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UPDATING THE BUILDING CODE TO
INCLUDE INDOOR FARMING OPERATIONS
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Abstract

Urban agricultural production has grown to be a critical tool in the battles for food security and sustainability. A common regulatory barrier to urban agricultural operations big and small has been ambiguity in land-use laws. Local governments are increasingly friendly toward community gardens, small greenhouse farming operations, farmers markets, and the like. Many have sought to lift regulatory restrictions and provide clarity in the law.

However, while these efforts benefit a multitude of local food production efforts, they do little to address the regulatory ambiguities faced by commercial-scale, indoor farming operations, especially vertical farms. Particularly concerning to indoor vertical farms are the ambiguities implicit in the International Building Code (“IBC”), which serves as the model building code for virtually every American municipality. Currently, the IBC lacks any provisions contemplating buildings purposed for large-scale indoor crop production. While some state governments have traditionally exempted agricultural buildings from this type of regulation, this is neither a safe nor feasible solution for indoor farming operations. This article seeks to provide alternative solutions. First, in the short term, local governments should provide clear statutory guidance concerning where indoor farming operations fit into the IBC scheme. Second, as a more sustainable solution, the International Code Council, should update the IBC to account for commercial-scale indoor farming operations by including such operations under a particular occupancy group.

I. Introduction

In recent years, there has been a drastic resurgence of urban agricultural practices.¹ As people begin to prioritize self-sufficiency,

* The author is a student of the University of Arkansas School of Law, Class of 2020. He would like to thank Professor Carl J. Circo for his guidance and comments throughout the process of writing the substantive portion of this note. He would also like to thank his fellow editors on the Journal of Food Law & Policy, Collette Cox, Jaden Atkins, and Evangeline Bacon, for their help in editing and revising this note. Finally, the author would like to thank his wife, Keelie, and his family and friends for their unwavering support.

¹ See Michael Roberts & Margot Pollans, *Setting the Table for Urban Agriculture*, in URBAN AGRICULTURE: POLICY, LAW, STRATEGY, AND IMPLEMENTATION 3, 3–9

prefer locally sourced foods, and decrease their carbon footprints, urban agriculture stands as an attractive alternative to traditional models of food production. Urban agricultural practices include raising livestock inside the city, small personal urban gardens, garden clubs, community-supported agriculture ventures, farmers markets, and larger commercial enterprises.² Commercial vertical farming operations have grown alongside community-based farms and gardens,³ providing large-scale crop production with environmental advantages over traditional commercial crop production.⁴ While indoor vertical farms are growing, the largest challenge they face is in raising the capital necessary to get off the ground.⁵ Local governments can facilitate these fundraising efforts by making regulations more friendly to indoor vertical farming operations.

Luckily, urban planning models that integrate local food production systems into the fabric of land use have grown in popularity, displacing the more restrictive traditional zoning systems.⁶ The broader trend of integrating agriculture into cities is known as “Urban Agrarianism.”⁷ Many city and county governments have updated zoning ordinances and other regulatory measures aimed at protecting small-scale urban agricultural practices.⁸ These measures focus more on expanding zoning permissions, offering tax incentives, and exempting certain structures from building codes.⁹ While helpful to community gardens and small, traditional farms, these policies shed very little light on how building codes will affect indoor vertical farms. Consequently, such policies leave large-scale, commercial urban farms out of the picture.

This article highlights the need to fill the existing gaps in pro-urban agriculture policy schemes. Specifically, it offers two courses of action—one intended to alleviate the problem in the short-term, and the other intended as a more permanent fix. First, local governments need to provide clarification as to which occupancy group governs indoor vertical farms. Publishing opinion letters that

(Am. Bar Assc. ed., 2015) (discussing the history and development of the current American urban agricultural trend).

² See *id.* at 4.

³ See AGRILYST, STATE OF INDOOR FARMING 7 (2017).

⁴ See generally Kheir Al-Kodmany, *The Vertical Farm: A Review of Developments and Implications for the Vertical City*, 8 BUILDINGS 24 (2018) (providing an overview of the benefits of vertical farming and the state of the industry).

⁵ AGRILYST, *supra* note 3, at 36.

⁶ Roberts & Pollans, *supra* note 1, at 12.

⁷ *Id.*

⁸ *E.g., id.* at 11–12.

⁹ See *infra* Part V.

are directly on point is the easiest way to do this. Second, the long-term solution is to update building codes—specifically, the International Building Code (“IBC”)—alongside zoning ordinances, either by adding a new “occupancy group,” or adding statutory clarity to the existing occupancy groups.

The background section of this article begins with a baseline description of indoor vertical farming and explains why state and local governments should seek to encourage the growth of commercial indoor vertical farming operations alongside small-scale urban agriculture. The next section then outlines current zoning and building code barriers to urban agriculture, how local land-use regulations have evolved to address these barriers, and why these measures fail to address the current problems with building codes. The next section then discusses the current deficiencies in the International Building Code itself. Finally, the discussion section of this article addresses why statutory clarification and modification of the International Building Code is the next logical step in encouraging indoor vertical farming.

II. Background

A. *What is Indoor Vertical Farming?*

To understand indoor urban farming, one must first be familiar with urban agriculture generally. A fitting and popular definition for urban agriculture is “the growing of plants and the raising of animals within and around cities.”¹⁰ As noted in the Introduction, this can include a variety of crop production formats—from backyard and rooftop gardens to neighborhood gardens on combined lots.¹¹

From a very general standpoint, we can consider “indoor urban farming” to be the raising of plants in enclosed structures in an urban setting. Indoor farming facilities may be constructed purposefully from the ground up or converted from existing buildings. “Vertical farming” falls under the larger umbrella of indoor urban farming for the purposes of this article.¹² In basic terms, vertical farming is the farming of crops distributed vertically rather than horizontally, as is done in traditional row-cropping.¹³

¹⁰ *Urban Agriculture*, FOOD & AGRIC. ORG. OF THE U.N., <http://www.fao.org/urban-agriculture/en/> (last visited Oct. 10, 2019).

¹¹ Roberts & Pollans, *supra* note 1, at 4.

