Staff Paper

Tax Policies, Agriculture and the Environment

By

Steven R. Miller

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Department of Agricultural, Food, and Resource Economics
MICHIGAN STATE UNIVERSITY
East Lansing, Michigan 48824

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Steven R. Miller**
Department of Agricultural, Food and Resource Economics
Morrill Hall of Agriculture, 446 W Circle Cr Room 202, East Lansing MI 48824
Michigan State University
Office: (517) 355-2153, Fax: (517) 432-1800, email: mill1707@msu.edu

Abstract

This paper reviews agricultural tax policies, with particular emphasis on Michigan, that have potential implication to environmental outcomes. In this, non-environmental tax policies are considered that may impact environmental outcomes through secondary channels. Such channels are discussed along with possible policy implications.

Introduction

Over time, Americans have expressed increased concern for the environment and public health. With that, policy makers are finding increasing pressure to support tax legislation that promotes the environment. Existing studies on tax policy related to agriculture and the environment were examined including how tax policy influences environmental outcomes.

Tax provisions that encourage agricultural production necessarily lead to expansion of agricultural practices–practices inherently designed to change the natural landscape. Such change comes at a cost to the environment through land transformation, loss of biodiversity, and pollution through emissions and agro-chemical runoff. However, best practices can mitigate the environmental impacts of agriculture, and in the U.S., several programs have developed over the years to encourage sustainable agricultural practices. Despite interest in environmental outcomes, few of these programs entail tax considerations.

U.S. tax policy is largely designed for revenue generation, though tax concessions are often built into federal, state and local tax codes to incentivize desired behaviors (e.g., conservation easements). Tax policy has broad, indirect implications for the environment, as distortionary taxes (i.e., taxes that affect the prices of items in a market) often give rise to secondary impacts. Taxes can have direct impacts on behavior by imposing additional costs on undesired outcomes. For example, a tax on carbon emissions increases the cost of activities giving rise to greenhouse gas releases. Rather than taxing undesired outcomes, taxes can be directly imposed on activities with direct links to outcomes. For example, a tax can be imposed farm machinery that burns diesel fuels based on the value of greenhouse gas generation through operations. However, attempting to reduce emissions from burning fuel by taxing the capital that uses that fuel fails to recognize or incentivize potential emission abatement effort through innovation such as improved vehicle emissions controls. In effect, the more disconnected the tax incentive from the environmental outcome, the less efficient the tax incentive may be in generating desired outcomes. Alternatively, taxing outcomes directly may lead to higher administrative costs associated with the tax incentive. Emissions are difficult to monitor, especially for such diverse non-point sources as that arising from machinery use and agricultural practices. In such cases, a relatively less effective but more accessible indirect tax may be more efficient from an economic perspective. To be effective indirect tax incentives should have a direct link to desired outcome, be cost effective to implement, result in minimal secondary (unintentional) outcomes and be salient to the farm operations.

Income tax is perhaps the most salient federal tax paid by farmers, where most farm income is taxed as individual income rather than corporate income (Durst & Monke, 2001). Income tax entails revenues from operations as well as capital gains from the sale of assets. Estate taxes are considered the second most significant tax burden of farms. In addition, farmers are subject to a variety of state and local taxes including income, sales and property. Possibly the most significant state and local tax is real estate or property tax.

Income tax policies have two indirect channels for generating secondary impacts on the environmental. The first channel affects the extent to which agricultural activities are pursued in the economy, as land use has important environmental consequences (Koontz, 2001). For example, tax policy may affect one's desire to start a new farm venture and dictate the best way to retire from farming. They may also influence who practices farming and in certain cases where farming takes place. The second channel affects how farmers practice farming. Tax policies have the potential to influence the production decisions of farmers and in some cases lead to beneficial environmental outcomes.

The size of farm is a common theme in this review, as tax affects vary depending on farm size and existing environmental research delineates agricultural impacts largely on the size of farm operations. As income tax is a primary federal tax burden on farmers, the progressive nature of the U.S. income tax rates tends to be more burdensome to farmers with higher net revenues associated with higher gross sales. In this, the value of tax avoidance is greater for higher income farms, though smaller farms may also achieve high value of tax avoidance in the presence of significant off-farm income.

