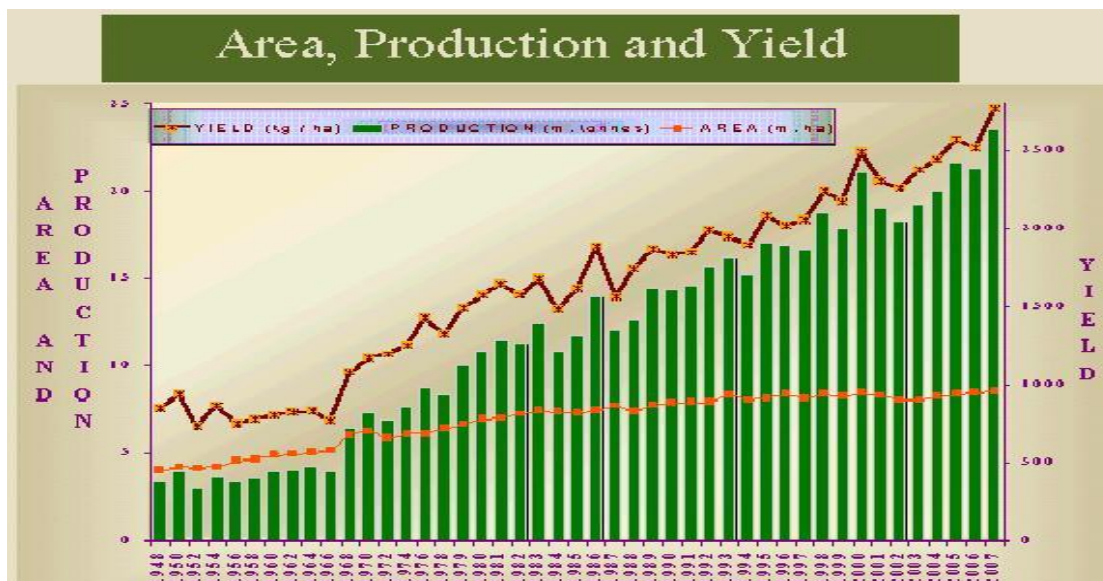


Figure 2. Wheat production evolution in Pakistan: National coordinator wheat, Mujahid (2010).

besides storage issues. The most critical of all the factors affecting wheat quality are weeds and the application of orthodox technology. Harmful weeds as many as 37 species grow in wheat fields in different cropping systems, the most troublesome being *Phalaris minor*, *Chenopodium album* and *Convolvulus arvensis* etc. A substantial quantity of wheat grain is required for the local population besides export constraints. In the near future, the development of improved variety of wheat accompanied with high quality yield and wide adaptation will certainly achieve promising results. This will help to standardize the socio-economic conditions of the country in general and farming community in particular (Alam, 2011). Therefore, the need of the hour is to optimize the incumbent wheat yields to fulfill the country requirements besides exports.

R AND D FOR OPTIMIZED YIELD AND QUALITY WHEAT PRODUCTION

Wheat research and development (R and D)

In 1977 to 1978, after the discovery of the epidemic disease of yellow rust to the crops, an increased emphasis was focused on the R and D facet. Resultantly, Pakistan Agricultural Research Council (PARC) was established and declared as the coordinated body for research in agricultural sector across the country. Since the inception of Wheat, Barley and Triticale program, a very consistent and effective contribution has been made by PARC in carrying out research and developmental activities to increase the production of wheat in different agro-ecological areas of Pakistan, thus, enhancing farm

income. The program follows a multi-disciplinary approach in order to formulate a stable high yielding wheat variety and to develop crop management practices. At the present, the wheat research programs are lying due to emphasis on the following salient research areas (Alam, 2011; Ahmad et al., 2010):

1. Drought/heat tolerance
2. Diseases
3. Salinity
4. Crop management

Development pertaining to wheat variety in Pakistan

1. LU26: A unique wheat variety LU26 was discovered in 1976.
2. Bravo: (Released in 1999). This is a beardless white chaff variety and an early heading cultivar with excellent test results.
3. Rosco: A beardless, white chaffed variety, bearing excellent straw strength besides winter sustainability. Rosco has slightly surpassed honey in terms of yield in three years of replicated tests.
4. Lisbo: It is beardless and white chaffed. It has better test weight than Rosco and Hopewell and is somewhat closer to honey. In height comparison, lisbo is slightly shorter than Rosco.
5. Vicar: It is beardless and white chaffed. It is very short and stiff with an excellent field view appearance and excellent disease resistance.
6. Laser: It is beardless and white chaffed. It is an extremely early heading line with high yield capability and possesses a very high test weight.