¹² The “vertical farm” can be traced back as far as 600 A.D. to the Hanging Gardens of Babylon, but the modern concept of vertical farming refers primarily to indoor farming practices. See Al-Kodmany, *supra* note 4, at 32.

¹³ *Id.*

While outdoor vertical farming is a relevant practice, it is of less consequence for the purpose of this article. Accordingly, as used in this article, “vertical farming” refers exclusively to vertical farming methods that require permanent building structures.¹⁴

There are essentially three types of vertical farms: (1) small structures located on the rooftops of residential and commercial buildings; (2) farms constructed from tall buildings with several layers of growing beds (“modest-sized vertical farms”); and (3) what Kheir Al-Kodmany refers to as “visionary” multi-story buildings (“visionary vertical farms”).¹⁵ This article concerns the latter two.¹⁶

One common method of building modest-sized vertical farms involves the conversion of abandoned factories or other industrial buildings, as this method can drastically cut start-up costs by eliminating the need to construct a new building.¹⁷ “The Plant” is one such farm. The Plant is an indoor vertical aquaponic farming operation located in Chicago, Illinois, run by the non-profit organization, Plant Chicago.¹⁸ The Plant utilizes the “aquaponic” method—a combination of aquaculture and hydroponic food production—whereby a closed hydroponic system is created using a symbiotic relationship between the production of fish and crops.¹⁹ The fish are grown for food production and their waste products are then used to provide the necessary nutrients for hydroponic crop production; the only required resource input is fish food.²⁰ Like many other indoor vertical farms, The Plant utilizes an alternative energy source—in this case, an anaerobic digester—for some of its energy needs.²¹ Moving forward, The Plant will act as an excellent

¹⁴ It is important to focus on permanent structures here because the vertical farming operations discussed require sturdy, permanent buildings. Additionally, temporary agricultural buildings such as hoop houses are regulated much more loosely by the bulk of statutory land-use schemes. *E.g., infra* Section V.D.

¹⁵ See Al-Kodmany, *supra* note 4, at 2.

¹⁶ Rooftop vertical farms are typically small in scale and of such a construction that they will reap the same regulatory benefits as traditional community gardens. Nicole M. Reese, An Assessment of the Potential for Urban Rooftop Agriculture in West Oakland, California (May 16, 2014) (unpublished Master’s Projects and Capstones) (on file with the Gleeson Library, University of San Francisco).

¹⁷ Lisa Tomlinson, *Indoor Aquaponics in Abandoned Buildings: A Potential Solution to Food Deserts*, 16 SUSTAINABLE DEV. L. & POL’Y 16, 18 (2017) (describing a case study of “The Plant,” an indoor farming operation built into the Peer Foods Factory building in Chicago, the owner of which purchased the building for the estimated value of the metal inside).

¹⁸ *Who We Are*, PLANT CHICAGO, <http://plantchicago.org/who-we-are> (last visited Mar. 29, 2019).

¹⁹ Tomlinson, *supra* note 17, at 16.

²⁰ *Id.*

²¹ *Id.*

example of how vertical farming operations may run afoul of local regulations.²²

B. The Benefits of Indoor Vertical Farming

The last century saw a major shift in agricultural production, away from small-scale, family-owned farming operations and towards massive commercial farming operations.²³ While this change in the industry allowed for significant gains in food production, modern row-crop farming methods have had a disastrous impact on the environment.²⁴ Tilling practices designed to plow under the previous crop to prepare for the next crop increase soil erosion.²⁵ No-tilling practices are not much better; while they limit soil erosion, they also require a much greater application of herbicide to kill the undesirable weeds that are normally prevented by tilling.²⁶ Indoor farming methods provide distinct advantages over traditional farming in these areas.²⁷

One major benefit of indoor farming over traditional land-based agriculture is the reduced use of resources such as water. Indoor farms can reduce water use by up to 90% when compared to traditional agricultural methods.²⁸ Finally, indoor vertical farming completely eliminates the use of tractors for plowing, planting seeds, weeding, applying fertilizer, and harvesting, which collectively account for more than 20% of all gasoline and diesel fuel used in the United States.²⁹

Another major benefit of indoor farming is increased yield resulting from several factors. First, indoor farming allows for year-round food production and is resistant to the effects of climate change.³⁰ While traditional farming is dependent on favorable weather, indoor farming systems are climate-controlled with great

²² See *infra* Section III.B.

²³ See Trautmann et. al, *Modern Agriculture: Its Effects on the Environment*, CORNELL COOP. EXT., <http://psep.cce.cornell.edu/facts-slides-self/facts/mod-ag-grw85.aspx> (last visited Mar. 10, 2019) (discussing the effects of widespread use of fertilizers and herbicides in modern agriculture).

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.*

²⁷ Al-Kodmany, *supra* note 4, at 6 (“Designed to grow in a controlled, closed-loop environment, these farms would eliminate the need for harmful herbicides and pesticides, maximizing nutrition, and food value in the process.”).

²⁸ See Al-Kodmany, *supra* note 4, at 15, 19 (describing existing vertical farms in Memphis, Tennessee and Den Bosch, Holland).

²⁹ See Al-Kodmany, *supra* note 4, at 4 (discussing fossil fuel use under a traditional farming system).

³⁰ *Id.* at 26.

precision.³¹ Second, popular methods for indoor crop production are inherently more efficient; vertical hydroponic and aquaponic growing systems allow plants to take in nutrients at a much higher rate and produce faster growth.³² A recent study found that a thirty-story vertical farm could produce 480 acres-worth of crop yield per acre of base area.³³ This is not shocking when one considers that a single-story hydroponic greenhouse can produce 8.71 pounds per square foot of leafy greens compared to 0.69 pounds per square foot when using conventional methods.³⁴

Finally, there are the secondary social and economic benefits derived from the production efficiencies described above.³⁵ Growing food indoors in urban areas supplies food during times when outdoor crop production is interrupted.³⁶ Additionally, indoor vertical farming provides a method of crop production that can provide agricultural autonomy to areas with unfriendly climates.³⁷ Geographical regions that are hostile to traditional agriculture are often very friendly to alternative energy production, like wind, solar-photovoltaics, and solar-thermovoltaics.³⁸ This provides regions with an opportunity to establish sustainable crop production through the construction of alternative energy sources alongside indoor farming operations.³⁹

III. Modern History of Land Use and Agriculture in the U.S.

While the umbrella of land use controls stretches beyond zoning ordinances and building codes, these account for the bulk regulatory challenges faced by vertical farmers discussed in this article. This is because both zoning ordinances and building codes prohibit certain uses and structures depending on the situation.⁴⁰ To understand where we are now and one reason why the IBC is in such

³¹ *Id.* at 28.