Researchers often describe comparative environmental impacts of small farms against large farms. Generally, such studies have conveyed comparisons based on differentiation of practices largely adopted by farms of various size (Pacini, Wossink, Giesen, Vazzana, & Huirne, 2003; Souza & Ikerd, 1996). Large farms are generally viewed as being more mechanized and capital intensive, while smaller farms as more conducive to sustainable agriculture (Tavernier & Tolomeo, 2004). However, the delineation of environmental outcomes is not always clear, as agricultural systems are quite complex and varies across commodities and regions. What may be an environmentally sound practice here may not be there. In addition, environmentally sound practices may not be so prescriptive under different methods. For example, organic farming is largely viewed as environmentally superior to conventional practices, but if organic farming in an arid region requires irrigation in excess of conventional practices, organic may induce unfavorable environmental outcomes. In effect, producer size as an indicator of the expected environmental outcomes of farming activity, is less than a robust predictor. Regardless, popular perceptions persist that size of operations have direct implications on environmental outcomes and agricultural sustainability.

To be sure, certain practices can be delineated as environmentally sound, leading environmental researchers to prescribe such practices (Tisdell, 1994), but such practices may result in lower productivity and, therefore, require more acres to be devoted to agricultural production. Similarly, organic systems, largely shown to have preferable environmental outcomes where practiced, are generally deemed environmentally friendly, but such systems tend to have lower yields than conventional practices. This leads to the unconventional conclusion that conventional practices may be environmentally superior to organic practices if it leads to a sufficient reduction in acres converted to agricultural uses (Robertson & Swinton, 2005). In summary, there exists no clear delineation of environmental outcomes across various production practices and size of operation. Despite this, the research has strongly associated with tax and environmental impacts to farm size, as we will discuss below.

Income Tax Policies on Agricultural Activity and Land Use

Tax policy has the potential to indirectly influence environmental outcomes of agriculture through its impact on the extent to which agricultural activities take place. In their comprehensive review of tax policies' impact on agriculture, Durst and Monke (2001) show that federal tax policies, through preferential treatment of capital gains and estate taxes, increase farmland prices, thereby favoring large producers who gain benefits through tax preferences. Current tax policies have the net effect of restricting availability of farmland and increasing demand for farmland. The net effect is an increase in farmland values, which reduces access to beginning farmers who benefit from low land prices. This effect contributes to the development of agricultural structure where larger, or established farms, have greater access to expansion relative to smaller up starts.

Other tax consequences have implications on the structure of U.S. farming. The current federal tax system has a lock-in effect on existing landowners through its treatment of capital gains. Economists distinguish between real and nominal capital gains, where real gains adjust for inflation and provide a better metric for measuring the increase in value of assets. However, U.S. tax policy uses nominal capital gains as a tax basis rather than real capital gains. The result is that asset holders are taxed on both the change in asset values and on inflation. This effect inflates the capital gains tax bill associated with the sale of farm assets. From an investment perspective, landowners are better off if they defer such capital gains taxes by holding on to their land longer (Slemrod & Feldstein, 1978). The higher the tax bracket, the more significant is the lock-in effect. Similarly, borrowing to invest in farmland provides tax breaks, as nominal interest expenses are fully deductible. As the value of the tax deduction depends on one's tax bracket, established farms in higher tax brackets are able to outbid smaller farms in lower brackets (Durst & Monke, 2001). Ultimately, these two forces increase farmland prices.

Estate taxes can also affect who farms. Excessive estate taxes can potentially force the liquidation of farm property upon the passing of farm holder. Most Americans will not be required to file estate taxes as the size of the estate must exceed $5,250,000 or $10,500,000 for married filing jointly before the tax is imposed. However, farms, steeply invested in land and capital, commonly exceed this threshold, exposing heirs to large estate tax bills. While the effect was greatest in the 1980 before the cap was much lower in real terms, such tax bills can lead the heirs to liquidate the farm or render the farm undercapitalized for effective operations. Provisions of the tax codes reduce the burden of estate tax on farms including the provision of valuing assets at farm-use value rather than market value and special deductions for family owned operations. The combination of estate tax provisions for farm capital and real estate along with the lock-in effect of capital gains tax make holding on to farm property through death economically viable. That is, it cost more to liquidate the farm through the sale of its assets than it does to pass the farm on to heirs. The estate tax benefits are bolstered if the land is operating under a donated conservation easement (discussed below). This lock-in effect further locks out beginning farmers from entering the market by restricting access to farmland, thereby increasing farmland values (Hennessy, 1999).