7. Eagle, Ivory and Alpha: These three lines being the newest are extremely promising lines emanating in our wheat system. They displayed tremendously high straw strength and best yield in 2002 trials.

8. Valor: A genetic breed of latest wheat with a soft red winter variety is developed by sunbeam extracts.

9. Husky: Bearing a beardless medium height, with an excellent "field appeal" and a robust growth pattern with large heads. However, in certain tests it has shown some unevenness.

10. Daisy: A soft red winter wheat breed has also been developed by Sunbeam Extract Co. It is recently licensed exclusively to Central Ohio Seed Testing, Inc.

11. Totem: A very erect and short height beardless breed. It is very early, possesses strong powdery mildew resistance and excellent straw strength (Alam, 2011; Ahmad et al., 2010).

Development projects for disease-resistant wheat varieties

In order to get rid of wheat stem rust disease and to foster the development of disease resistance wheat breeds, some of the international agricultural research outfits have jointly embarked upon a project with Pakistan Agricultural Research Council (PARC). The Mexico-based International Maize and Wheat Improvement Centre and the International Centre for Agriculture Research in the dry Areas located in Aleppo in Syria will actively participate in the project development which encompasses pre-breeding, rust surveillance, seed diversification and development of optimal conservation technologies. The ultimate purpose is to enhance wheat yield and production with double edge advantages of improved varieties and greater adoption of the best quality management practices (Mujahid, 2010).

Crop development

Keeping in view the climate, type of seed and soil enrichment, the wheat requires a period of 110 to 130 days between planting and harvesting. Optimal crop management warrants that the farmer must have a thorough understanding of each phase of development of the growing plants. Particularly, spring fertilizers, herbicides, fungicides, growth regulators are usually employed only at critical stages of plant development. For instance, it is presently recommended that the second application of nitrogen is best carried out when the ear (not visible at this stage) is about 1 cm in size (Z31 on Zadoks scale). In order to achieve desired results especially, from the climate point of view, the knowledge of development stages is extremely important. For example, pollen formation from the mother cell and the stages between anthesis and maturity are susceptible to

high temperatures. This adverse effect is further aggravated by water stress. Farmers also benefit from knowing when the 'flag leaf' (last leaf) appears, as this leaf represents about 75% of photosynthesis reactions during the grain filling period. Therefore it should be preserved from diseases or insect attacks to ensure a good yield (Ahmad et al., 2010).

Identification of crop stages

Incumbent systems presently employed to identify various crop stages are hereby mentioned:

1. The Feekes scale is used to identify wheat growth stage.
2. The Zadoks scale is a cereal development scale proposed by the Dutch phytopathologist Jan C. Zadoks is widely used in cereal research and agriculture.

Each scale refers to a standardized system which reflects sequential stages attained by the crop during the breeding season (Asif, 2011).

METHODOLOGY

The research paper has been formulated to identify the cardinal problems being confronted in the quality production of wheat. A thorough insight into the incumbent practical problems being faced by the farmer's community in particular and agricultural sector in general was strongly required. Therefore, a quantitative analysis has been applied to develop a strong base of identified problematic areas. The quantitative analysis has been fostered by a detailed questionnaire to gain substantial ingress into the root cause of the wheat cultivating mechanism and the allied critical factors. The questionnaire has been derived with an open ended strategy which entails seeking of comments and information from the grass root level specially, pertaining to the application of the latest technology apparatus applicable to all the stages of development right from the plantation of seed to harvesting methods.

A pilot study has already been carried out on 5 farmers. A sample size and targeted area of 10 acres has been taken into account for the purpose. Collected data deduced out of the study has been modified to develop the questionnaire. The questions in the questionnaire have been formulated in a very sequential and coherent manner thus, encouraging the recipients to give their inputs in an organized manner commensurating with the difficult level of questions. The answers to the questions are gauged with a distribution of numbers depicting the following levels: strongly agree = 5; agree = 4; satisfactory = 3; disagree = 2; strongly disagree = 1.

