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RODENTICIDES MARKET

BY TYPE (Anticoagulants & Non-Anticoagulants), **BY END USER** (Agricultural Field, Warehouses, Pest Control Companies, Urban Centers, & Others) **& BY GEOGRAPHY**

— Global Trends & Forecasts To 2019

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1 EXECUTIVE SUMMARY

Rodenticides are a heterogeneous group of compounds used to kill rodents. Rodenticides are generally of two types, anticoagulant and non-anticoagulant. Anticoagulant rodenticides have been used to control rodent population for over 50 years. Although rodents help in maintaining an ecological balance in the ecosystem, they also cause huge damage to crops, buildings, and are responsible for transmission of various diseases to humans. Hence, rodent control has become an essential part of pest control programs.

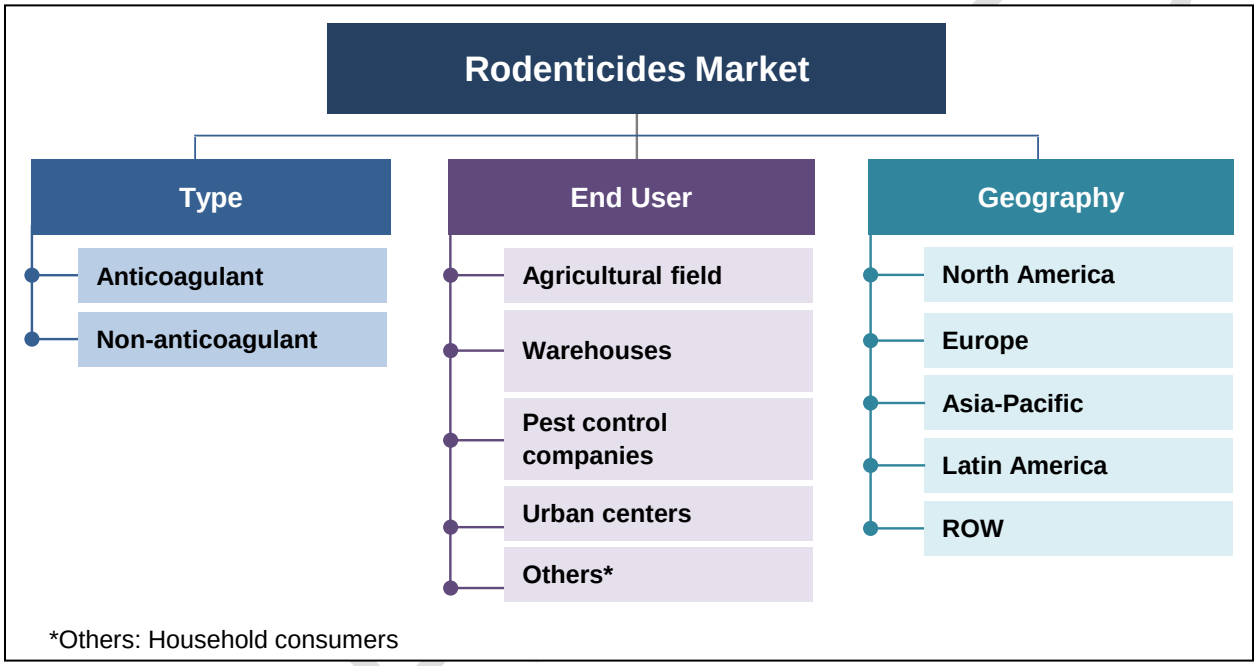
The rodenticides market has shown a positive growth trend over the last few years. Rodenticides baits are effective in controlling rat and mice infestations and are used for both indoor as well as outdoor applications. Growth in demand for food grains and the increasing awareness in farmers to reduce crops wastage due to rodent pests are the major drivers for the market. New product launch is the key strategy adopted and implemented by the leading players in this market.

Rodenticides are used in agricultural applications such as to protect crops in fields as well as stored crops in warehouses, by pest control agencies, urban centers, and by consumers. Rodent control is an important program used by professional pest controllers. Increasing concern for health and sanitation in urban centers has also increased the use of rodenticides.

2 PREMIUM INSIGHTS

FIGURE 1

RODENTICIDES MARKET SEGMENTATION



Source: MarketsandMarkets Analysis

The rodenticides market was segmented on the basis of type, end user, and geography. The rodenticides market, by type, was segment into two broad categories: anticoagulants and non-anticoagulants. Rodenticides are used by different end users such as agricultural fields, warehouses, pest control companies, urban centers, and others (household consumers). The market for rodenticides in different regions was analyzed.