³² *Id.* at 7; see also Wilson Lennard & Simon Goddek, *Aquaponics: The Basics*, in *AQUAPONICS FOOD PRODUCTION SYSTEMS: COMBINED AQUACULTURE AND HYDROPONIC PRODUCTION TECHNOLOGIES FOR THE FUTURE* 113, 138–39 (Simon Goddek et al. eds., 2019).

³³ See Al-Kodmany, *supra* note 4, at 4.

³⁴ AGRILYST, *supra* note 3, at 14.

³⁵ See generally Chirantan Banerjee, *Up, Up and Away! The Economics of Vertical Farming*, 2 J. AGRIC. STUDIES 40, 51 (2014) (discussing the social and economic opportunities associated with vertical farming).

³⁶ See Al-Kodmany, *supra* note 4, at 28 (discussing the potential for indoor farming to provide a source of food during times of reduced yield and drought).

³⁷ Banerjee, *supra* note 35, at 51.

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ See discussion *infra* Section III.A; see discussion *infra* Section III.B.

desperate need of update and clarification, one must first understand how land use controls came to exist in their present form. Use-based zoning and building restrictions that are ambiguous in definition and scope—at least as it relates to agricultural purposes—create headaches best soothed with express statutory solutions. This section outlines the basics of use-based zoning restrictions and modern building codes. Specifically, it shows how ambiguities in the current law make it difficult or impossible to know how vertical farms will be treated from one urban area to the next.

A. Euclidian Zoning Ordinances

Local government ordinances are the primary source of law for zoning regulations.⁴¹ Zoning laws are premised on state and local government police power.⁴² Local zoning regulation in the United States dates to the colonies, where land use controls were often a mayoral power.⁴³ These controls frequently allowed for urban agriculture by their nature.⁴⁴

In the early twentieth century, new zoning practices started to take over.⁴⁵ The effect of this was that American cities relegated agricultural production out of urban areas.⁴⁶ With the advent of railroads and refrigeration, perishable food did not have to originate as close by to be fresh for consumers.⁴⁷ However, over the last decade, urban agriculture has seen an explosion in popularity, brought on by shifts in consumer priorities toward increased personal wellness and environmental sustainability.⁴⁸

Much of the zoning power of American city governments comes from iterations of the Standard Zoning Enabling Act, a model law created by the U.S. Department of Commerce in 1924.⁴⁹ The power of local government to enact such measures was established

⁴¹ Jeffrey P. LeJava & Michael J. Goonan, *Zoning and Land Use Planning*, 41 REAL EST. L. J. 216, 225 (2012).

⁴² ROBERT R. WRIGHT & MORTON GITELMAN, *LAND USE IN A NUTSHELL* (West Publishing Co., 1978) (4th ed., 2000).

⁴³ JULIAN CONRAD JURGENSMEYER & THOMAS E. ROBERTS, *LAND USE PLANNING AND DEVELOPMENT REGULATION LAW 44* (West Group eds., 2003).

⁴⁴ During this time, regulations were focused more on compelling development within cities through affirmative use obligations. While agricultural land use regulations existed, they related to fencing property rather than restricting agricultural practices themselves. *See id.*

⁴⁵ *Id.*

⁴⁶ Roberts & Pollans, *supra* note 1, at 206.

⁴⁷ *Id.* at 207.

⁴⁸ *See id.*, at 201–02 (tracking a drastic increase in the mention of “urban agriculture” in the popular press and in law reviews and journals beginning in the mid-2000s).

⁴⁹ U.S. DEP’T OF COMMERCE, *A STANDARD STATE ZONING ENABLING ACT* § 1 (revised ed. 1926); *see also* JURGENSMEYER & ROBERTS, *supra* note 43, at 68.

in the seminal case *Village of Euclid v. Ambler Realty Co.*⁵⁰ In *Euclid*, the Supreme Court determined that a city government had the power to create and enforce zoning laws as part of its police power.⁵¹ In other words, cities can establish zoning ordinances to provide for the health, safety, and welfare of citizens.⁵² Cities use this police power to safely manage their growth and development and keep undesirable activities and building structures out of certain areas.⁵³

The method of zoning that grew out of *Euclid*, “Euclidian Zoning,” still stands as the most common zoning method used today.⁵⁴ The Euclidian Zoning model is predicated on the idea that some uses of land are appropriate for certain areas while others are not.⁵⁵ Local governments regulate land use by partitioning land into districts based on the desired use.⁵⁶ Common district categories include residential, commercial, mixed-use, industrial, and agricultural districts.⁵⁷ Within each zone, particular uses may be deemed “approved,” “permitted,” or “as a right” if the governing body intended them to be allowed without interference.⁵⁸ Conditional use may be permitted on a particular lot for a purpose that is considered appropriate for the zone type in some, but not all, instances.⁵⁹ Conversely, prohibited uses may not be allowed at all.⁶⁰

B. Building Codes – The IBC

While building codes share a common purpose with zoning ordinances in that they are intended to promote local health, safety, and welfare, they are distinct from zoning ordinances in that—rather than regulating the purpose of parcels of land—building codes regulate methods and materials and establish other minimum thresholds in the construction, maintenance, remodeling, and

⁵⁰ *Vill. of Euclid v. Ambler Realty Co.*, 272 U.S. 365, 389-90 (1926); *see also* JUERGENSMEYER & ROBERTS, *supra* note 43, at 44–45.

⁵¹ *Vill. of Euclid*, 272 U.S. at 387.

⁵² JUERGENSMEYER & ROBERTS, *supra* note 43, at 47.

⁵³ *Id.* at 68–69.

