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# Why Do They Continue to Use Pesticides? The Case of Tomato Growers in Boushehr Province in Southern Iran

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## ABSTRACT

**Despite huge environmental, economical, health, and societal costs of pesticides, research has argued that farmers in developing countries will continue to use pesticides. The present study used an extended model of the theory of planned behavior (TPB), which includes the additional variables of moral norm and self-identity, to predict the farmers' decisions (intentions) regarding pesticides usage in a multistage, clustered random sample of farmers (n= 150) in a face-to- face survey of students that was undertaken in Dyer County in Southern Iran. The reliability and validity of the instruments were examined and approved. Findings revealed that the extended model is an improvement over the standard TPB variables for predicting intention. Hierarchical regression analysis showed that attitude, subjective norm, perceived behavior control and self-identity can predict 63% of variances in farmers' intentions. In conclusion, the results of this study demonstrated that the extended TPB can be used as a conceptual framework for intervention programs aimed at decreasing pesticides spraying intention.**

**Keywords:** Moral norm, Self-identity, Theory of Planned Behavior.

## INTRODUCTION

Since the green revolution, pesticides play a major role in pest management in agriculture (Atreya, 2007). As a result, the use of pesticides has spread rapidly and become an indispensable element for farmers throughout the world, particularly in developing countries. Despite the positive effect that pesticides have on agriculture and human well-being (Ahmed *et al.,* 2011; Yazdanpanah *et al*., 2015) i.e. increasing farm productivity translating into improved incomes and food provision for farm households (Snelder *et al*., 2008), their use poses several risks to human health, non-target organisms, and the environment as a whole (Maria Travisi *et al.,* 2006; Dasgupta *et al.,* 2007; Antle and Pingali, 1994; Yazdanpanah *et al*., 2015). Use of pesticides in agriculture would lead to their presence in other environments (Kirchmann and Thorvaldsson, 2000; Dasgupta *et al.,* 2007) through wind drift to adjacent areas, leaching to the surface- and groundwater, and international trade. Its residues may pollute drinking water or foodstuffs, threatening human health and spraying of pesticides may threaten ('non-target') plants and animals, therefore, it leads to the loss of biodiversity (Jensen and Blok, 2008). In sum, the negative results of this material include the degradation of environment (soil, water, and air) and depletion of natural resources, in particular, fertile soils and

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degradation of landscapes and rural communities (livelihood).

Popular usage of modern agricultural technology in Iran has begun since the Green Revolution technology was instituted through a government program called 'White revolution', which started with land reform as prerequisite to any effort to modernize the agriculture sector. The combination of land reform with other planned interventions (extension services, subsidized inputs and improved communications) drastically changed the agricultural system (Yazdanpanah *et al.,* 2013b). More lands were brought into cultivation (Rezvani, 2005) and use of new varieties expanded, consequently, chemical and mechanical technologies were significantly increased. In this period, the major types of chemical technology relevant to agriculture were fertilizers, herbicides, insecticides and animal pharmaceuticals (Yazdanpanah *et al.,* 2013a; Malek-Saeidi *et al.,* 2011). As a result, use of pesticides spread rapidly and became an indispensable element for Iranian farmers. The present annual use of pesticides in Iran is about 24,000 tons, of which the highest amounts are related to insecticides, herbicides, and fungicides (PPO, 2014). Recently, the Health Ministry officials have stated that Iran has the world's first rank in stomach cancer. Based on this statistic, 70,000 people are diagnosed with the cancer annually. One third of this is due to the use of agricultural crops with pesticide residue (Tabnak, 2013). In line with this, one member of Iran parliament believes that pesticide residues have caused negative impact on agricultural exports in Iran and cause the high costs of health care (Tabnak, 2013).

Despite such environmental, economical, health, and societal costs of pesticides, researches (Wilson, 1998; Wilson and Tisdell, 2001; Snelder *et al.,* 2008; Atreya, 2007; Dasgupta *et al.,* 2007) have argued that farmers in developing countries will continue to use pesticides. The root of the problem appears to be related to the way of farmers' decision makings (Heong *et al*., 2002). While Wilson (2000) believed that economic factor influence on farmers' decisions, other argued that social psychological factors have more influences on their decisions (Heong *et al*., 2002; Heong *et al.,* 1994). In other words, Studies on human judgment and choices have, however, shown that economic models have been unable to account for how people actually make decisions (Slovic *et al.,* 1977, Simon, 1978). In this regard, Koh and Jeyaratnam (1996) argued that the first step in developing pesticide hazard reduction programs is to establish the extent of the problem by investigating farmers' knowledge, attitudes, and behaviors about agricultural pesticides. Researchers (Dehghani *et al.,* 2011; Ibitayo, 2006; Viviana Waichman *et al.,* 2007; Celina *et al.,* 2006; Dasgupta *et al.,* 2007) have consequently emphasized that pesticides are used improperly due to the lack of appropriate knowledge about their applications and onward effects. Meanwhile, some questions inevitably arise, for instance: What are farmer's attitudes toward pesticides? What encourages them to accept or reject pesticides? What factor/s determine/s their intention to use pesticides?. The answers have important policy implications for the implementation of environmentally-friendly programs. Actually, by using this knowledge, policy makers can facilitate intention changes regarding the use of pesticides which in turn influence the organic cultivation area. However, very little, if any, research of this kind has been undertaken in Iran. Therefore, the aim of this study was to provide much-needed empirical data on the intentions of Iranian farmers regarding the usage of pesticides. To better understand the determinants of farmers' decisions on pesticides use and behaviors, the use of theory for research in the area of human behavior has been consistently advocated. As such, models from psychology have been adopted. Accordingly, we have applied a well-established social–psychological model, i.e. the Theory of Planned Behavior