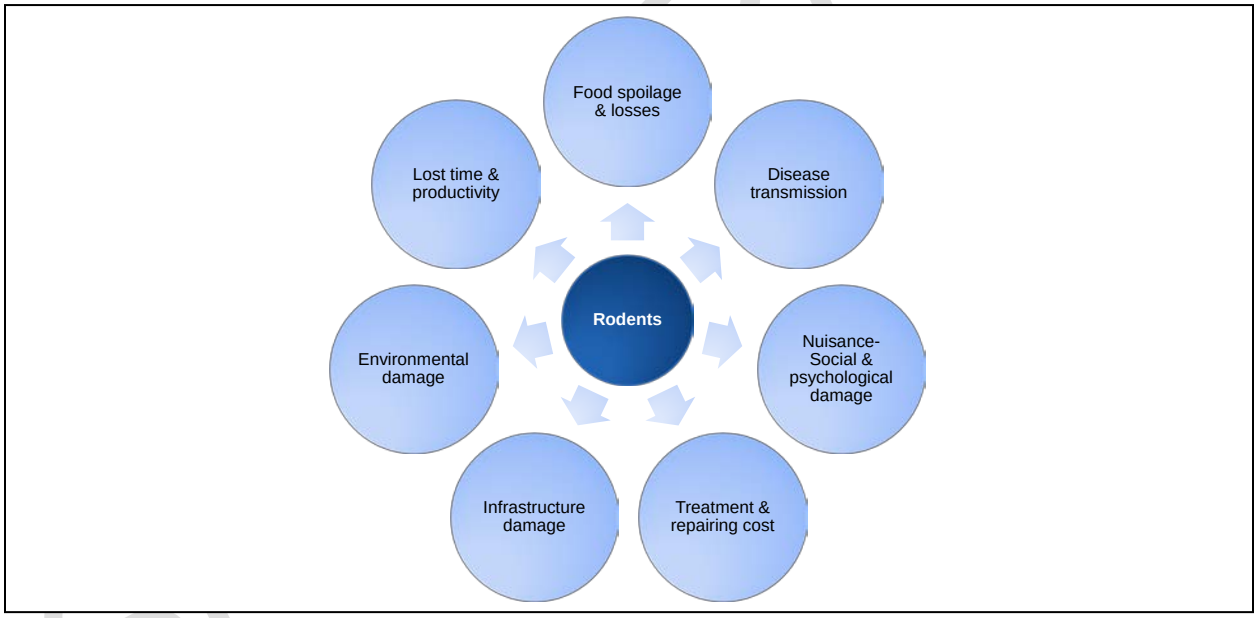
3 INDUSTRY ANALYSIS

3.1 INTRODUCTION

Rodents are common pests that destroy agriculture output stored in agriculture fields and factory warehouses. The wild rodent species are responsible for the spread of zoonotic diseases, such as plague, leptospirosis, and lassa fever. The rodents are also responsible for infrastructure damages that include pipelines, rail tracks, and buildings.

FIGURE 2

DAMAGES CAUSED BY RODENTS



Source: CIEH, Pesticide Research Journals, and MarketsandMarkets Analysis

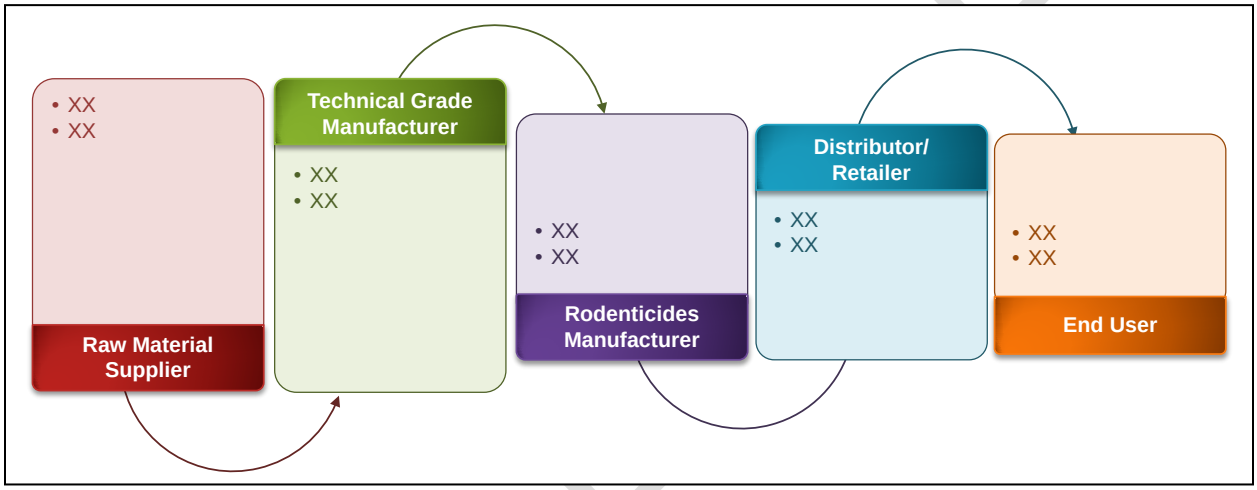
The experts suggest that cost of repairing the damages caused by pests, essentially rodents, is estimated to be five times the cost of controlling the pest population. Therefore, it becomes essential to curb the rodent and other pest population.

3.2 CORE INDUSTRY ANALYSIS

3.2.1 SUPPLY CHAIN ANALYSIS

FIGURE 3

RODENTICIDES MARKET SUPPLY CHAIN ANALYSIS



Source: MarketsandMarkets Analysis

The raw materials used for manufacturing rodenticides include active ingredients and inert ingredients which are generally mixed with milled grains and vegetable oil to increase its palatability. These raw materials are supplied to technical grade manufacturers that purify these chemicals and sell them in bulk to rodenticide manufacturers. Rodenticide manufacturers formulate the baits in various textures so that there is high acceptance and the finished products are packed and supplied to the distributors; ultimately, being delivered to the end consumers with the help of retailers and wholesalers.