⁵⁴ *Id.*

⁵⁵ LeJava & Goonane *supra* note 41, at 226–27.

⁵⁶ *Id.*

⁵⁷ Heather Wooten & Amy Ackerman, *Seeding the City: Land Use Policies to Promote Urban Agriculture* 6, NAT’L POL’Y & LEGAL ANALYSIS NETWORK (2011).

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.* at 20.

demolition of buildings.⁶¹ The IBC is frequently used as a model and has been adopted by most cities in the United States.⁶²

Like local zoning ordinances, the IBC groups different types of buildings, called “occupancy groups,” based on their intended use.⁶³ Much of the IBC’s application is predicated on which occupancy group a given building falls under.⁶⁴ For instance, the maximum number of stories and allowable height are determined by occupancy group.⁶⁵ Occupancy groups include Assembly, Business, Educational, Factory, High-Hazard, Institutional, Mercantile, Residential, Storage, and Utility and Miscellaneous groups.⁶⁶

Without question, use-based regulatory schemes are an effective way to ensure public health, safety, and welfare. There will always be certain spaces, structures, and activities that are incompatible—or even dangerous—with one another. However, use-based restrictions can just as easily function as a barrier to urban agriculture. This is particularly concerning where no forms of urban agriculture are provided for at all or where the limited provisions that do exist are vague in scope and definition. In regard to vertical farming, knowing which occupancy group(s) a vertical farming structure may fit into is of substantial importance because it determines maximum height and number of stories, what zone a vertical farm can operate in, and whether the processing of crops is allowed on site.

IV. Current Barriers: What Stands in the Way?

In the classic use-based restriction tradition, local regulatory barriers are designed with the purpose of either permitting or denying particular uses and structures in particular areas. However, some land use barriers may arise inadvertently—as a consequence of statutory ambiguity, for instance. For this reason, it helps to distinguish *express* or *deliberate* barriers to vertical farming from *incidental* barriers.

⁶¹ JOHN MARTINEZ, *Local Government Law* § 16:27 (2018); see also Tomlinson, *supra* note 17, at 18.

⁶² MARTINEZ, *supra* note 61, at § 16:27.

⁶³ INT’L BLDG. CODE §§ 303–312 (2018).

⁶⁴ See *id.* § 302.1.

⁶⁵ *Id.*

⁶⁶ *Id.* §§ 303–312.

Express restrictions can come in many forms, including lot size limitations,⁶⁷ setback requirements,⁶⁸ and restrictions on the sale of agricultural products.⁶⁹ Inadvertent restrictions are more likely to come about through statutory omissions and ambiguities, often resulting from legislators failing to keep up with the times. However, despite the fact that inadvertent barriers are unintentional by nature, they frequently have the effect of exposing certain uses of land to more express restrictions (i.e., failure to adequately define the scope of a particular occupancy group can expose some buildings to regulations that were not intended to apply to it).⁷⁰

A. *The Problem of Ambiguity*

The most readily-addressable barrier to vertical farming operations is the ambiguity inherent in existing zoning and building requirements. Even cities seeking to expand urban agriculture generally may accidentally create ambiguities or fail to expressly include a given method of farming or raising livestock in such a way that prevents its propagation. This concern is evidenced by the permeation of land use treatises discussing the definition of “agricultural use,” “agricultural building,” and similar terms.⁷¹

As discussed in the introduction to this article, urban agriculture embodies a vast spectrum of food production, including community gardens, backyard and rooftop gardens, commercial greenhouses, apiaries, backyard livestock, and more.⁷² With this variety of use and application available under the “urban agriculture” banner, local governments must take on the task of expressly providing for all those agricultural activities they intend to encourage. The consequence of not carefully including and defining all potentially beneficial urban agricultural practices is that prospective farmers are exposed to legal and financial risk.⁷³ Additionally, because land use regulations include both zoning

⁶⁷ See New Rochelle, N.Y., City Code §§ 89-16, 89-17 (prohibiting the raising of livestock activities on lots less than two acres in size and mandating one acre per animal, even for the raising of chickens).

⁶⁸ Setback measures may even apply to accessory uses that are invaluable to vertical farming operations. See St. Paul, MN, Code of Ordinances, tit. VIII, ch. 300, § 343 (restricting the height and area of solar power panels).

⁶⁹ LeJava & Goonan, *supra* note 41, at 227.

⁷⁰ See *infra* Section IV.C (discussing the consequences of vague definitions in the IBC).

⁷¹ See 38 A.L.R. 5th 357 (discussing multiple state court decisions regarding the definitions of “agriculture,” “agricultural building,” “farm building,” and the like); see also *Agricultural Exemptions*, 4 AM. L. ZONING § 33:4 (5th ed.).

⁷² LeJava & Goonan, *supra* note 41, at 217.

⁷³ Wooten & Ackerman, *supra* note 57, at 7.

ordinances and building codes, legislators must be careful to provide clarity in both regards.

B. Zoning Ambiguities

The term “Urban Farm” provides an excellent example of ambiguity in legislation. In Seattle, Washington, an “Urban Farm” is defined as a “use in which plants are grown for sale of the plants or their products, and in which the plants or their products are sold at the lot where they are grown, off-site, or both, and in which no other items are sold.”⁷⁴ St. Paul, Minnesota defines the very same term as “a commercial growing operation that is *generally larger in scale* than a community garden.”⁷⁵ By contrast, Minneapolis, Minnesota, defines the same term as “[a]n establishment where food or ornamental crops are grown or processed to be sold or donated that includes, but is not limited to, outdoor growing operations, indoor growing operations, vertical farms, aquaponics, aquaculture, hydroponics and rooftop farms.”⁷⁶ It is easy to see here how statutory clarity dramatically improves one’s ability to understand how the law will apply to them.

Another example of a zoning ordinance definition that tells a potential vertical farmer very little about their legal risk is found in Denver, Colorado. The City of Denver provides for urban crop production as a non-primary, accessory use, defining “garden” as the “growing and cultivation of fruits, flowers, herbs, vegetables, and/or other plants” which may exist in addition to a residential structure.⁷⁷ On its face, this definition might encapsulate a respectable range of personal and commercial levels of crop production. However, it is unlikely that a large indoor farming operation will be welcome in the zoning areas covered by this law, and prospective indoor farmers have only the scope of the term “accessory use” by which to judge their legal risk. While the intent behind such language may be to open as many doors as possible, ambiguity stands in the doorway.