U.S. tax policy not only benefits established and larger farms, but also benefits small, lifestyle farms. Lifestyle farms are small farms by which there is no expectation of it being the primary source of income. Small farm operations are a source of tax shelters for non-farm income, and have seen a steady rise in numbers over the last ten years (Durst & Monke, 2001; Hoppe & Banker, 2010). In general, small farm losses can be used to offset non-farm income for income tax purposes. Other tax benefits may exist including concessions on property tax, and moderating estate tax liabilities. While a tax shelter is not the only reason to start a lifestyle farming operation, evidence suggest it is a contributing factor to their growth (Durst & Monke, 2001; Hoppe & Korb, 2004). The influx of small farms in recent years has potential environmental implications depending on small farms' comparative environmental footprint relative to large farms.

The literature suggests that farm size has implications on environmental outcomes, and tax policy drives some of these outcomes (Macdonald, 2011). Large farms in particular have been targeted by environmental groups as generating adverse environmental consequences through intensive cropping and animal livestock systems. For example, monoculture cropping systems, thought largely to be driven by large farms, engender pest pressures which careful crop rotations mitigate (Pimentel, 2009). Similarly, large livestock operations called concentrated animal feeding operations (CAFO) tend to generate manure byproducts in excess of what the surrounding land can take up (Kaplan, Johansson, & Peters, 2004). However, larger establishments have the potential to also generate superior environmental outcomes as they are generally in a better position to invest in environmentally friendly practices (Katherine Falconer, 2000) and in some cases may have greater incentives to pursue environmentally sound practices. In addition, larger producers generally exhibit greater productivity gains through economies of scale (Chavas, Chambers, & Pope, 2010).

Alternatively, organic farms, largely seen to posit better environmental outcomes than conventional farming, tend to be smaller farms. While USDA data shows that large farms generate the largest share of total organic production sold, organic sales make up a larger share of total small farm output (Martinez et al., 2010). Extensive research has shown that organic crop and livestock production has positive environmental impacts on biological diversity, soil attributes (Shepherd et al., 2003), and generally have reduced carbon footprints (Lal, Kimble, Follett, & Cole, 1998). While environmentally preferable conventional practices can be adopted with similar results (Pacini et al., 2003), organic crop production tends to have beneficial impacts on soils over most conventional best practices. However, compared to conventional practices, organic farming may lead to lower yields per acre, thus requiring more acres to be employed in agricultural practices. Additionally, organic cropping systems have shown to be more susceptible to soil erosion in areas where erosion is a threat.

Additionally, organic livestock production is generally better suited to open range operations with smaller heard counts, as close proximity of livestock in CAFO production facilitates the spread of disease that often warrants preventative usage of pharmaceuticals (Gliessman, 2006). Organic livestock is commonly practiced within integrated farm management where crops and livestock coexist, as open range livestock facilitates soil amendments, reducing application of synthetic fertilizers (Watson, Atkinson, Gosling, Jackson, & Rayns, 2002). Management of such systems generally requires less investment in capital equipment compared to CAFO operations (Mayda, 2004). However, like organic cropping systems, organic livestock operations generally fail to meet the level of productivity and economic efficiency of larger operations requiring greater capital investment, though, like organic cropping, they are generally associated with preferred environmental outcomes (Sundrum, 2001).

Despite widely held beliefs, it is difficult to make substantiated generalizations of environmental outcomes when comparing large and small farms, as outcomes have the potential to vary significantly across producers and are subject to environmental conditions as well as commodity types (van der Werf, Tzilivakis, Lewis, & Basset-Mens, 2007). Although the connection is not direct, tax policies that promote small farms, may promote positive environmental outcomes to agricultural land under organic farming. However, productivity losses over conventional practices may require more land be employed in agricultural production (Robertson & Swinton, 2005). Because of this, no consensus has been reached as to whether larger farms posit different environmental outcomes (Soule, 2001), and testing such effects requires more research. However, research largely views organic production as giving rise to preferable environmental outcomes to land under organic farm production.