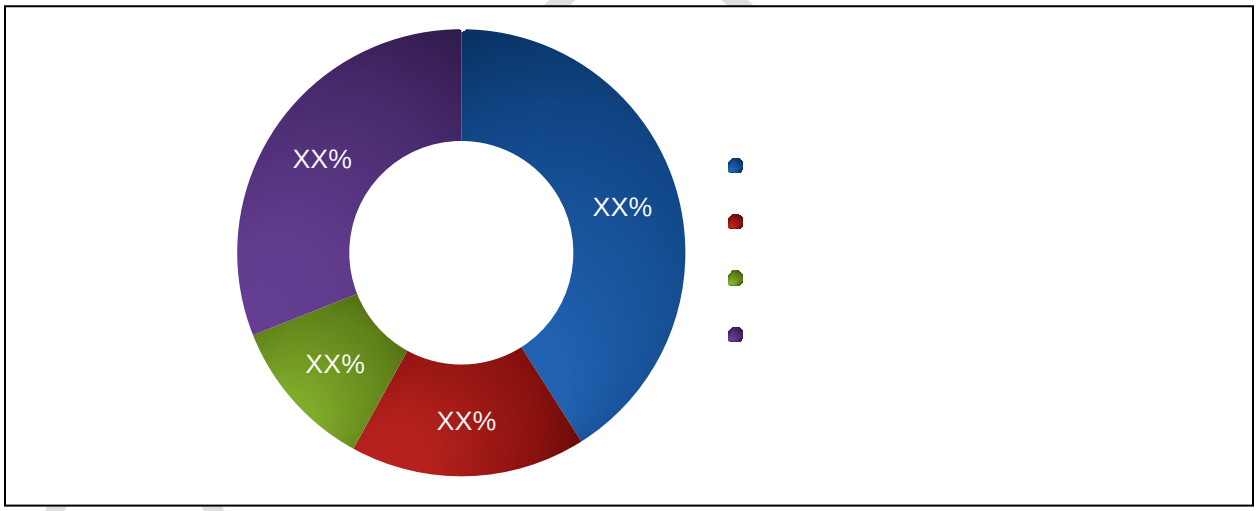
4 MARKET OVERVIEW

4.1 RELATED MARKETS

The related markets of chemical rodenticides are non-chemical options such mechanical traps and glue board products. The increasing concerns regarding poisoning of non-target species such as pets and children are driving the rodenticides market towards these options. Other rodenticides may include tracking powders, fumigants, and sulfur. Other related agrochemicals include pesticides such as insecticides, herbicides, fungicides, and bio-pesticides that increase crop yield by controlling other pest attack on crops.

FIGURE 4

AGROCHEMICAL MARKET SHARE (VOLUME), BY TYPE, 2013



Source: MarketsandMarkets Analysis

In 2013, the agrochemicals market, by volume, was dominated by herbicides which accounted for the largest share, followed by insecticides and fungicides.

5 MARKET ANALYSIS

5.1 MARKET DYNAMICS

5.1.1 DRIVERS

5.1.1.1 Prevention of wastage and contamination of crops, stored products, and damage to infrastructure

All crops grown for human and animal food are prone to damage by rodents. These rodents threaten the incomes and food safety of millions of farmers and their families. They destroy crops, particularly cereals such as rice, wheat, barley, millet, corn, and sorghum, legumes and root crops such as cassava, taro, yams, and potatoes. All vegetable and fruit crops are also attack by rodents. Rice is the dietary staple of hundreds of millions of people across Asia. Rice pre-harvest losses are estimated to be between XX%-XX% in most Asian countries.

In Malaysia, the oil palm crops are infested by population of the Rattus tiomanicus species, which can build up to XX rats per hectare and cause losses of up to XX% of crop yield. Rodents damage stored products along the entire post-harvest pipeline, from field stores to vast industrial bulk storage depots.

TABLE 1

ESTIMATED DAMAGE AND LOSSES OF STORED CROPS & OTHER FOODSTUFFS

Country	Type of storage	Commodities attacked	% Damage or loss
Brazil	Stacks, sacks, cribs	Rice, corn, beans	XX
Bangladesh	Open and closed stores	Rice, pulses, grains	XX
Egypt	Open and closed stores	Cereal grains	XX
India	Warehouses, sacked	Cereal grains	XX

Country	Type of storage	Commodities attacked	% Damage or loss
Mexico	Granaries, sacks, cribs	corn, rice, ground nuts	XX
Malaysia (Sarawak)	Cribs	Rice	XX
Nigeria (Kano State)	Temporary or closed stores	Pulses and groundnuts	XX
Philippines	Warehouses, sacks	Rice, maize, legumes	XX
Thailand	Sacks, cribs	Corn, rice	XX
Turkey	Warehouses, sacks	Wheat, rice, corn, legumes	XX

Source: FAO and Related Research Journals

The FAO reports losses due to rodents of stored crops across the world and estimated that XX million tons of cereals are lost each year. Rodents also damage many structural elements of buildings and installations such as insulation material, wood and plastic door and window fittings, water conduits, electrical cables, wall partitions, and roofing components.

5.1.1.2 Prevention of disease transmission caused by rodents

Rodents act as vectors or carriers of diseases that include plague, leptospirosis, salmonellosis, and tularemia. Hence, several government public health organizations use rodenticides to eradicate disease transmission, especially during an epidemic. The urban centers and several government institutions work in tandem to provide immediate response during such situations. These key segments store rodenticides for prevention of disease transmission.

