

ORIGINAL ARTICLE

Agricultural Pesticides Current scenario, Regulation and Sustainable Marketing prospects in Saudi Arabia

Khalid A. Asiry^{a,*}, Junaid Alam^b, Naimah A. Al-Anazi^c, Ihsanullah Daur^a, Sami Saeed M. Hassan^d and Vajid N. Veettil^c

^aDepartment of Arid Land Agriculture, King Abdulaziz University, Jeddah, Saudi Arabia

^bDepartment of MBA. Faculty of Institute of Business Management, GLA University, Mathura, India.

^cDepartment of Biology, Faculty of Science, University of Hail, Saudi Arabia.

^dDepartment of Zoology, Faculty of Science, University of Khartoum, Sudan

*Corresponding author e-mail address: prof_1974@hotmail.com

ABSTRACT

The current study explores the market situation and regulatory mechanisms for pesticides in Saudi Arabia. Nevertheless, pesticides application safeguards better yield from farms and ensures better storage of agriculture products. On the other hand, misuse of pesticides creates health risks that need regulatory mechanisms to ensure safe use of pesticides. According to the current study, the agricultural sector in Saudi Arabia is growing rapidly due to the institutional and non-institutional incentives provided to this. Consequently, needs for agricultural inputs are growing that demand supply as well as regulations by the related authorities. The article presents the trend of pesticides demanded in Saudi Arabia in the past 2-3 decades. Moreover, it explains the associated regulatory controls for agricultural pesticides in Saudi Arabia. The information in this study has been collected from authentic sources including ministries, statistical yearbooks and personal visits to retailers, suppliers and farm houses. Based on the information presented in this article and our personal contacts with people (data not presented) – show enormous scope for pesticides marketing and training in Saudi Arabia. Future research is recommended to focus on judicial use of pesticides training in Saudi Arabia, as sometimes misuse of pesticides was observed during the course of this study.

Keywords: Pesticides, Market, Demand, Supply, Quality control, Prices.

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INTRODUCTION

Worldwide agricultural is an important sector as it provides the basic requirements to people and provides raw material for industrialization [20]. In the past, agricultural production in Saudi Arabia was limited to specific areas due to harsh climates and only nomads were working with agriculture in dispersed agricultural areas for their own use, and selling some surplus to cities [4, 5].

During the 1980s, the Saudi government commenced focus toward improvement of agriculture sector with the objectives to improve food security through self-sufficiency and enhance incomes of rural people. Consequently, it brought modern machinery and agricultural equipment were exempted from customs' duties [21]. With the passage of time and the continuation of the agricultural developmental process, interests in importing improved seeds and pesticides also emerged [11]. As a result, the Saudi agriculture sector witnessed many praise-worthy achievements and realized the level of self-sufficiency in wheat [3]. After that, with decrease in support to agriculture, steady decline in GDP of agriculture's occurred [8]. Realizing that, the government upsurge support for agriculture and under the 2030 vision, the kingdom approved 92 billion riyals (\$24.5 billion) funding for agriculture, environment and water sectors to diversify economy [19]. Here, it is worth to mention that with the incredible progress in agriculture, concern about environmental pollution has emerged in Saudi Arabia [1, 13]. El-Mubarak *et al.* [10] research findings underscored persistent organic pollutants (POPs), in the ambient air of Saudi

Arabia. Osman *et al.* [17], analyzed 89 samples of cabbage, squash, green pepper, carrot, cucumber, lettuce, egg-plant and tomato by a multi-residue method of gas chromatography in Al-Qassim region, Saudi Arabia where they found 54 samples above the maximum residue levels (MRLs).

