Commercial Aquaponic Systems –

Integrating recirculating fish culture with hydroponic plant production.

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Published in 2017 by Wilson Lennard
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Printed in Australia
ISBN 978-1-64204-837-7

Acknowledgements:

My journey through the field of aquaponics has been a long and interesting one which has been influenced and assisted by many people.

I would like to thank all of the researchers and academics who came before me and provided such a sound scientific base from which I could work to develop my understanding of aquaponics. There are too many of them to thank individually, but I would like to say that from my scientific point of view of starting my journey in 2000, the old stuff (pre - 2000) is far better than the new stuff (post – 2000)!

My friends and family need to be thanked because although few of them have directly contributed to my scientific and engineering knowledge acquisition, they have all had to put up with my obsession with aquaponics and the industry. I am sorry you have all been subject to my fairly constant communicated frustrations with the industry I work within. Many thanks go to my best friend, Ben Spiby, for designing the cover of my book and putting up with me for his entire life!

I would like to thank my Honours and PhD supervisor, Mr Brian Leonard, who had the presence of mind to leave me alone with my own musings and allowed me to develop and manage my own research. I am endlessly grateful for having that space and trust given to me.

I especially would like to thank my professional aquaponics mentor and friend, Dr James Rakocy, who has been open and always sharing with his knowledge of aquaponics. He has become an even greater influence in my life as a friend and for that, I am eternally grateful.

Finally, I would like to thank my dad; for everything.

Preface:

Aquaponics is becoming one the fastest growing areas in the agricultural technology production space. Even though aquaponics is becoming very popular, little, if any, scientific or engineering knowledge appears to be currently applied to it. Despite this anomaly, many small and larger aquaponics enterprises are being constructed and applied in the urban, indoor and vertical farming sectors and unfortunately, many are failing. Many of these failures are due more to the exacting economic conditions required to make small, urban farming enterprises viable businesses. However, system technical design and management issues also represent a good proportion of the reasons behind failure.

Aquaponics, in a commercial context, is essentially the integration of two established technical production approaches; Recirculating Aquaculture Systems (RAS) for fish production and hydroponics (and substrate culture) for plant production. It therefore makes sense to try and use the existing hardware (components), knowledge and expertise associated with these two technologies to design and configure commercial aquaponic systems, rather than taking an approach to start over again from scratch. Sadly, this freely and broadly available existing knowledge is rarely utilised in many current aquaponic designs.

Another important aspect of aquaponics is the development and evolution of the varying methods used to integrate fish production with plant production. Classically, the term aquaponics is applied to fully recirculating system designs where the water used is completely shared between the two major components (fish culture and plant culture). However, in the last few years, the sharing of the nutrient resources available in aquaponic systems between the fish and the plants has undergone a development towards other technical integration approaches and now the definition of what is “aquaponic” has broadened to also include designs which are either non-recirculating (e.g. using the waste nutrient streams produced by standard RAS to feed a plant culturing unit with no return of water to the fish component) or semi-recirculating (e.g. using the available nutrient-rich waters on a side stream loop).

The purpose of this book therefore, is to not repeat the knowledge that is already available for standard, tank-based fish production (RAS) or standard hydroponic plant culture in detail, but to rather concentrate on the requirements of the integration process so as to produce the most efficient and optimised aquaponics designs and management methods available. This book wont therefore, go into upper level design and engineering aspects of the fish or plant culturing components of the aquaponic system design process. More detailed information may be found in other, excellent references and resources related to stand-alone RAS fish culture and stand-alone hydroponic plant culture. This book will concentrate on the application of science and engineering principals to the integration of these two

existing technologies in a number of ways that meet the ultimate aquaponic outcome; the efficient and optimised use of the nutrient resources (i.e. fish feed) added to the system.

This book will also consider many of the satellite technologies associated with aquaponics, such as greenhouses, lighting, etc. However, and again, there are many excellent resources already available for these requirements, all of which go into far more exacting and complex detail than this book could attempt to do. Therefore, while these other technologies will be considered, it is more the purpose of this book to concentrate on the integration principles associated with fish and plant culture and so these other technologies are better served by trying to provide a list of appropriate external resources.

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