Rodenticides, in the form of fumigants, can quickly eliminate rat and mice population even in severe cases of infestation. Because rodenticides are more effective than traps, they prevent rats and mice from infecting humans with diseases, such as sylvatic rodent-borne plague and typhus, which are still common today. Other diseases that effective rodent control prevents are lymphocytic choriomeningitis and dysentery.

6 RODENTICIDES MARKET, BY TYPE

6.1 INTRODUCTION

Rodenticides application is a component of the pest management program implemented to kill rodents. The rodenticides are classified into anticoagulant rodenticides and non-anticoagulant rodenticides. The anticoagulant rodenticides are further classified into first-generation anticoagulant rodenticides and second-generation anticoagulant rodenticides. All these doses are applied in three forms, that is, baits, tracking powders, and fumigants.

Baits are the injected/poisoned food designed to attract the rodents to kill. The tracking powders are placed along the rodent runways, wherein the fur picks up the powder and is ingested by the rodent while grooming. Fumigants are the release of poisonous gases to kill the rodents in their burrows. The anticoagulant rodenticides are used for multiple feed baits where it takes time to kill. The rest of the rodenticides are used for acute poisoning where the rodents get killed in a short time with high-intensity chemicals.

TABLE 2

RODENTICIDES & THEIR TYPES

Rodenticides Type	Rodenticides	Chemical class	Days of feeding needed
First-generation anticoagulant	Chlorophacinone	Indandione	Multiple
First-generation anticoagulant	Diphacinone	Indandione	Multiple
First-generation anticoagulant	Coumatetralyl	Coumarin	Multiple
First-generation	Warfarin	Hydroxycoumarin	Multiple

Rodenticides Type	Rodenticides	Chemical class	Days of feeding needed
anticoagulant			
Second-generation anticoagulant	Brodifacoum	Coumarin	Single
Second-generation anticoagulant	Bromadiolone	Hydroxycoumarin	Single
Second-generation anticoagulant	Difenacoum	Coumarin	Multiple
Second-generation anticoagulant	Difethialone	Hydroxycoumarin	Single
Second-generation anticoagulant	Flocoumafen	Coumarin	Single
Non-anticoagulant	Bromethalin	Coumarin	Single
Non-anticoagulant	Cholecalciferol	Vitamin D3	Single or multiple
Non-anticoagulant	Zinc phosphide	Inorganic compound	Single

Source: Research Publications and MarketsandMarkets Analysis

Single dose anticoagulants pose a higher risk of secondary poisoning. Residues of the single dose anticoagulant remain for days in the liver of rodents due to which the predatory birds and animals eating them may build up toxic dose over time.

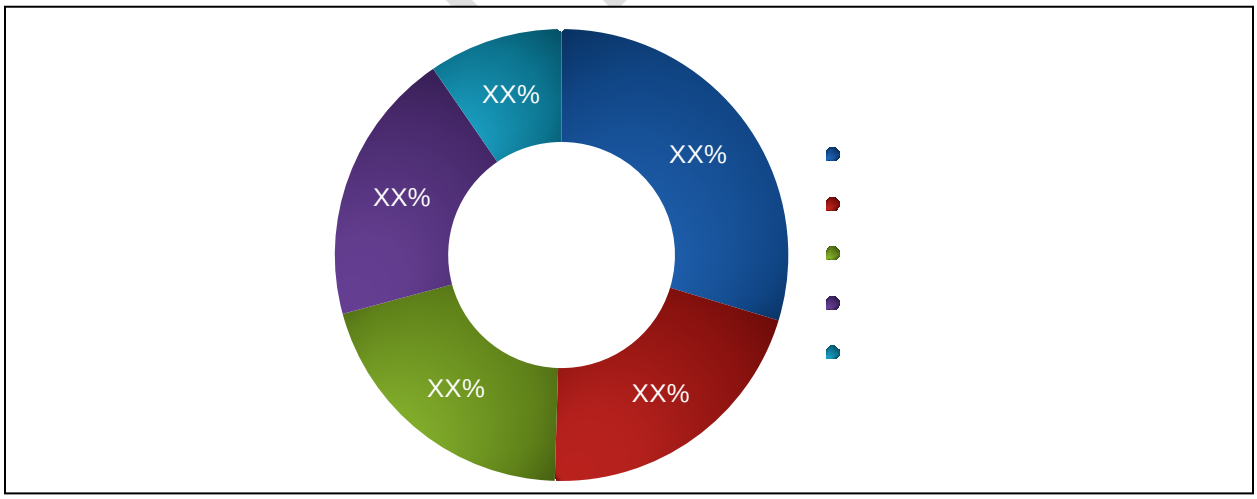
7 RODENTICIDES MARKET, BY END USER

7.1 INTRODUCTION

Rodenticides are used as a curative treatment against the already existing rodent infestation or as a preventive treatment against rodents. Rodenticides are widely used in agricultural fields, green houses as well as warehouses to protect crops as well as food grains temporarily stored after harvesting in open areas. Apart from being used in crop protection, they are also used by professional pest control companies to treat and eradicate rat infestations. Warehouses generally contain food grains which are highly prone to rodent attacks. In urban centers, rodenticides are used around building structures, sewers, and waste dumps. Besides being used in crop fields and warehouses, rodenticides are also used in urban centers to maintain health and sanitation in and around buildings, sewages, and garbage dumps.