Indeed, many Saudis know that pesticides in agriculture have indispensable importance across the world as well in Saudi Arabia as it protects the crop loss from pests and it also helps to increase market value of the final products. However, along with the good aspects of pesticides there are dangerous aspects of pesticides that have adverse effects on the environment, biodiversity and ultimately on human health. For this reason Saudi Food and Drug Authority (SFDA) has been authorized to inspect the pesticides in agricultural departments, customs check points, shops, stores, and corporations that deal with pesticides. The ministry of Environment, Water and Agriculture also plays its role in this regard to frame rules for judicial use of fertilizers and pesticides use in accordance with SFDA. Up to date there is no comprehensive study on the use, marketing of pesticide in Saudi Arabia for sustainable agriculture. Also, marketing needs awareness about rules and regulations. Thus, this article compiles uses of pesticides, regulations and future prospective for pesticides.

MATERIAL AND METHODS

This research appraised the market situation and prospect for pesticides in the Kingdom of Saudi Arabia using authentic sources including ministries, statistical yearbooks and personal visits to the retailers, suppliers and farm houses. Saudi Arabia – officially called the Kingdom of Saudi Arabia – is an economically important country with land area of 2,150,000 km² (approx.) and thus geographically the 5th largest country in Asia and 2nd largest country in the Arab world (Wikipedia) [see Fig 1]. The major crops grown in Saudi Arabia are maize, potato, vine, various fruits and vegetables mainly (dates, watermelons, citrus and tomato etc).

The study examines pesticides market in this key country of the Arab world and its' future prospects. It presents the comprehensive information so that it may used for national and internal benefit of people.



Fig-1: Map of Saudi Arabia [18]

RESULTS AND DISCUSSION

Pesticides market in Saudi Arabia

The arid nature of the agricultural lands in the Kingdom of Saudi Arabia makes the agricultural practices comparatively more challenging. Therefore, the input market for the sector is always the demand oriented market. The contemporary inputs include ploughing tools, irrigation sprinkles and the quality seeds are imported or produced as per the demand [11, 22].

As far as the market for chemical pesticides is concerned, the following table provides the initial impression regarding its types and its monetary volume of the market size.

Table-1: Leading active ingredients or leading brand in Saudi Arabia.

Sector	Active ingredients	Active value (US \$m)
Herbicides	Glyphosate	2.88
	Dicamba	2.48
	2,4-D	2.22
Total		4.7
Insecticides	Dimethoate	2.68
	Lambda-cyhalothrin	1.74
	Alpha-cypermethrin	1.12
	Diazinon	0.74
	Cypermethrin	0.73
Total		7.01
Fungicides	Propiconazole	1.95
	Epoxiconazole	1.92
	Tebuconazole	1.67
	Thiophanate	0.64
	Spiroxamine	0.64
Total		6.82

Source: Ministry of Environment, Water and Agriculture, Saudi Arabia. [21]

Table-1 depicts the picture clearly about the market size. As on June 2014, there were three major categories of active ingredients with its agents. Total size of herbicides market alone was approximately 4.7 million USD, whereas insecticides' market size was about 7.01 million USD and the fungicides market was 6.82 million USD. In total the monetary value of the market size for the chemical ingredients in the Kingdom was 18.53 million USD (The ministry of Environment, Water and Agriculture, Saudi Arabia. [21]. The initiative towards agricultural development is an appreciable phenomenon in the Kingdom. At the same time the agricultural input markets are wide enough. Usually the inputs may be categorized into two kinds. The first may be the agricultural inputs which are welcomed with grace and non-fear attitude by the competent authorities because they are not harmful and are hazard-free such as quality seeds, technical equipment, irrigation tools and machines and other related items which actually helps to increase the farm yields and improve the quality of the farming within the country. The second types of inputs are counted as essential as well pivotal for the farm yields but at the same time, its residues are having serious side effects. It may pollute the groundwater, air, and organic properties of the crops somehow. Obviously these are chemicals, fertilizers, pesticides, insecticides and fungicides. These inputs, while causing pollution, cannot be appreciated when operated through open market [9, 15]. Therefore the imports, production and supply mechanism of these inputs must pass through the scanner of sustainability standards adopted by the competent authorities of the Kingdom. This does not mean that there are only dark sides of usage of these items. There are certain benefits which encourage using those inputs in the agricultural practices under the able vigilance of competent authorities. The authorities must assure the optimal usage of pesticides so that the balance between environmental sustainability and agricultural yield should be maintained. More specifically the volume of pesticides and chemical inputs shall be discouraged as maximum possible. Virtually, these types of products shall be allowed to supply only when the demand is unavoidable or may be recognized as necessity. Actually in Saudi Arabia the pesticide market is influenced by encouragement and supports facilitated by the Government that put the suppliers of agricultural pesticides in the comfort zone. The volume of demand for agricultural pesticides is factorized according to the crops grown in the country [14, 17, 12, 6, 2, 7]. Table 2 shows the demand/uses of pesticides according to crops grown.