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(Ajzen, 1988, 1991), to identify the psycho-social factors that affect farmers in deciding about using pesticides.

## The Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is an important social cognitive model that aims to explain variance in volitional behavior (Ajzen, 1991). The TPB is a social-psychological model which claims that a person's actual behavior in performing a certain action is directly guided, as a central factor, by his or her behavioral intention, which in turn is jointly determined by the attitude, subjective norm, and perceived behavioral control (PBC) toward the behavior (Ajzen, 1988). Thus, according to the TPB, individuals who have positive attitudes toward objective behaviour, and believe that there is normative support for engaging in behavior, and feel that it is easy for them to engage in it, should have strong intentions to carry out the behavior. As PBC is a proxy for actual control, it may also have a direct impact on behavior (Fielding *et al.,* 2008; Sharifzadeh *et al.,* 2012). In TPB, "attitude" refers to "the degree of a person's favorable or unfavorable evaluation or appraisal of the behavior in question" (Fishbein and Ajzen, 1975). Subjective norm refers to "the perceived social pressure to perform or not to perform the behavior" (Ajzen, 1991) and, finally, PBC refers to "people's perception of ease or difficulty in performing the behavior of interest" (Liao *et al.,* 2007), or "the extent to which individuals perceive the behavior to be under their volitional control" (Fielding *et al.,* 2008).

Although the success of the TPB in terms of predicting behavior has been proven (Liao *et al.,* 2007; Kaiser, 2006; Yazdanpanah *et al.,* 2011, 2014), the theory has not still stopped evolving, and other scientists in various research domains have expressed the belief that, for some behaviors and contexts, the inclusion of other variables might increase the model's predictive utility of the model. They have thus added their own constructs to the theory in order to increase the utility of its predictive power (Fielding *et al*., 2008; Burton, 2004: Whitmarsh and O'Neill, 2010). In this regard, Ajzen (1991) argued that the model was "in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variation in intention or behavior." In this context, Kaiser (2006) believed that behavior aimed at conservation is a form of moral behavior, as being a conservationist often means deciding against one's own self-interest. This is why he added "moral norm" into TPB. Kaiser and Scheuthle (2003) had previously found the moral norm to be a supplementary predictor of a person's intention to act in a conservational manner (after attitudes, subjective norms, and PBC). In the TPB, there is also growing evidence for the inclusion of self-identity (how one perceives oneself) as being predictive of behavioral intention (Burton, 2004; Pelling and White, 2009) and behavior (Whitmarsh and O'Neill, 2010; Sparks and Shepherd, 1992). In this regard, Burton (2004) argued that three basic steps are required to improve the behavioral approach: pay more attention to the role of subjective norms in decision making, obtain a correct measurement of PBC, and understand the importance of the self-identity construct in social psychology and the contemporary challenges to farmers' self-identity. He added that in many cases it may be desirable to investigate the role of identity in decision-making by farmers. The concept of self-identity comes from identity theory introduced by Stryker (Burton, 2004). According to Stryker's theory, the self is a set of socially constructed roles that reflect the extent to which a person sees himself as fulfilling the criteria for a particular societal role (Pelling and White, 2009). Self-identity, therefore, is generally interpreted as being a label that people use to describe themselves, as well as something that is expected to have an important influence on intention (Cook *et al.,* 2002). Figure 1 shows the research framework.