FIGURE 5

RODENTICIDES MARKET SHARE (VALUE), BY END USER, 2013



Source: MarketsandMarkets Analysis

Pest control companies are the largest users of rodenticides and make up for nearly one third of the market. Rodenticides are also widely used in agricultural fields and urban centers.

8 RODENTICIDES MARKET, BY GEOGRAPHY

8.1 INTRODUCTION

Rodenticides play an important role in the protection of stored food grains from rodent consumption and spoilage. They are widely used around the world by professional pest controllers as well as consumers. Anticoagulant rodenticides are used in Europe due to restrictions on non-anticoagulants.

The use of rodenticides largely depends on the country and the crops grown. Sugarcane and rice are extremely palatable to a rodent which usually leads to uncontrolled population. Besides agriculture, rodenticides are also used by urban centers, warehouses, food processing units, and the pest control segments. The Asia-Pacific region is the fastest growing market for rodenticides, with India leading the market with a CAGR of XX%.

TABLE 3

RODENTICIDES & REGULATING AGENCY, BY COUNTRY/REGION

Country/Region	Regulating Agency
U.S.	United States Environmental Protection Agency (EPA) & Authorized State Agency
Canada	Pest Management Regulatory Agency (PMRA)
Europe	EU Biocidal Products Regulation (BPR)
Australia/New Zealand	Australian Pesticides and Veterinary Medicines Authority, Food Standards Australia New Zealand

Source: MarketsandMarkets Analysis

The EPA is the most prominent regulating agency for rodenticides. In 2014, EPA signed an agreement with Reckitt Benckiser Inc. (U.S.) to remove certain rodenticides products which do not comply with their safety standards.

9 REGULATIONS ON RODENTICIDES

9.1 INTRODUCTION

The regulations regarding rodenticides have been framed and implemented in many countries across the globe. Various laws and amendments have been recreated to meet the present standards for rodenticide application. Regulations are mandatory as some rodenticides include acute toxicants like non-anticoagulants, which are extremely limited in some countries. The regulations are largely concerned with the accumulation and toxic effects of rodenticides on human beings, non-targeted wildlife, and the environment. Various limitations have been laid on the trade, production, application, and distribution of rodenticides.

9.2 NORTH AMERICA

9.2.1 U.S.

9.2.1.1 The Code of Federal Regulations (CFR)

The CFR pertains to all the general regulations published in the Federal Register by the executive departments and agencies of the U.S. Federal Government. A total of XX subject titles are incorporated in the CFR. Title XX CFR encompasses the code for Protection of Environment, which is administered by the U.S. Environment Protection Agency (EPA).

The e-CFR has the latest updates of CFR information. It is compiled with CFR material and Federal Register amendments, produced by the National Archives and Records Administration's Office of the Federal Register and the Government Printing Office.

9.2.1.2 The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 1972

FIFRA is a product-licensing statute, which states that a pesticide must obtain an EPA registration before its production, transport, and sale. It regulates pesticide use through its labeling, packaging, composition, and disposal emergency exemption authority.

9.3 EUROPE

9.3.1 CURRENT STATUS FOR APPLICATION OF RODENTICIDES

TABLE 4

CURRENT STATUS ON ACTIVE INGREDIENTS USED AS RODENTICIDES, 2007–2017

Active Substance (AS)	Date of Inclusion Directive	Date of Annex I inclusion	Date of Expiry
Difethialone	XX	XX	XX
Carbon dioxide	XX	XX	XX
Difenacoum	XX	XX	XX
Bromadiolone	XX	XX	XX
Alphachloralose	XX	XX	XX
Aluminum phosphide	XX	XX	XX
Coumatetralyl	XX	XX	XX
Chlorophacinone	XX	XX	XX
Flocoumafen	XX	XX	XX
Warfarin sodium	XX	XX	XX
Warfarin	XX	XX	XX
Brodifacoum	XX	XX	XX
Powdered corn cob	XX	XX	XX