Table-2: Saudi Arabia over all pesticides market for various crops in 2014 (US\$M)

Crop Group	Herbicides	Insecticides	Fungicides	Others	Grand Total
Cereals	16	10	6	2	34
Maize	1	0	0	0	1
Rice	0	0	0	0	0
Soybean	0	0	0	0	0
Rape	0	0	0	0	0
Sunflower	0	0	0	0	0
Cotton	0	0	0	0	0
Sugarbeet	0	0	0	0	0
Sugarcane	0	0	0	0	0
Potato	1	1	0	0	2
Vine	1	1	2	0	4
Pome fruit	0	0	0	0	0
Other F&V MAINLY(Dates, Watermelons, citrus & tomato etc)	8	8	7	0	23
Grand Total	27	20	15	2	64

Source: Ministry of Environment, Water and Agriculture, Saudi Arabia. (2014)

From Table-2, it can be noted that the cereals are the most vulnerable crop for the market of pesticides. During the year of 2014, the pesticides used in cereal cultivation were 34 million USD out of which the monetary values of used herbicides were 16 million USD whereas the insecticides consume 10 million USD. Overall, the demand for herbicides in 2014 were 27 million USD, for insecticides it was 20 million USD and for fungicides it was 15 million USD, which makes the aggregate demand for the pesticides were 64 million USD.

Comparing the monetary values of Table-1 and Table-2 shows that all pesticides in the market are not leading brand and there is need of huge volumes of pesticides. It does not mean that there is free market operation for pesticides in the Kingdom. The competent authorities have done the ample amount of efforts to ensure the sustainable values of the pesticides marketing process. There is proper full proof mechanisms developed to permit the marketing of such products in the nation. The interested organizations supposedly go through the mechanism of registration process to supply the pesticides in Saudi Arabia. The registration process ensures accomplishment of the standards fixed by CIPAC (Collaborative International Pesticides Analytical Council).

However, all these show that to increase the agricultural yields pesticides with minimum possible price are needed. For this reason the market in the pesticide sector is initiated here in the kingdom as well as it is been imported from other countries too. The imports in both powder and liquid pesticides are listed in Table-3.

Table-3: Quantity of liquid and powder pesticides imported in the kingdom.

Year	Herbicides		Fungicides		Insecticides		Total	
	Powder (Ton)	Liquid (Ton)	Powder (Ton)	Liquid (Ton)	Powder (Ton)	Liquid (Ton)	Powder (Ton)	Liquid (Ton)
1984 - 95	850	11028	7876	10821	6399	19594	15125	41443
1996	74	905	241	195	268	767	583	1867
1997	71	317	248	79	369	389	688	785
1998	232	1180	661	437	1290	1738	2183	3355
1999	103	399	176	138	194	486	473	1023
2000	556	1140	633	718	721	2771	1910	4629
2001	590	349	527	612	1201	2864	2318	3825
2002	215	880	114	512	897	2349	1226	3741
2003	228	746	126	464	908	2231	1262	3441
2004	259	1468	944	609	349	1806	1552	3883
2005	150	1574	961	941	723	3966	2834	6461
2006	152	1806	804	988	692	3222	1648	6016
2007	280	1733	980	783	1555	4147	2815	6663
2008	74	1540	820	456	685	3617	1569	5613
2009	145	1782	613	360	590	2153	1348	4295
2010	150	2218	550	447	729	2981	1429	5646
2011	61.40	179.16	625.10	631.92	118.74	3536.36	1805.24	5959.88
2012	55.21	151.33	1490.22	520.93	94.65	2924.61	1828.98	3238.14
2013	8213	92653	1190321	421970	74520	212681	1273.05	727304