Besides influencing who practices farming, tax policies may also affect agricultural practices. Most significantly, capital investment deductions decrease the cost of purchasing equipment relative to labor (Uchtmann & Cross, 1984). In this, payroll tax increases the cost of labor, while capital investment tax reduces the effective cost of labor-substituting capital. Federal tax allows businesses to deduct 100 percent of the purchase of qualified capital equipment and structures. Section 179 of the IRS tax codes allows farms to deduct up to $500,000 of the capital purchases and some land improvement in the year of the purchase against their overall income tax liability. While, high-level Section 179 deductions for capital and land expenditures are slated to sunset in 2014, for most farms, this allows them to deduct their entire capital investment expense in a single year rather than along a depreciation schedule – only the largest farms cannot take advantage of Section 179 due to caps on the program (Durst & Monke, 2001). By reducing the cost of capital, tax policies have increased the attractiveness of capital-induced automation in the farm production system.

Switching to capital-bolstered automation has some implications for environmental outcomes. Under automated systems, agricultural chemicals are generally applied on a set schedule. This is in contrast to integrated pest management (IPM) approaches that largely rely on scouting for pest before spraying (Mullen, Norton, & Reaves, 1997). IPM practices are more labor intensive and are believed to mitigate some of the environmental consequences imposed by conventional agriculture. However, this difference may be eroding with technological gains in farm machinery. Smart sensing technology and geographic information systems (Mukhopadhyay, 2012), while not as robust as labor-intensive IPM approaches, has reduced the redundancy of nutrient and pesticide applications (Lan, 2012).

Capital-bolstered automation also promotes larger economies of scale in operations. Farm capital is expensive, and from a cost perspective, is most effective if applied over many acres of production or over larger herd sizes. Tax incentives that favor capital investment will tend to promote farm size and the inherent environmental threats posed by such large farms. Alternatively, tax policies that favor labor employment is likely to shift production toward labor-intensive practices like IPM and favor farms of smaller scale.

While U.S. tax policy is mostly mute when it comes to environmental incentives, some tax programs do promote positive environmental outcomes. One federal income tax policy directly targets environmental practices through participation in the USDA Conservation Reserve Program (CRP). Through CRP, farms with land susceptible to erosion may be eligible for tax benefits for converting land to less intensive uses. The CRP is a voluntary program, where farmers can enter into a contractual agreement with the USDA to set aside lands at risk of erosion for conservation purposes. Under the 10- to 15-year contractual arrangement, the USDA will provide rental and other incentive payments up to 50 percent cost share for converting and maintaining conservation practices on enrolled land. Under the IRS, the cost-share payments under the CRP and certain state cost-share programs may qualify for a cost sharing exclusion from total taxable income. The outcome is that the cost-share exclusion increases the likelihood of eligible farmers enrolling at risk lands in the CRP. However, the cost-sharing exclusion is limited to qualifying programs and a three-part test for applicability (IRS, 2011).

While tax policy is one means for influencing environmental outcomes of agriculture, the U.S. has a rich history in applying education and cost-share incentives to promote environmental stewardship. Programs have evolved over time and at times program participation has been buoyed by tax considerations. For example, the 2008 Farm Bill renewed federal tax incentives for agricultural land under conservation. Under this program, farmland development rights can be surrendered, for a specified value of tax deductions claimable over time. A qualifying farmer or rancher can deduct up to 100% of income across up to 16 years in exchange for donating a permanent conservation easement on their farmland. The total value of the deductions depends on the value of land placed in conservation easement and the tax bracket of the farm operator. Federal tax provisions may also favor state-sponsored programs. Under certain circumstances, the value of farmland and forestland placed in a conservation easement for the purposes of protecting natural habitat of fish, wildlife, plants or similar ecosystems, or for the preservation of open space can be used as a charitable deduction against personal income for federal tax purposes. Such open space agreements must be facilitated by a state governmental conservation program and cannot entail fare-market payments in return for participation. The IRS may have other restrictions. Under § 170(h)(4), property entered into a conservation easement is treated as a charitable donation. However, many states operate farmland conservation programs that provide direct tax or rent income for participation.