Source: EBPF and EFSA

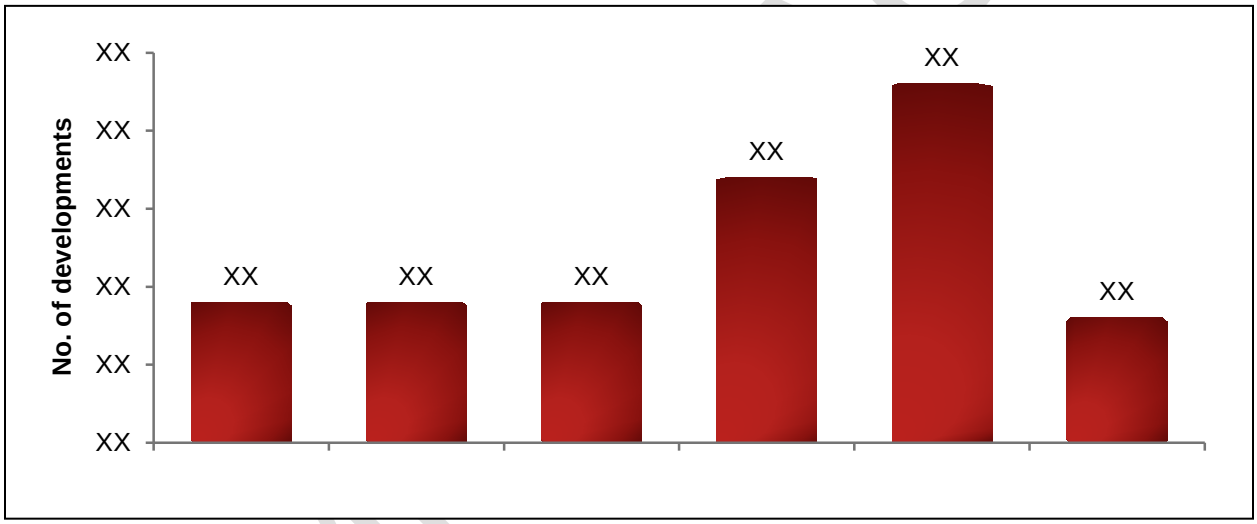
10 COMPETITIVE LANDSCAPE

10.1 INTRODUCTION

10.1.1 RODENTICIDE: HIGHLY COMPETITIVE MARKET

FIGURE 6

ANNUAL RODENTICIDES MARKET DEVELOPMENT TREND, 2009-2014



* Company developments taken into consideration up to May 2014

Source: MarketsandMarkets Analysis

The global rodenticides market registered a total of XX developments between 2009 and 2014. Due to increase in the global population, the there is a need for increase in crop yield. However, in order to reduce the wastage of crops caused by rodents, the demand for rodenticides is also seeing an increase. New product launches was the major development between 2009 and 2014. The maximum number of developments was recorded in 2013 with the total number accounting to XX developments.

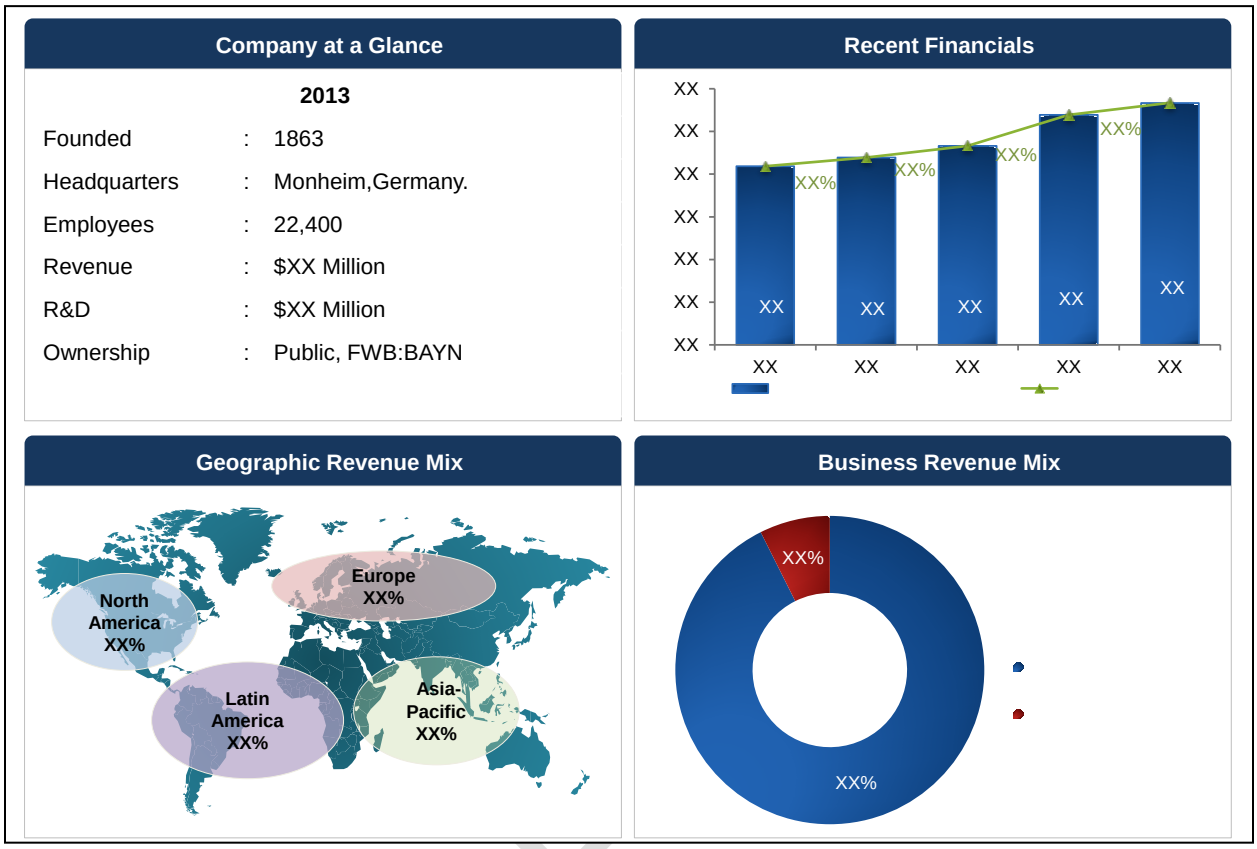
11 COMPANY PROFILES

11.1 BAYER CROPSCIENCE AG

11.1.1 OVERVIEW

Bayer CropScience AG operates as a subsidiary of Bayer AG. The company is involved in crop protection, non-agricultural pest control, seeds, and plant biotechnology. The company operates through three business segments including Crop protection, Environmental science (Non-agricultural pest-control), and Bioscience (seed & plant biotechnology).