C. IBC Ambiguities

Ambiguous and underdeveloped building codes act as another barrier to vertical farming development. While the business group (“**Group M**”), factory group (“**Group F**”), and utility and

⁷⁴ Goldstein et al., *Urban Agriculture: A Sixteen City Survey of Urban Agriculture Practices Across the Country* 53, (Turner Env’tl. L. Clinic) (2011).

⁷⁵ St. Paul, MN., Urban Agriculture Plan Ch. 3.13 (2011), http://www.minneapolis.mn.gov/www/groups/public/@cped/documents/webcontent/convert_265422.pdf; see also Goldstein et al., *supra* note 74, at 30.

⁷⁶ Minneapolis, MN, Code of Ordinances, tit. 20, ch. 520, § 12 (2019).

⁷⁷ DENVER, CO CITY CODE § 11.12.8.2 (2018); § 11.2.6 (2018).

miscellaneous group (“Group U”) all have potential relationships with indoor crop production, the IBC does not provide a definition that describes or encapsulates “vertical farming.”⁷⁸ At best, Group U covers some kinds of agriculture-related structures under the term “agricultural building[s].”⁷⁹ An “agricultural building” is defined as:

A structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products. This structure shall not be a place of human habitation or a place of employment where agricultural products are processed, treated or packaged, nor shall it be a place used by the public.⁸⁰

Of great importance is the fact that there is no language pertaining to the production, cultivation, or growing of crops in this definition.⁸¹ Nor does it expressly *exclude* such uses, prohibiting only habitation, processing, treating, packaging, employment, and public use for agricultural buildings.⁸² Consequently, any local government adopting these sections of the IBC without a supplemental definition of “agricultural building” fails to provide statutory clarity regarding buildings that actually operate as farms.

Outside of the Group U provision’s description of agricultural buildings, the only other mention of food production in the IBC is under Group F, which includes buildings used for “assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy,” although the list is not exhaustive.⁸³ The IBC lists “food processing establishments and commercial kitchens not associated with restaurants, cafeterias, and similar dining facilities more than 2,500 square feet in area” under the Moderate-Hazard Factory Industrial Group (“Group F-1”).⁸⁴ While filing vertical farms under Group F-1 would foreclose on much of our problem—and make sense given that conversion of factory buildings is such an attractive starting point for vertical

⁷⁸ See Tomlinson *supra* note 17, at 21 (discussing the City of Phoenix’s interpretation of the IBC).

⁷⁹ INT’L BLDG. CODE § 202 (2018).

⁸⁰ *Id.*

⁸¹ Note that “crop production” and “horticulture” are not used interchangeably in most statutory schemes. See *id.*; see also INT’L BLDG. CODE § C101.1 (2018).

⁸² While the IBC does not define “habitation” specifically, it defines a “habitable space” as “[a] space in a building for living, sleeping, eating or cooking,” and expressly excludes “[b]athrooms, toilet rooms, closets, halls, storage or utility spaces . . .” INT’L BLDG. CODE § 202 (2018).

⁸³ *Id.* § 306.1.

⁸⁴ *Id.* § 306.2.

farms—it is hard to construe this language in such a way so as to capture indoor commercial crop production (absent an express provision).

Other occupancy definitions of the IBC do not lend much more support. For instance, the IBC also includes “incidental uses,” which it defines as “ancillary functions associated with a given occupancy that generally pose a greater level of risk to that occupancy.”⁸⁵ However, these uses are restricted to those expressly listed in IBC Table 509, which includes things like furnaces and stationary battery storage, but nothing involving indoor farming or agriculture generally.⁸⁶

The IBC’s treatment of construction materials further complicates the building code scheme. The IBC separates occupancy groups into sub-groups based on their elemental construction materials.⁸⁷ IBC height and space requirements are determined based on the occupancy group, the construction type, and the existence of automatic sprinkler systems.⁸⁸ While this is all very straightforward on its face, complications can quickly arise in a mixed-use scenario. A single building may be subject to several conflicting height and occupancy restrictions based on the occupancy group and construction materials.⁸⁹

If the mixed-use conundrum were not enough, further complicating issues like the conversion of existing buildings into vertical farms is the fact that the IBC provides that, when a building changes occupancy groups, it must meet the requirements of additional codes, such as the International Energy Conservation Code (“IECC”), at least where adopted.⁹⁰ Like the IBC, application of the IECC depends in large part on the occupancy group a structure fits into. This exacerbates the effect of the statutory ambiguity.

V. Analysis

A. *Current Solutions: What They Are, and Why They Fail Without the IBC*

While restrictive, use-based urban planning models still account for the majority of local ordinances, urban agriculture-

⁸⁵ *Id.* § 509.1.

⁸⁶ *Id.*

⁸⁷ *Id.* § 504.2.

⁸⁸ *See id.* § 504.3–504.4.

⁸⁹ *See id.*

⁹⁰ *See* INT’L ENERGY CONSERVATION CODE § 505C (requiring any buildings undergoing a change in occupancy group to comply with IECC provisions if the change in use results in increased use of electrical energy or fossil fuels).

friendly models are coming back into the foreground.⁹¹ This increase in public interest in urban agriculture has expanded into the legal profession as well, with the mention of “urban agriculture” in law journals increasing dramatically after 2008.⁹² Specifically, there is a shift in agricultural law away from the historical purpose of preserving rural agricultural and toward *legalizing* and *promoting* urban agricultural practices.⁹³ This urban planning movement—which is designed to implement urban agrarianism—is known as “agricultural urbanism.”⁹⁴ Agricultural urbanism operates as an alternative to use-based urban planning in that it advocates for sustainable urban agriculture as a mandated use, providing that portions of land in a community are to be set aside for food production.⁹⁵ This is analogous to the function of inclusionary zoning for urban housing.⁹⁶

Much of the current legal discourse pertains to the need for changes at the state and local level.⁹⁷ At these levels, legal efforts geared toward the expansion of urban agriculture include approaches such as changes in municipal zoning codes,⁹⁸ property tax incentives,⁹⁹ and agricultural exemptions from land use laws.¹⁰⁰ These measures have been successful in breaking down regulatory barriers and fostering community-based urban agriculture systems. But, assuming the ultimate goal is to foster food security and environmental sustainability, such measures must also address commercial-scale vertical crop production. These efforts fall short if building codes are left untouched. Pay careful attention to the measures described below and where they fail to fill the gap left by the outdated IBC.