Although, the focus of the research paper is to identify the effects of technology in the production quality of wheat meeting export standards and demands in Pakistan, yet a quantitative analysis has also been carried out to further reinforce the on ground findings. The methodology applied for conducting the survey would be a blend of electronic and postal mediums to gather comments and information from the recipients belonging to all the tiers relevant to the production mechanism of wheat. Quantitative analysis has been adopted only due to the reason that optimal input of all the segments of society is incorporated in making this exercise a wholesome and fruitful effort.

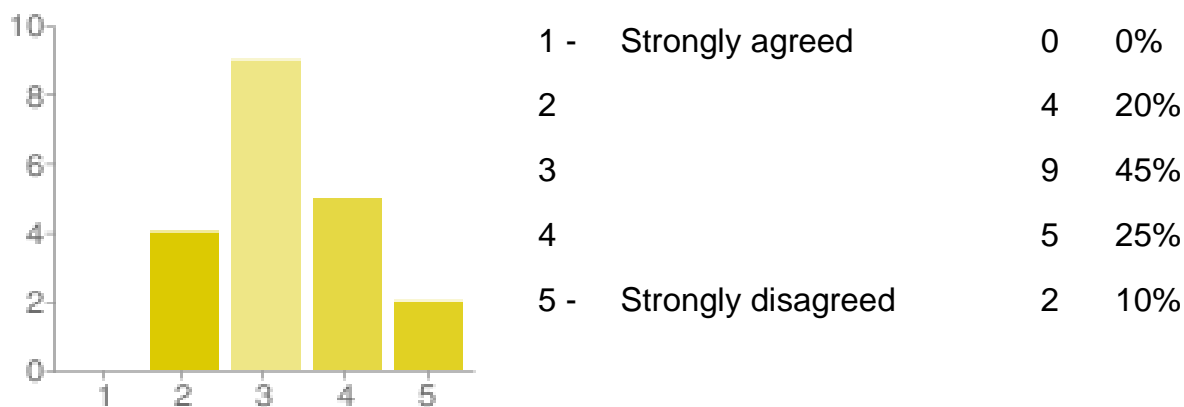


Figure 3. Respondent towards export quality wheat.

ANALYSIS

After studying the different research papers and literature on the subject defining the methodology of the research, a questionnaire was floated through electronic as well as, postal media to get on ground realities and facts. The same questionnaire is attached as annexure A to this research paper. The questionnaire was circulated to a specific segment of the society in order to get a wholesome and fruitful picture at the end of the research. Question papers were primarily forwarded to 50 individuals (35 electronic and 15 postal). Out of 50 individuals, 22 responded in a befitting manner thus, defining broad contours of our research. Information gathered as a result of survey was initially sifted and then thoroughly analyzed through application of various tools and techniques. In this context, the electronic survey has been analyzed through the application of special Google Tools and SPSS Application. Google tools provide a rational base for distribution link of the survey questionnaire besides carrying out a methodical analysis of the collected information. The aforementioned scientific tools and techniques have been utilized to carry out analysis based on the latest research system software thus, accruing a logical conclusion of the gathered information whereas, the analysis through conventional means would not have been so rational and methodical. The information received through the survey in the form of questionnaire will be discussed segment wise in the ensuing of paragraphs.

Export quality of wheat

The information pertaining to the export quality of wheat was sought from the respondents. 45% of the recipients said that the export quality of wheat is satisfactory but not up to the desired international standards. It is pertinent to highlight that no recipient agreed that the desired export standard was maintained. The primary root cause for

production of inferior quality wheat indicated by the recipients is the questionable fertility of the cultivated land. The same is vividly depicted from the bar chart (Figure 3) in the form of graphical representation.

Soft loans by the government

Provision of soft loans by the government for enhancing the quality of wheat was sought from the recipients. In Figure 4, 50 to 70% of the lot strongly disagreed and were informed that the government does not facilitate provision of soft loans which otherwise would prove very useful in enhancing the quality of wheat. It is pertinent to highlight that certain individuals despite of owning the land are not being provided with soft lands by the government which in itself is a major cause of proliferating despondency amongst the farmers.

Good quality wheat seeds

Information gathered regarding the provision of quality seeds by the government has been strongly disagreed by 50 to 70% of the recipients (Figure 5). This anomaly in provision of quality seeds by the government within the market is one of the major causes of substandard wheat production. Expanse seeds are being sold to the farmers as indicated by 40 to 65% of the recipients.