The company has its presence in over 120 countries across the globe. The company primarily operates in Europe and has active presence in North America, Latin America, Africa, Middle East, and Asia-Pacific regions. The company employed around 22,400 for the CropScience segment in 2013. The key competitors of this company include Motomco (U.S.), Syngenta (Switzerland), and SenesTech (U.S.).



Source: Company Website, Company Annual Report, and MarketsandMarkets Analysis

11.1.2 PRODUCTS & SERVICES

Bayer CropScience provides a range of crop protection products as well as biological seeds. These include fungicides, pesticides, rodenticides, and so on. They also offer a broad portfolio of rodenticides under their environmental science segment.

TABLE 5

BAYER: PRODUCTS & THEIR DESCRIPTIONS

Brand	Product name	Description
Finale	Liquid Concentrate	This product is a highly active, single feed anticoagulant rodenticide. It contains difethiolone as an active ingredient and is used to control Norway rats, roof rats, and house mice.

Brand	Product name	Description
	Pellets	This product is used to control rat and mouse infestations. It is a highly active anticoagulant used and causes death within XX days of consumption.
	Wax Blocks	This product is a single feed anticoagulant rodenticide used to control roof rats, Norway rats, and house mice.
	Liquid Bait	This product is used to make up rodenticide baits used in homes, farms, and industrial premises. It is effective against warfarin resistant rats and mice.
	Grain Bait	Grain baits are used particularly against mice with their small appetites and their intermittent feeding behavior.
	Paste	This product is used to kill all kinds of rodents in a single feed and is highly effective against warfarin resistant rats.
Racumin	Bait Block	This product is a multi-feed anticoagulant which is used to control a variety of rats and mice. It can be used both for domestic and industrial applications.
	Paste	This product has a unique formulation that is weather resistant and palatable. It contains a bittering agent that prevents human and non-target animals from ingesting.
	Tracking Powder	This product contains coumatetralyl as an active agent. It is used to control all rodents in domestic areas as well as industries.
Rodilon	Paste	This product contains difethiolone and is highly effective due to its molecular configuration. It is a powerful rodenticide used to control all rodent infestations.

Source: Company Website, Company Annual Report, and MarketsandMarkets Analysis

11.1.3 STRATEGIES & INSIGHTS

Bayer CropScience concentrates on maintaining its position in the crop protection industry by acquiring other companies who have expertise in crop protection and related products. It is the most dynamic company in the market that continually invests in research and development of new products in crop protection and pest management. The company focuses on upgrading its existing products to increase their performance in the Asia-Pacific region for its seed business. The company is entering into partnerships to sustain in the growing market. It is investing in new facilities to develop new innovative products.

The company intends on expanding its operations in the Latin American region. It is involved in several acquisitions and joint R&D ventures to expand its geographical operations. The company also intends on diversifying and increasing its pest management business by entering into research agreements with different related companies.

11.1.4 DEVELOPMENTS

Date	Approach	Description
March 2014	Expansion	The company opened a new production facility at Wismar, Germany to increase its production of biological crop protection products as well as expansion of research and development activities.
March 2014	Acquisition	Bayer CropScience acquired Biagro Group (Argentina), which is a leading producer and distributor of biological seed treatment productions. This was aimed at increasing the strategic growth in Argentina and also offering a broader portfolio of products in the crop protection business.
September 2013	Expansion	Bayer CropScience invested around Euro XX billion to step up their production capabilities for active ingredients used in crop protection.
July 2013	Expansion	Bayer CropScience expanded its U.S.-based research operations that will integrate its research operations with their production to

Date	Approach	Description
		accelerate innovation of their products.
June 2013	Expansion	Bayer CropScience invested $XX million to open a new wheat breeding station in Milly-la-Forêt near Paris, France with focus on improving yields, addressing environmental challenges, and improving wheat varieties.
April 2013	Agreement	Bayer CropScience entered into a research agreement with KeyGene (The Netherlands) to develop improved crop varieties with initial focus on wheat followed by oilseed rape, rice, and cotton. As per the agreement, Bayer can access the unique KeySeeQ discovery pipeline of KeyGene.
April 2013	Agreement	Bayer CropScience (Germany) and Monsanto (U.S.) entered into a licensing agreement for next-generation and enabling technologies in the plant biotechnology field. According to the agreement, Bayer CropScience will get royalty-bearing license to Genuity Roundup Ready XX Yield and Genuity Roundup Ready XX Xtend technology in soybeans in U.S. and Canada and also to Intacta RR2 PRO in soybeans in Brazil and other Latin American countries in the future. Monsanto will be granted licenses to evaluate enabling technologies for corn rootworm control and herbicide tolerance.
March 2013	Collaboration	Bayer CropScience expanded their R&D cooperation with the research company, Nature Source Genetics (U.S.), by entering into a five-year collaboration that involves pre-breeding and enhancement of soybean germplasm. According to the partnership, Bayer CropScience's soybean breeders and geneticists will combine with Nature Source Genetics' technical expertise and bioanalytical platform to identify and utilize the broad range of promising germplasm.
March 2013	Agreement	Bayer CropScience signed an agreement with a wheat-breeding company, Biotrigo Genetica Ltd. (Brazil), to expand their successful cooperation. According to the agreement, Bayer can use the lineage of new wheat varieties of Biotrigo.