⁹¹ Roberts & Pollans, *supra* note 1, at 9.

⁹² *Id.* at 5, Table 2.

⁹³ *See id.* at 11 nn. 46–47.

⁹⁴ *Id.* at 11 nn. 46–47.

⁹⁵ *Id.*

⁹⁶ Inclusionary zoning sets aside land for specific types of housing. *See* JURGENSMEYER & ROBERTS, *supra* note 43 at 6:7.

⁹⁷ *See, e.g.,* Wooten & Ackerman, *supra* note 57, at 10–15 (outlining a plethora of legal frameworks promoting urban agriculture generally).

⁹⁸ Kathryn A. Peters, *Current and Emerging Issues in the New Urban Agriculture: A Case Study*, 7 J. FOOD L. & POL'Y 297, 313–28 (2011) (discussing zoning measures).

⁹⁹ *See also* UTAH CODE ANN. § 59-2-1703 (West 2014) (granting tax incentives to urban farming operations that fall within certain lot size specifications and that have been in operation for at least two years prior to application for the applicable tax incentive); *see also* Roberts & Pollans, *supra* note 1, at 11–12.

¹⁰⁰ LeJava & Goonan, *supra* note 41, at 227; *see also* Wooten & Ackerman *supra* note 57, at 14.

B. Zoning Updates

In the midst of use-restriction ambiguities, many cities are making moves in the right direction by updating their zoning provisions to expressly include desired forms of agriculture. Pittsburgh, Pennsylvania, for example, has amended its zoning provisions to permit urban agriculture as a primary or accessory use depending on the zone.¹⁰¹ It expressly provides for commercial crop production as well.¹⁰² Similar measures have been enacted in Jersey City, New Jersey,¹⁰³ and Seattle, Washington.¹⁰⁴ Kansas City, Missouri is another city on the rise. Specifically providing for commercial crop production, Kansas City enacted a zoning exemption for “crop agriculture,” or crop production intended for sale off-site.¹⁰⁵ However, this measure still expressly requires that all agricultural buildings comply with the applicable building code.¹⁰⁶

These zoning permission updates are friendly to urban agriculture generally and appear to pave the way for vertical farming operations. However, each of these cities still requires that agricultural buildings comply with relevant building codes or contemplate buildings in a way that clearly fails to consider vertical farms.¹⁰⁷ While express zoning permission alleviates concerns around whether a parcel of land is appropriate for vertical farming, it does nothing to address the difficulties of applying the building code to the vertical farm buildings.¹⁰⁸ This illustrates why zoning revisions alone cannot bridge the gap to allowing vertical farming.

C. Tax Incentives

Another area where local governments are trying to foster growth is in property tax exemptions. Tax incentives seek to foster

¹⁰¹ PITTSBURGH, PA., CITY CODE § 911.04.A.2(a)-(c) (2018), § 912.07 (2015).

¹⁰² *Id.*

¹⁰³ JERSEY CITY, N.J. CODE OF ORDINANCES § 345-60(V.1) (2011).

¹⁰⁴ SEATTLE, WASH., CITY CODE §§ 23.42.051-.052 (2010).

¹⁰⁵ CULTIVATE KC, *Growing Good Food in Kansas City Neighborhoods: A Guide to Urban Agriculture* Codes in KCMO 4, https://www.cultivatekc.org/wp-content/uploads/2019/02/CultivateKC_Booklet_Codes_KCMO.pdf (last updated Apr., 2015).

¹⁰⁶ *Id.*

¹⁰⁷ *See, e.g.*, JERSEY CITY, N.J. CODE OF ORDINANCES § 345-60(V.1); *see also* SEATTLE, WASH., CITY CODE § 23.42.051 (restricting “[s]tructures for urban farm use” to a height of twelve feet).

¹⁰⁸ Buildings utilized in operations such as The Plant in Chicago, Illinois, illustrate the difficulty here. *See* Chi., Ill. Municipal Code § 17-9-0103.3 (2017) (failing to mention of buildings being used in vertical farm operations). *See generally* BUBBLY DYNAMICS, LLC, *The Plant*, <https://www.bubblydynamics.com/the-plant/> (last visited Oct. 9, 2018) (describing the concept, purpose, and physical characteristics of The Plant by the company that owns and operates it).

the growth of urban agricultural operations by providing financial incentives to offset start-up costs. This could be very important to prospective vertical farmers worried about how they will pay for labor, materials, property taxes, and building permits. States with tax incentives targeting urban agriculture include Utah, California, Maryland, New Jersey, Minnesota, and Missouri.¹⁰⁹ However, as with many zoning updates, some will fall short of encouraging the growth of vertical farming operations. Some tax incentives may not apply to prospective vertical farmers at all, as the land or structure in question falls outside the requirements for the incentives.

Utah requires that the lot size be at least two but not more than five acres in area and that the lot was used for at least two successive years preceding the tax year.¹¹⁰ Because the purpose of vertical farming indoors is to limit land use, this is antithetical to vertical farming's mission. Likewise, a prospective farmer would have to farm the land for two years before applying for the tax exemption and building a vertical farm.

California's Urban Agriculture Incentive Zones Act ("UAIZ Act") allows acreage from one-tenth of an acre to a maximum of three acres, but only applies to "vacant, unimproved, or blighted lands [that can be] converted for small-scale agricultural use." Here again, a potential farmer looking to benefit from this law to develop a vertical farm is out of luck. They are restricted to small-scale production, which eliminates any profitability. This also further exacerbates the challenge of getting capital funding in the first place.