Donation of conservation easements contrasts with land retirement through the Conservation Reserve Program (CRP) or the sale or lease of development rights. The CRP and sale of development rights provide rent payments for farms that voluntarily place at-risk farmland into non-production. For most farms, the IRS considers these payments as taxable income, reducing the attractiveness of participating in CRP. More so, the IRS treats such payments as self-employment income subject to a higher self-employment tax.

Looking Forward: Role of Taxation in Agriculture and Environmental Benefits

While the U.S. policies toward environmental threats have historically been directed at command and control, or regulatory approaches, the European Union has largely led the charge in designing incentive-driven systems (Harrington & Morgenstern, 2007; Hoerner & Bosquet, 2001). Nonetheless, incentives are not new to U.S. environmental policy, but have been implemented over the past century with cost-share incentives through the Natural Resource Conservation Service (NRCS) of the U.S. Department of Agriculture. At times, participating in such conservation programs have been tied to tax implications through tax credits and deduction as well as through estate tax concessions.

Economists generally view incentive-based approaches as being more cost effective than command and control approaches for reaching environmental outcomes (Harrington & Morgenstern, 2007; Stavins, 2013). Incentive-based approaches are passive in that individuals are motivated by the properly aligned incentives, while under command and control approaches they are largely motivated by the potential costs of failing to adhere to regulations and the threat of detection. For command and control approaches, regulators influence the level of motivation by changing the level of surveillance or the cost of non-compliance if detected. Increasing either is likely to increase environmental outcomes but also the costs of regulation. Increasing the cost of non-compliance increases the value, and therefore, the effort of concealing non-compliance. Hence, requiring regulators to increase surveillance and thereby further increasing the cost of implementing a command and control approach to regulation.

A large body of research has developed around tax incentives for environmental outcomes. Possibly at the forefront of such discussion is a carbon tax. The discussion largely centers on whether tax policy can lead to reduced greenhouse gas releases without adverse effects on economic growth (Bosquet, 2000). A widespread emission tax on carbon has implications for farms by increasing the costs of using carbon-generating inputs like fuel and synthetic fertilizers. As a tax on fuel, a carbon tax indirectly represents a tax on farm machinery and result in secondary impacts associated with higher costs of farm equipment. That is, it will likely encourage replacing mechanization with labor. However, a recent study of farm response to changes in energy prices suggest that increases in the costs of operating farm machinery is not likely to result in significant reductions in farm capital input (Lambert & Gong, 2010). In their study, Lambert and Gong find that farm demand for machinery is mostly inelastic to higher fuel costs; a result that can be largely attributed to inelastic consumer demand for food and fiber. Researchers have also found little reduction to increases in the costs of pesticides and fertilizer inputs (Bosquet, 2000; K Falconer & Hodge, 2000). Hence, a tax on carbon-inducing fuel use, will likely not lead to production shifts toward less labor-intensive production approaches like IPM. It may also have an adverse effect of further alienating beginning farmers through higher production costs. However, higher operating costs in the form of fuel or agro-chemical taxes could also reduce the costs of machine inputs making entry into agriculture more attainable. Hence, while a carbon tax will increase the cost of mechanized agriculture production, it is likely to have little effect on the use of carbon-generating machinery on farms and on the size of operations.

Tax policy may target practices directly tied to environmental outcomes to be aligned with environmental outcomes. USDA programs, like those under the Natural Resource Conservation Service (NRCS) provides guidelines based on studies for adoption of particular practices and for investment in land improvements, structures, equipment and fixtures and require farm participation in planning and implementation before providing cost-share incentives. This program has a long history of success and U.S. tax policies have historically been aligned to boost encouragement for participation (Durst & Monke, 2001). Current NRCS participants enter into a contract to implement NRCS-approved practices and may entail capital purchases and or improvement to land. The program is generally restrictive in the time-window of implementation and to practices and investments recognized by the NRCS. While land improvement expenditures largely give rise to direct reduction in net income, under IRS rules, tax codes also provide that cost-share payments may be excluded from income under certain circumstances. As investments under NRCS programs are targeted for their environmental outcomes, tax policies favoring enrollment in such programs will encourage participation and lead to direct and verifiable environmental outcomes.