Matching technology for better wheat production

The survey signifies that 50 to 60% of the farmers are satisfied with the available technology which shows lack of knowledge and ignorance. On the other hand, 30 to 40% individuals have strongly disagreed that commensurating technology with the latest trends is available. The graphical data (Figure 6) strongly conveys that 60% of the recipients have either shown satisfaction

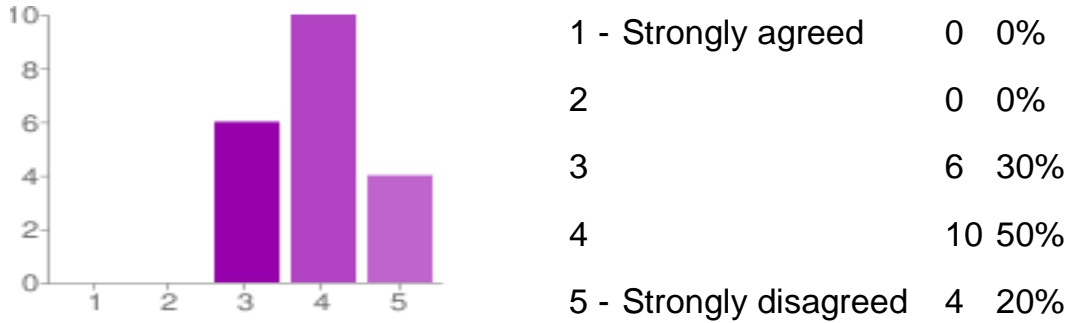


Figure 4. Respondent towards soft loans by the government.

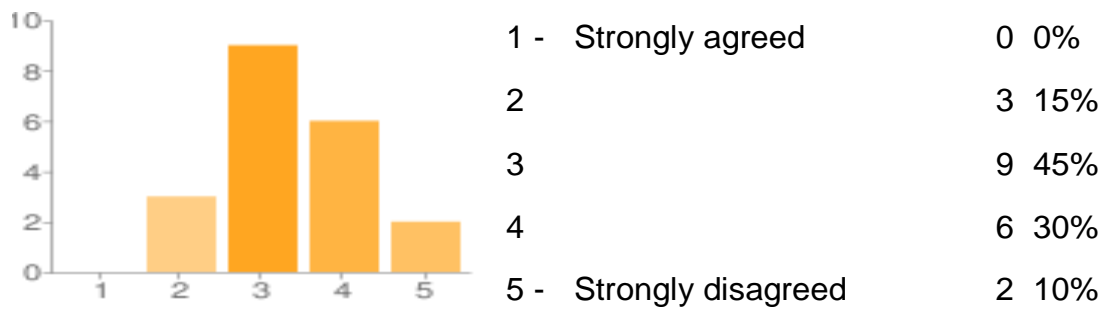


Figure 5. Respondent towards provision of good quality seeds by the government.

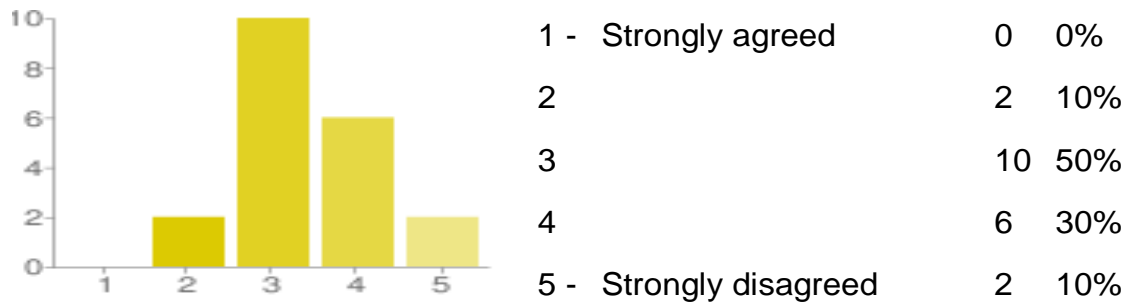


Figure 6. Respondent towards better technology for wheat production.

or ignorance about the technology trends which clearly is a cause of substandard quality wheat.