Missouri's Urban Agriculture Zone Exemption is quite promising. It is likewise limited to blighted areas, but the definition of "blighted" targets existing, run-down lots in urban areas.¹¹¹ This law is specifically beneficial to indoor vertical farming operations that seek to convert abandoned factory buildings or similar structures into vertical farm sites. However, like every tax exemption example given thus far, any buildings used or constructed on the property must comply with Missouri's version of the IBC.¹¹²

¹⁰⁹ Roberts & Pollans, *supra* note 1, at 12; see Martha Harrell Chumbler, *The Tax Implications of Urban Agriculture: Liabilities and Incentives*, in *URBAN AGRICULTURE: POLICY, STRATEGY, AND IMPLEMENTATION* 173, 173-194 (Martha H. Chumbler et al. eds., 2015) (outlining various municipal and state approaches to offering tax incentives for urban agricultural land use).

¹¹⁰ UTAH CODE ANN. § 59-2-1703 (West 2019). Note that the lot size restriction will decrease to a minimum of one acre in 2020.

¹¹¹ See Roberts & Pollans, *supra* note 1, at 182.

¹¹² MO. REV. STAT. §§262.900.1-2 (2014); see also Roberts & Pollans, *supra* note 1, at 182.

D. Agricultural Building Code Exemptions

Agricultural building exemptions are generally applied at the state level to address concerns like the one this article focuses on.¹¹³ While the IBC does not contain any agricultural exemptions itself, a state government may preempt certain locally adopted portions of the IBC to affect them.¹¹⁴ Some exemptions pertain to building codes and zoning ordinances alike.¹¹⁵ Unfortunately, agricultural exemptions to the building code often fail for three reasons. First, they are subject to the same ambiguity problems discussed throughout the article thus far. Second, much like the tax incentives discussed above, building code exemptions often impose conditions that new vertical farming operations will find impracticable if not outright impossible to meet. Third, there is a legitimate concern that exempting large structures from building regulations poses a risk to public welfare—both from a human health and economic perspective.

First, many agricultural exemptions simply will not apply to vertical farm buildings, either expressly or because they suffer from the same ambiguity problems inherent in the IBC occupancy group definitions.¹¹⁶ Because many exemptions tend to reference the “agricultural building” as defined under Group U, the confusion surrounding what types of buildings are covered remains.¹¹⁷ This

¹¹³ *E.g.*, FLA. STAT. § 163.3162 (2018).

¹¹⁴ FLA. STAT. § 163.3162 (“[A] county may not exercise any of its power to adopt any ordinance, resolution, regulation, rule, or policy to prohibit, restrict, regulate, or otherwise limit an activity of a bona fide farm operation on land classified as agricultural land.”); IOWA CODE § 335.2 (“[N]o ordinance adopted under this chapter applies to land, farm houses, farm barns, farm outbuildings, or other buildings or structures which are primarily adapted, by reason of nature and area, for use for agricultural purposes, while so used.”).

¹¹⁵ MO. REV. STAT. § 65.677(2018) (township zoning “shall not be exercised so as to impose regulations or to require permits with respect to land, used or to be used for the raising of crops, orchards, or forestry or with respect to the erection, maintenance, repair, alteration or extension of farm buildings or farm structures.”)

¹¹⁶ *See e.g.*, CANYON CTY. BLDG. DEP’T, AGRICULTURAL BUILDING EXEMPTION (citing CANYON CTY., IDAHO BLDG. CODE ORDINANCE 04-11 §§ 06-01-07, 09(4)), <https://www.canyonco.org/wp-content/uploads/2016/05/Agricultural-Building-Exemption-Rev.pdf>; *see also* 2006 MISS. AG LEXIS 321, *17 (Opinion No. 2006-00436) (stating that structure must be used for storing farm products or implements or will be used to shelter livestock).

¹¹⁷ *E.g.*, N.H. REV. STAT. ANN. § 674:32-c (“The tilling of soil and the growing and harvesting of crops and horticultural commodities, as a primary or accessory use, shall not be prohibited in any district. Nothing in this subdivision shall exempt new, re-established, or expanded agricultural operations from generally applicable building and site requirements . . .”). Note that because many vertical farming operations convert old factory buildings or similar structures, this limitation fails to reach vertical farming as we have discussed it here.

was recently the subject of an Attorney General's Opinion letter from Mississippi, which determined that exemptions must be decided on a case-by-case basis.¹¹⁸

Second, agricultural exemptions often come with conditions precedent that preclude new vertical farming operations.¹¹⁹ Requirements include minimum acreage, preexisting ground-crop farming operations, strict zoning qualifications, and the like.¹²⁰ As one Idaho county's opinion letter stated, "[i]f you are not farming the ground on which your Agricultural Building ("Barn") is to be placed; you probably do not qualify for an Agricultural Building Exemption."¹²¹

Third, even when the agricultural building exemptions do apply, it is not clear that they *should*. There is a genuine concern that larger buildings of greater economic importance should be subject to building code regulations. A white paper from the Minnesota Governor's Council on Fire Prevention and Control discussed this issue in November of 2010.¹²² With an apparent sense of urgency, this white paper discussed losses related to snow-load collapse, windstorms, and fire.¹²³ It concluded that non-engineered and partially-engineered structures lack the structural accounting and oversight to provide adequate safety for workers and pose a risk to insurance companies.¹²⁴ While this is a larger policy issue in and of itself, it calls into question whether agricultural exemptions can be a meaningful part of the solution where vertical farming is involved, especially when considering the types of structures involved in these operations.

¹¹⁸ See 2006 MISS. AG LEXIS 321, *17 (Opinion No. 2006-00436); see also *Hinds County Board of Supervisors v. Leggette*, 833 So. 2d 586, 592 (Miss. Ct. App. 2002) (discussing factors and guidelines for making a factual determination as to what the definition of an "agricultural operation" is in regard to a zoning exemption).

¹¹⁹ See CANYON CTY. BLDG. DEP'T, AGRICULTURAL BUILDING EXEMPTION (citing CANYON CTY., IDAHO BLDG. CODE ORDINANCE 04-11 §§ 06-01-07, 09(4)), <https://www.canyonco.org/wp-content/uploads/2016/05/Agricultural-Building-Exemption-Rev.pdf>.

