Proceedings of the Seventh International Conference on Urban Pests
William H Robinson and Ana Eugênia de Carvalho Campos (editors) 2011
Printed by Instituto Biológico, São Paulo, SP. Brazil.

INDUSTRY RESEARCH FUNDING STRATEGIES: INTERNAL, CONTRACT OR UNIVERSITY?

MICHELLE S. SMITH
Dow AgroSciences, 9330 Zionsville Road, Indianapolis, Indiana 46033 USA

Abstract Manufacturers that discover and develop active ingredients for the urban pest management market are generally agricultural chemicals companies. As the agricultural chemical industry has expanded into seeds and biotechnology, existing challenges in funding urban pest management research and development have been amplified and new challenges have emerged. Among the considerations for decision-making on whether research studies will be conducted internally or externally are profitability outlook, cost, intellectual property and expertise.
Key Words Research and development, contract, industry

INTRODUCTION

The cost of discovering and developing a new crop protection product averaged $256 MM in the period 2005 to 2008 (Phillips McDougall, 2010a). This figure represents an increase of 39% from 2000, and 41% from 1995. Much of the growing cost of discovery, and a significant proportion of the cost of development, is an internal expense of an agricultural chemicals company such as Dow AgroSciences, which maintains a large infrastructure dedicated to this purpose. Part of the $256 MM cost, however, particularly in the development phase of product research and development, is related to collaborations and contracts in which research projects are conducted by organizations and institutions external to the developing company.

This paper discusses factors impacting product development research project funding and whether a project is executed by the developing company versus through a collaboration or contract.

AG CHEM COMPANIES TRANSITION TO BIOTECHNOLOGY

According to market research, overall research and development (R&D) spending among six major ag-chem and seeds/biotechnology companies increased from $3.1 B in 2002 to over $5B in 2009 (Phillips McDougall, 2010b). All of these companies sell ag-chem products and have expanded to market seeds and biotechnology solutions. Over this period of increased R&D spending, the proportion of investment in seeds and biotechnology R&D grew at a rate greater than the investment in agricultural chemicals R&D: 58% of the total R&D investment in 2002 was dedicated to discovery and development of agricultural chemicals, while in 2009 that percentage declined to less than 47% (Phillips McDougall, 2010b). This shifting investment profile is especially relevant to researchers working in the area of Urban Pest Management (UPM), because the tools developed for weed and insect control in the UPM markets are almost always line extensions from active ingredients first developed for use in agricultural crops, rather than as a result of a deliberate discovery effort aimed at UPM targets. As competition grows more fierce for ag-chem project funding within these companies, what may be seen as merely incremental sales of UPM products can become less favored and support for development of new products for this incremental market may decline. To cut an even smaller slice of the pie available for UPM product development research projects, of the estimated number of products in the ag-chem pipeline in the development phase in 2009, only one-third were insecticides (Phillips McDougall, 2010b). For UPM uses outside of turf and ornamental herbicides, this relatively small resource represents some of our future products for cockroaches, fleas, ants and bed bugs.

URBAN PEST MANAGEMENT MARKET PROFITABILITY FACTORS

All publicly held companies are driven to create profit for shareholders. In the ag-chem business, patent protection for new products helps ensure that the significant investment to develop the products is worthwhile. The direct cost to develop a single new active ingredient was previously stated to be estimated at $256MM, which includes the cost of screening 140,000 candidates (Phillips McDougall 2010a). he opportunity costs include investing

nearly 10 years' worth of time and research effort. Neither does development and support cost end when the product launches; additional investment can be justified for label expansion and product stewardship. Generic competition that results when a product is no longer patent protected can negatively impact the profit picture for both the basic manufacturer and the market as a whole, and in the last 10 years, generic market share has steadily increased, while proprietary off-patent and patented technology market share has declined (Phillips McDougall, 2010b). An illustration of this phenomenon relevant to UPM is the change that occurred in the liquid termiticides market after 2006, when generic imidacloprid entered. According to Specialty Products Consulting (2010), the U.S. liquid termiticide market in manufacturer level sales was estimated at $195.7MM in 2006; by 2009 the value of that market had declined to $104.7MM. As a result, the liquid termiticides market is today less attractive for new product development, unless a product can be developed with minimal investment.

An additional factor to be considered in assessing profit opportunities in the UPM market is whether the market is crowded, with many products that meet customer needs already available. As an example, the 2009 UPM insecticides market was estimated to be $181.3MM in manufacturer level sales (Specialty Products Consulting, 2010). The single best-selling product in that market had sales estimated at just $4.7MM, with many, many other products comprising the rest.