Another income tax concession likely to lead to known environmental outcomes is currently in practice. Cost share payments received by farms with land enrolled in the USDA Conservation Reserve Program may qualify for cost sharing exclusion. However, IRS tax codes require both one-time incentive payments and annual cost share payments to be included as income. Similar provisions can be applied for NRCS investments in land improvements and practices, as long as such investments do not materially increase the value of the farm or contribute to gains in farm earnings through operations. Such credits should be designed to offset costly modifications pursuing preferred environmental outcomes. While policies favoring capital investment in general may or may not contribute to preferred environmental outcomes, policies targeting assets and activities with known outcomes will generate greater efficiencies toward reaching desired outcomes.

As agriculture is a capital-intensive industry, tax policies aimed at the treatment of capital expenditures play a significant role in farm net income. While the extent of capital investment requirements differs across commodities, management processes and operation sizes, it has direct implications on who farms and how they farm. The literature suggest that farm demand for capital inputs (and most other inputs) is largely inelastic to prices changes, suggesting that farmers are not quick to change practices (Gliessman, 2006). It also appears apparent that farms respond to technological change and that late adopters generally fail to capture the associated economic gains. As discussed above, technological advances in smart sensing technology (Mukhopadhyay, 2012) and geographic information systems along with variable rate technology that allows farmers to fine tune agro-chemical applications are examples of new capital investments that reduce the environmental burden of modern agriculture without reducing productivity. Regardless, these technologies are expensive and often out of reach of beginning farmers. Hence policies that encourage the formation of larger farms, also facilitates the adoption of new technologies. Additional tax policies that encourage the adoption of capital purchases of technologies that promotes positive environmental outcomes can expedite their adoption. Such policies can be added to existing favorable treatment of NRCS cost-share payments, but require NRCS approval as an environmental investment.

Dust and Monke (Durst & Monke, 2001) suggest an approach to encourage the formation of small farms and facilitate a new generation of agricultural producers. Under existing tax codes, farmland rent is treated as income for the landholder. However, reducing the income tax burden of land rent income may have the effect of lowering the rental price of land offsetting the lock-in effect discussed above.

We should be careful to recognize that other forces influence land use and farm formation. For example, technological advancement in some farm equipment and information has increased the minimum efficient scale of operations (Macdonald & Mcbride, 2009), especially in livestock production. It has also allowed producers to fine-tune agrichemical applications, reducing the urge to over-apply pesticides and fertilizers. The price of new harvesting and field equipment has risen sharply over the past decade, making such investments out of reach for many small growers. Such equipment has become larger, and more mechanized to take advantage of large acreage production. Similarly, a wave of environmental and healthy-choice sentiment has swept the nation, giving rise to demand for organic and locally sourced foods. This trend has placed a premium on foods with organic and grown-locally labels and developed niche markets largely targeted by small growers. While tax policy may indirectly accelerate these transformations to the agricultural landscape, the absence of tax incentives is not likely to reverse the current trends.

Conclusions

Taxes that lead to distortionary outcomes will necessarily have some secondary impacts. These impacts mostly fall within two categories; taxes that influence land use, and taxes that influence agricultural practices. Federal income tax has the greatest potential to affect growers, but state and local property taxes may also have significant impacts on agricultural production. Despite the extensive research on tax policy and agriculture, little research has pursued income tax policy impacts on environmental outcomes in the U.S., and this topic is only newly investigated in other OECD countries.

Our review suggests that income tax policy may have marginal impacts on agricultural environmental outcomes in general, but those policies directed at investment in land improvements through monitored federal and state conservation programs have greater promise for instilling sustainable agricultural investments and practices. While the literature mostly delineates environmental outcomes by size of operations, we see little evidence that such representation is valid. At most, preferential income tax treatment of farm capital investment and estate tax incidence tends to favor the formation of larger agricultural producers, technological advances and the cost of farm capital has buoyed that trend. However, large producers tend to have greater productivity levels that reduce land commitment to agriculture. While smaller farms, more commonly associated with beneficial practices, and organic farming has been linked to preferred environmental outcomes, such systems generally require more acres to achieve the same level of output as conventional practices. Environmental tax policies that target practices associated with particular farm characteristics is likely to fail to meet their objectives. Alternatively, policies incentivizing practices and investments with known environmental outcomes are more likely to succeed. One way to target tax policies for incentivizing beneficial environmental outcomes is to set policies that encourage participation in NRCS programs, including the Conservation Reserve program.

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