Source: Department of extension and agriculture service Saudi Arabia. Agricultural Statistics, Year Book 2014.

All the pesticides mentioned in Table-3 are legally allowed to be used during farming processes in the agriculture. The table indicates that from 1984 to 1995 the uses of all kinds of pesticides are aggregated, whereas it is quite clearly mentioned from 1996 till 2013. The pesticides are marketed in both forms i.e. powder as well as liquid. The information extracted from the Table-3 also indicate that the uses of pesticides are consistently increasing yearly, but this may be due to subtle quantitative change in terms growth of size of agricultural practices in the Kingdom. The most remarkable change occurred in 2013 wherein the volumes of import have increased from 3238.14 tons in 2012 to 727304 tons in 2013. Moreover, it was 3355 tons in 1998, a huge jump from 785 tons in 1996 which was again cut-down to 1023 tons in 1999. Later on since 2000 onward the increasing trend of pesticides import is consistent. In 2013 the imports went up far ahead than the previous years. The total imports of pesticides were recorded 727304 tons which was all time the highest volume of imports.

Growth opportunities in Saudi Arabia pesticide market

Table-4 indicates the efforts made by the ministry of Environment, Water and Agriculture and growth of pesticides in the agricultural sector of Saudi Arabia.

Table-4: Pesticides market growth in term of materials, area and consumption.

Years	No. of Sprinkler Workers		No. of Sprinkler Pumps	No. of Plants Treated in 1000	Area Treated (Hectare)	Pesticide Consumption (Tons)
	Workers	Technicians				
1984 - 95	8506	3709	15847	36081	2725276	7276
1996	650	260	863	3883	157499	323
1997	659	274	872	4298	173212	304
1998	645	263	870	3430	515176	449
1999	652	265	694	4880	221000	203
2000	600	364	746	3365	162000	274
2001	655	270	834	3415	171000	370
2002	656	272	831	3465	179000	280
2003	657	276	856	3365	285984	335
2004	682	288	943	3402	271814	325
2005	687	291	965	5266	200465	199
2006	839	478	1215	5446	403851	330375
2007	843	482	1395	5101170	328906	399337
2008	921	516	1416	4613000	375700	348000
2009	935	531	1540	5302946	302768	337830
2010	985	542	1660	5411200	259724	322772
2011	581	247	641	890361	423661	456356
2012	674	314	643	8718.32	1932917.67	261.30
2013	674	314	643	8718.32	1932917.67	261.30

Source: Department Of Extension and Agriculture Service Saudi Arabia, Agricultural Statistics, Year Book 2015

From Table-4 it is quite clear that the treated area under the pest control has significantly increased from 200465 hectares in 2005 to 403851 hectares in 2006. The increase is almost double during one year. While further, it also jumped significantly in 2012-2013 with 1932918 hectares of agricultural land were treated for pest control. These successive jumps into the uses indicated that there are definite surges for agricultural inputs in the Kingdom. Even though this product is demand driven but shall be controlled by the regulatory authorities to ensure the sustainability in the market. Therefore, the Kingdom of Saudi Arabia has developed a strong mechanism for regulatory scanners of marketing of agricultural pesticides.

Regulation of pesticide market in Saudi Arabia

Pesticide registration requirements

The first regulations of the trade with agricultural pesticides started in 1976. In 2004 the Supreme Council of the Gulf Cooperation Council (GCC) approved" the regulation of agricultural pesticides in the countries of the Cooperation Council for the Arab Gulf States. In 2006 the Cabinet approved the application of this law in the Kingdom after the issuance of its Executive Regulations.