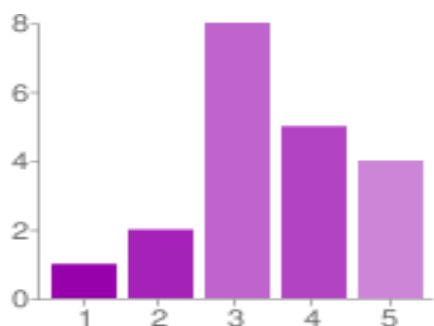
Government efforts for increasing quality and productivity

As per the statistics 40 to 40% of the recipients strongly disagree that the government is making concerted efforts to improve and enhance the quality and productivity of wheat whereas 40% of the lot have shown satisfaction at the government efforts which shows bench marking of lowest standards just because of ignorance and

unawareness (Figure 7). This is the focal point which needs to be understood that almost of the half of the recipients have shown the satisfaction over the prevailing standards which is clearly indicating one of the major causes of inferior standards.

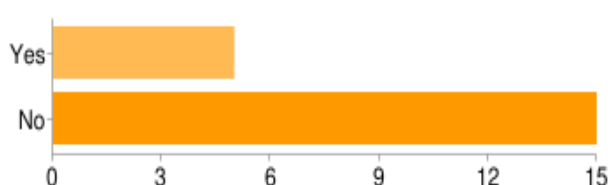
Technical information provided by the government for increase its productivity and quality?

Graphical data (Figure 8) is self evident that 75% of the recipients have shown interest that the government is not providing technical proliferation through media or other



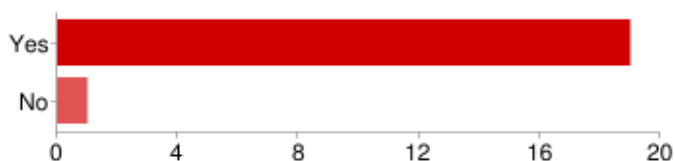
1 - Strongly agreed	1- 5%
2	2- 10%
3	8- 40%
4	5- 25%
5 - Strongly disagreed	4- 20%

Figure 7. Respondent towards government efforts for increasing quality and productivity.



Yes	5	25%
No	15	75%

Figure 8. Respondent towards technical information provided by the government.



Yes	19	95%
No	1	5%

Figure 9. Respondent towards the establishment of need help cell to emerging technical needs.

means to create awareness amongst the farmers' cadre. However, 25% were affirmative in their answer that they are satisfied with the technical information / support provided by the government which is contrary to the facts. Infact lack of government to enhance the productivity is one of the chief causes of inferior quality of wheat.

Need help cell to address the emerging technical needs

95% of the recipients have clearly pointed out that there is a definite need for establishing a help cell which should provide technical advice to the farmers for identifying the problem areas and recommending suitable remedial measures (Figure 9).

RECOMMENDATIONS

After analysing the facts and figures achieved from

different segments of the farmers in different areas, the following recommendations were formulated to implement the production of export quality of wheat in order to meet the demands of wheat inside as well as, outside of the country:

1. A research needs to be carried out to increase the fertility of the lands where questionable.
2. There is a need to make quality control authorities at the government level effective to meet the international standards of the wheat quality.
3. There should be an awareness program to make a farmer aware of the international quality standards and how they can be achieved.
4. The soft loans should be given to farmers so that they can contribute well in the wheat production and the procedures of the loans should be simple and short enough to facilitate a farmer.
5. A research should be carried out to produce the best quality of wheat seeds which should be disease resistant. During wheat season, farmers should be given wheat

seeds of the best quality on affordable rates. No other type of seed should be allowed to be used except the one recommended by the government.

6. The latest technology should be imported for the cultivation and harvesting of the wheat. The program should be made to make the farmer aware of the availability and use of that technology.

7. A complete policy manual should be formulated to increase the quality and quantity of wheat in the country and it should be continued in the period of each government with necessary changes made as per the requirement of time.

8. There should be a help cell to give a guide line to a farmer about the different aspects of wheat production, its stages and diseases etc and it should be opened all year round. The experts should be available there to give the guidelines free of cost in a polite and understandable manner.

Conclusion

Pakistan, primarily being an agricultural country is fully dependent on the export of crops especially, wheat for generating sufficient foreign reserves. However due to the vested interest of different stake holders and flaws in the procedures/systems, the desired quality of wheat is not being exported. An endeavour has been made in this study to identify these problems in the system and to recommend some pertinent measures for overcoming these impediments.

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