Date	Approach	Description
September 2012	Acquisition	Bayer CropScience acquired a wheat breeding station from RAGT Semences S.A.S. (France) that will enable the company to provide rapid solutions to wheat farmers by using expert tools like molecular breeding.
August 2012	Expansion	Bayer CropScience invested in a new breeding center in the Wimmera region (Australia) for breeding activities of wheat and oilseeds. The company is planning to develop new varieties with higher yields and productivity adapted to Australian conditions.
July 2012	Partnership	Bayer CropScience, Commonwealth Scientific and Industrial Research Organization (CSIRO), and Australian Grains Research and Development Corporation (GRDC) formed a research partnership to increase yield in wheat. CSIRO developed wheat which produces significantly more grain by genetic modification while Bayer CropScience and CSIRO plan to improve this technology to fulfill farmers' needs.
May 2010	Agreement	Dow AgroSciences and Bayer CropScience entered into cross-licensing agreements regarding cotton technologies thus offering growers with new traits and technologies from both the companies.

Source: Company Press Release, Company Annual Report, Company Website, Company Publications, and MarketsandMarkets Analysis

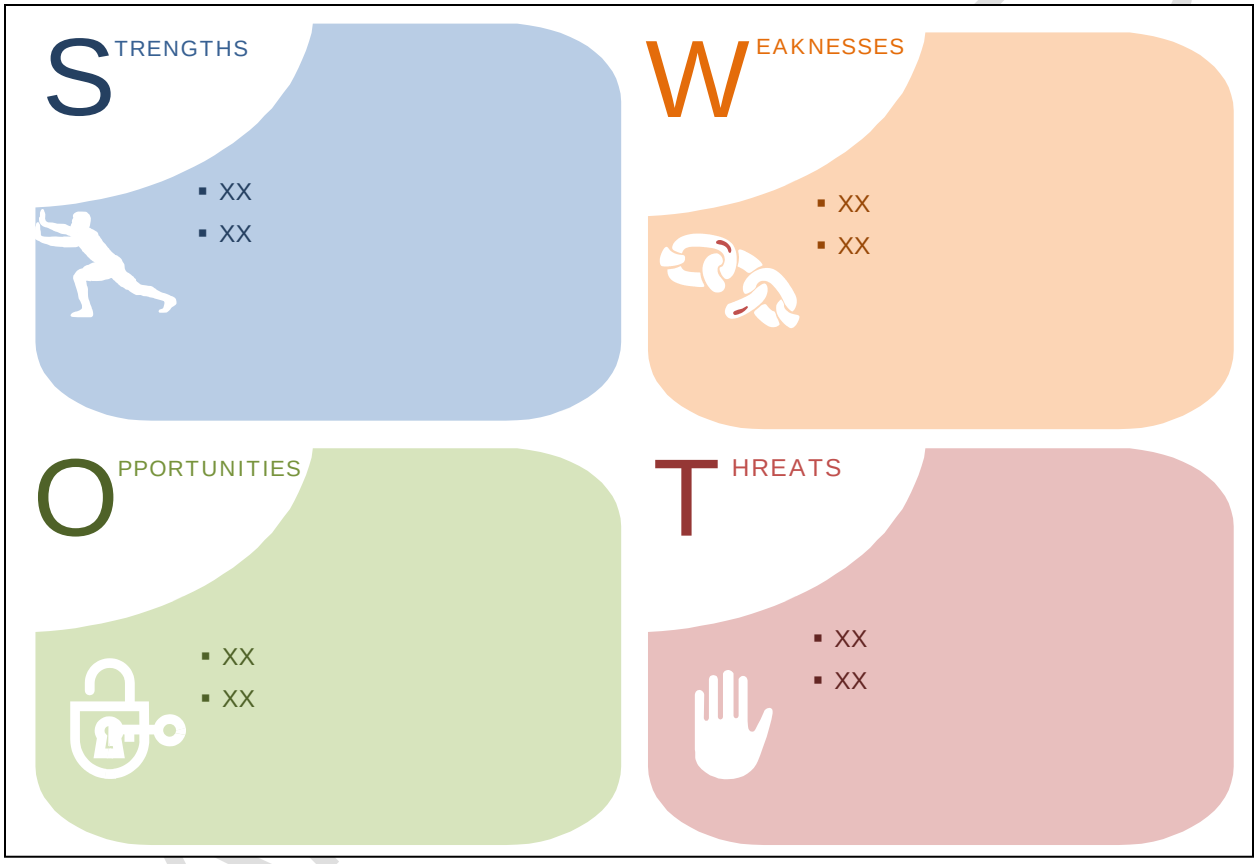
11.1.5 MNM VIEW

Bayer CropScience is involved in developing and manufacturing a varied product line which is devoted to crop protection and pest management. It has a strong presence in the U.S., Europe and is diversifying its presence into Latin America by acquiring complementary companies and entering into partnerships to gain synergy. The company focuses on expansions, strategic collaborations, and partnerships with corresponding companies.

11.1.5.1 SWOT Analysis

FIGURE 7

BAYER: SWOT ANALYSIS



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