¹²⁰ *Id.* (requiring that buildings be constructed on a single parcel of no less than five acres and in an agricultural district).

¹²¹ *Id.*

¹²² See MINN. GOVERNOR'S COUNCIL ON FIRE PREVENTION & CONTROL, BUILDING CODE EXEMPTIONS FOR AGRICULTURAL BUILDINGS 4-5 (Nov. 24, 2010) (discussing the risks associated with the exemption from the state building code for agricultural buildings) [hereinafter WHITE PAPER]; see also *Kuehl v. Cass Cty.*, 555 N.W.2d 686, 688-9 (Iowa 1996) (citing IOWA CODE § 335.2 (1995)) (ruling that hog barns sufficient to house 900 feeder hogs are exempt from building codes).

¹²³ WHITE PAPER, *supra* note 122, at 3.

¹²⁴ *Id.* at 5.

VI. Analysis: Solutions

A. Statutory Interpretation: *Falling Just Short*

One local government has attempted to tackle the issue of vagueness in the IBC with administrative guidance. Phoenix, Arizona, concerned with the IBC's rigidity on urban agriculture, updated its interpretation of the IBC to account for modern agricultural practices by recognizing that commercial-scale indoor agriculture differs from the accessory buildings allowed under Group U.¹²⁵ To remedy this, Phoenix expressly declared that, under its new interpretation, buildings used as growing areas fall under either Group F or Group U designations.¹²⁶ However, any indoor farm wanting to undertake retail sales also falls under Group M.¹²⁷

Phoenix accomplished a great thing here by clarifying the application of its building code for many prospective indoor farmers. However, the Phoenix scheme is not perfect. Because Group U, Group F-1, and Group M buildings each carry their own permitting requirements and limitations, any mixed-use building must jump through the same or similar hoops mentioned earlier.¹²⁸ For a farm attempting to grow, wash, and sell produce at the same building site, it is a daunting task to keep up with three separate use group provisions and all that they entail. Additionally, these provisions still lack language for common indoor farming practices like those used in aquaponics, as they contain no language pertaining to the production of livestock.¹²⁹

Consider the previously described Chicago-based farm, The Plant.¹³⁰ The Plant utilizes a converted factory to grow hydroponic produce and raise fish in a closed system; it also incorporates an anaerobic digester as a source of some of its electrical energy. This complex and varied usage is left unaddressed by the City of Phoenix's efforts.¹³¹ In fact, the inclusion of fish in The Plant's production scheme pushes the farm back into the same unknown territory previously inhabited by "agricultural buildings" under Group U, as the IBC states that livestock must be housed in

¹²⁵ See CITY OF PHOENIX, INDOOR AGRICULTURAL OCCUPANCY CLASSIFICATIONS (2013), https://www.phoenix.gov/pdds/site/Documents/TRT/dsd_trt_pdf_00756.pdf; see also Tomlinson *supra* note 17, at 21 (discussing the clarification).

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ *Id.*

¹²⁹ *Id.*

¹³⁰ See *supra* Section II.A.

¹³¹ See CITY OF PHOENIX, *supra* note 125.

“agricultural buildings.”¹³² This potentially creates an inherent contradiction in the IBC’s treatment of such a building because, even under the Phoenix interpretation, The Plant is both expressly *not* an “agricultural building” where it is used for the production of crops and *is* an “agricultural building” where it is used for the production of livestock.

Critiques aside, the City of Phoenix has provided local lawmakers with the building blocks of a solid short-term solution to ambiguity in the IBC. The concern with statutory clarification is not that it fails as a solution outright; indeed, explicit clarification as to which occupancy group a farm building falls under is a step in the right direction. Rather, the concern with statutory clarification is that it can only go so far in the face of a nuanced, still-developing industry. In other words, efforts like the City of Phoenix’s opinion letter operate as useful, but temporary, salve to the problem of ambiguity until a more permanent solution is available.

B. Updating the IBC

The more sustainable solution is a change to the law. The problems highlighted in this article may be solved with something as simple as the addition of new definitions, or carefully worded interpretations. For building codes, this means a straightforward modification of the IBC occupancy groups. Because virtually every building code in the United States is modeled after the IBC and states re-adopt the revised IBC every few years, changing the IBC directly would mean that local governments are essentially required to do nothing beyond continuing to adopt updated versions of the IBC. The IBC would simply be changed at the top and adopted by the states as usual. This is far more efficient than waiting on each state, county, or municipal government to adopt its own interpretation of the existing occupancy groups to facilitate vertical farming.

The only remaining question is which occupancy group to use. Given the trend in converting old factory buildings to vertical farms—as well as the need for flexibility in height and story limits—the most fitting occupancy group currently is the Group F. If the IBC were modified to incorporate “indoor crop farming” into Group F, particularly Group F-2, the following goals would be accomplished. First, the ambiguities that plague prospective vertical farmers now would be eliminated. Second, it would avoid the massive complexity of mixed-use in regard to all the various permits and hoops that prospective farming operations would have to jump through. Third, the contradictions in IBC use and height restrictions would be

¹³² INT’L BLDG. CODE § 302.1.

avoided, as indoor farm building would no longer potentially fall under the Group U or Group M categories.

VII. Conclusion

As described above, the popular regulatory measures of updating zoning plans, providing tax incentives, and passing statewide agricultural exemptions, are wholly inadequate for the purpose of fostering vertical farming operations in urban environments. Updated zoning plans tend to benefit community agriculture, but fail to consider large vertical farming operations and leave such operations at the mercy of statutory ambiguities. Tax incentives and statewide exemptions from the building code likewise fail to reach vertical farming buildings, either due to ambiguity or disadvantageous conditions. Additionally, there are seemingly legitimate public policy reasons for not allowing building code exemptions for large, costly structures. Statutory interpretation may alleviate certain problems in the short-term, but still leave some long-term issues with mixed-usage, particularly for farms that want to sell produce on-site. Updating the IBC will alleviate all of these problems and allow local governments to facilitate the growth of vertical farming in the future.