- Application form for the Registration of the Middle East and North African Countries is required.
- Development and submission of applications and dossier.

- Field trials assessment for new pesticides that have not been previously registered or re-registered.
- Confirm the sources of raw materials and finished products to be approved by EPA, FAO and WHO and not banned or prohibited.
- All documents must be handed to registration authorities as a hard copy, in hands, personally.

The ministry of Environment, Water and Agriculture owns its special accredited laboratories which make all the requested analysis for the formulated product and residue analysis according to the CIPAC standards.

Dossier requirements and certificates

From technical suppliers

- Registration certificate of active technical ingredient issued from Governmental authority such as the ministry of Environment, Water and Agriculture, ICAMA (CHINA) duly legalized.
- Free sale certificate from the manufacture of technical grade duly legalized.

Certificates required for formulated products

- Legalized Free Sale Certificate.
- Legalized Certificate of Registration.
- Legalized Certificate of analysis from the producer.
- Authorization letter from the producer of the finished product to the exporter.
- Certificate of storage stability.

Technical data information

- Physical and chemical properties.
- Impurities data.
- Toxicological data.
- Eco-toxicological data.
- Residual data.
- Maximum residue limits.
- Method of analysis for technical and residue analysis in soil, water and air.
- Environmental fate.

Finished product data information

- Product composition in details.
- Specification of the product.
- Uses and application rates.
- Method of analysis with the calculation sheet and chromatographs.
- Storage stability at hot and cold test.
- Material safety data sheet MSDS.
- Proposed label.

Monitoring and follow-up

Bio-efficacy carried by the ministry of Environment, Water and Agriculture to ensure the efficiency of the registered products according to Saudi Arabia climates and conditions. Costs vary greatly depending on the number of crops and pests. Controlling the banned and the restricted pesticides according to EPA list. Renew the expired products after the analysis or dispose according to scientific standards. Inspection for stores and warehouses to make sure of their commitment to the safety standards.

Misuse of pesticides in Saudi Arabia

Fig. 2 shows some agriculture and municipalities workers carelessly spray huge amounts of insecticides or without warning. Indeed, the government is spraying with goodwill as there are health concerns, such as dengue fever, and for this municipalities frequently spray insecticides as a preventative measure, however it need awareness and training of workers and people for proper safety measure.



Fig 2. Misuse of pesticides by some agriculture and municipalities workers

CONCLUSION

The present article appraised the market situation and prospect for pesticides in the Kingdom of Saudi Arabia. In Saudi Arabia, marketing jumped from 1867 tonnes in 1996 to 727304 tonnes in 2013 that highlights increasing market. Moreover, sustainable demand is expected to grow fast in during next decade as government has focus agriculture development under vision 2030. Additionally, the agricultural market in the Kingdom of Saudi Arabia is simply awakening that most of the agricultural farms are struggling to reach at the point of marginal revenue equals the marginal cost during practices. Thereby, the costs versus benefits analysis need to be considered for pesticides in the kingdom. Also, it has been observed that the pesticides markets are controlled and managed by the competent and accountable authorities. The volume of market size for pesticides has huge potential. Thus the careful management during the logistics, procurements, retailing, imports and usage of the pesticides has been ensured by the government. At the same time the ministry of Environment, Water and Agriculture, Saudi Arabia also committed to enhance the yields in the agricultural farms at least up to the level of marginal revenue equals or more than the marginal costs in the sector. Finally, the article recommends analysis of efforts and steps taken to neutralize the residues of pesticides usage in groundwater, air, fruits, vegetables and cereals produced. Also the article recommends selective and safe pesticides or bio-pesticides on the basis of Saudi people attitude (no data presented). Most of the information in this article originates from national data and from the authors' personal visits to pesticides related places.

CONFLICT OF INTEREST STATEMENT

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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