Finally in this discussion of profitability of UPM to a basic manufacturer, it must be recognized that with today's technology, little active ingredient is actually applied to achieve control of insect pests. This has been a stated goal for product development, and is a benefit to human health and the environment. That means, however, that the revenue associated with urban pest management is going to the Pest Management Profession in a far greater proportion than to the basic manufacturer, at least in the U.S. In 2009, the service revenue for pest control in the U.S. was estimated to be $6.32B, versus manufacturer revenue of $436MM (Specialty Products Consulting, 2010).

WHO DOES THE WORK?

Research in the discovery stage of product development is largely the domain of the R&D departments internal to the ag-chem companies, so for this paper I will focus on research that is more commonly conducted through external collaborations or contracts – in the development phase. This stage can be described as the stage during which research is more replicated in the field, after discovery milestones have been achieved and significant toxicology study hurdles have been met. For many UPM product concepts, the active ingredient may already have launched in various agricultural crops uses by the time the UPM products are in development, so much of the cost to register the active ingredient has been borne by the agricultural concepts. The studies that occur at this point for UPM product concepts can be designed to elucidate pest spectrum, effective rates, screen formulation options, or provide data to support product registration in the case of products designed to control pests of human health significance such as cockroaches and termites.

When a product concept has reached the development stage, industry R&D managers must decide whether needed studies will be conducted in-house by our own scientists, by contract research institutions, or through collaborations with University researchers. Discussed here are some factors that are considered in making these decisions.

It was stated previously that patent protection is key to maintaining the value of product development for an ag-chem company. This can be a strong driver behind a decision to keep R&D activities in-house rather than contract the studies. If intellectual property (IP) is potentially at stake in a study and an external party is contracted, it is necessary that a research agreement be executed to protect both the manufacturer and the researcher. The more difficult it is to execute such an agreement, the more reluctant the manufacturer is likely to be to contract out the work. In general, it has been my experience that independent contractors are willing and quickly able to execute research agreements. Part of this willingness may be that the contract research companies are in business to conduct research and are unencumbered by concerns of grants acquisition, publication and tenure, unlike many university researchers. In addition, the structure of the contractor's company may have fewer levels of review for an agreement; often the researcher is empowered to sign an agreement him- or herself.

Many excellent reasons exist for collaborating in product development research with a university cooperator. University researchers can possess unparalleled expertise in the subject; they can also lend a great deal of credibility to the investigations. These must be weighed against what might be perceived as a burden of bureaucracy in dealing with the university system.

In the period 1998 to 2008, overall industry funding at universities and colleges in the U.S. increased nearly $1B, from $1.95B to $2.91B (National Science Foundation, 2010). If only applied research funding is considered,

which would include much of the ag-chem funding, the figure also increased during that period, from $520MM to $656MM (ibid). A significant percentage of the funding that is directed to collaborative research with universities will be taken by the university as overhead. This overhead percentage can range from 20-50%, depending on the university and negotiated rates.

One trigger for a higher overhead charge can be the need for a signed research agreement, addressed above. Many universities have offices or departments dedicated to technology commercialization, and report publicly on numbers of invention disclosures, patents and licenses as metrics for success. In this respect universities and manufacturers may be considered competitors for IP. This helps explain why we can sometimes be at odds in negotiating terms of research agreements.

A more ideal arrangement can be achieved where a longer-term collaboration is designed, in which a free exchange of ideas can occur related to a product goal, and research direction, but possibly not every trial detail, is defined. These types of arrangements appear to be becoming more prevalent and are a valid strategy to get needed expertise and shared investment to approach a problem. In 2010 alone, Dow AgroSciences announced seven significant research collaborations with universities and other biology focused institutions.

CONCLUSIONS

New challenges continue to emerge in urban pest management. Old pests thought to be nearly eradicated such as fleas and bed bugs are experiencing resurgence. Pest species of termites are being discovered in geographies where they weren't known to exist before, and new species are emerging as pests at the intersection of agriculture and the suburbs, such as the Asian lady beetle. These new challenges represent opportunities for research on both sides – academia and industry – that will require the best of innovation and collaboration. With creative thought and continued dialog we can develop new ways of conducting research that meet the needs of all.

REFERENCES CITED

National Science Foundation, 2010. National Patterns of R&D Resources: 2008 Data Update. Detailed Statistical Tables/NSF10-314/March 2010.

Phillips McDougall, 2010a. CropLife America: The Cost of New Agrochemical Product Discovery, Development & Registration and Research & Development predictions for the future. January, 2010. Vineyard Business Centre, Laughland, Pathhead, Midlothian EH37 5XP.

Phillips McDougall, 2010b. The Global Agrochemical and Seed Markets Industry Prospects. October 2010. Business Centre, Laughland, Pathhead, Midlothian EH37 5XP.

Specialty Products Research, 2010. A Strategic Analysis of the U.S. Structural Pest Control Industry – The 2009 Season. A Syndicated Study. 35 East Main Street, Mendham, New Jersey 07945.