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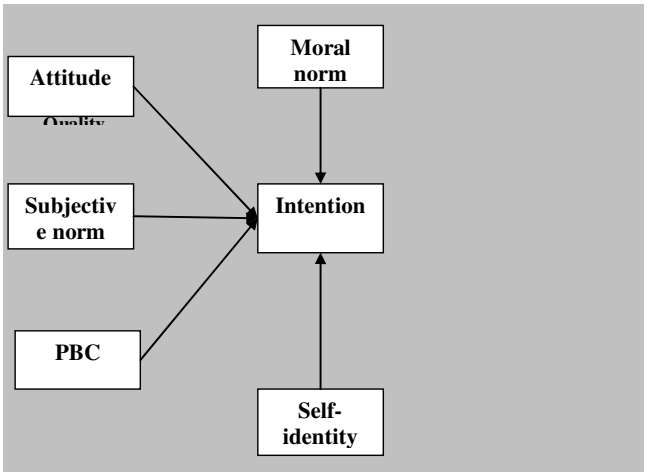


**Figure1.** Theoretical framework of the research variables.

## MATERIALS AND METHODS

### Study Site and Participants

Dyer County (Shahrestan) is in the southern part of Iran and on the shores of Persian Gulf in Boushehr Province (Figure 2) with an area of about 2,158 km$^2$. It lies in the dry climate zone, with a growing season of 4-5 months and a short rainy season from December to February. The district is an important vegetable-producing area, often referred to as the natural green house to produce vegetable, particularly tomato, in winter. In order to limit crop losses to insects and weeds, farmers increase the levels of applied chemical inputs. This trend is not specific to the region, but it is nation-wide. The production of this region goes to the national market and is produced under weak regulations for pesticide application, as other developing countries (Ríos-González *et al.,* 2013).

The study sample consisted of 150 farmers selected through a multistage, cluster random sampling procedure: At the first

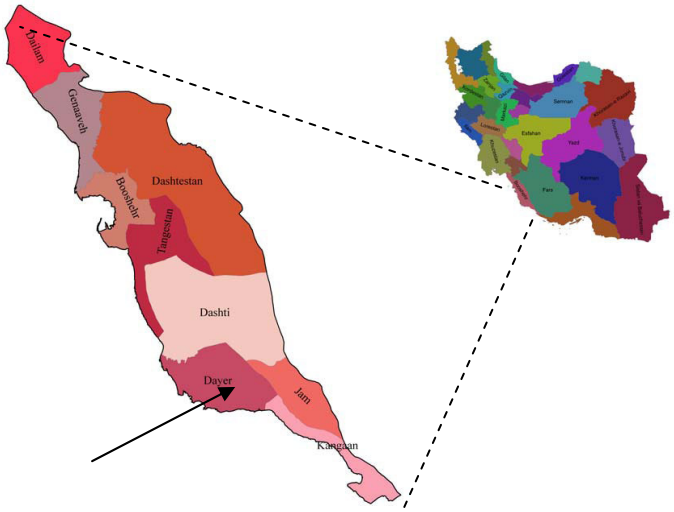


**Figure 2.** Location of the study site, Boushehr, Iran.





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stage, we clustered the county based on sub-counties (Dehestan). Then, 3 sub-counties were selected randomly out of 5 sub-counties. In each randomly selected sub-county, a proportional number of villages (Deh) were again randomly selected. At the final stage, a proportional sample of farmers was randomly selected from each village. A total of 150 interviews were conducted. The data was gathered based on face-to-face surveys with farmers in the winter of 2012. The interviewers were natives of the research area and, therefore, familiar with the language, religion, culture, and customs of local farmers.

### Data Collection Techniques

The needed data was collected through personal interviews using a structured questionnaire. The questionnaire covered the variables emphasized in TPB, including attitudes, subjective norms, PBC, moral norms, behavioral intention, self identity, and other additional variables. A 6-point scale was used for all the TPB variables to reduce the statistical problem of extreme skewness (Fornell, 1992). Based on Ajzen's (1985) recommendations, scales containing multiple items (statements) were developed to measure each of the aforementioned psychosocial variables. The validity of the questionnaire was approved by a panel of experts. Additionally, Cronbach alpha reliability coefficients in the final sample for all scales indicated good-to-excellent reliability (Table 1). The items (statements) indicating each scale in the questionnaire are shown in Table 2.

## RESULTS

### Farmers Demographic Characteristics

Farmers with the age of 20 to 75 had a mean age of 42.27 years (Sd= 9). Most interviewed farmers (74%) were young or middle-aged men, between 20 to 50 years old. Educational level was moderate between farmers. The majority of the farmers (52.5%) were high school graduates and could be classified as literate. Some of them (20.3%) had primary education, 7.2% had a college degree, and 19.6% had no education. In Iran, children start primary school at 5, middle school at 9, and secondary school at 12 years of age.

The results revealed that the mean attitude toward pesticide was 1.92 out of 5 (Sd= 0.84). This revealed that farmers did not have a favorable attitude toward spraying. The subjective norm with respect to none spraying was 4.21 out of 5(Sd= 1.029). This suggested that most farmers felt high pressure to not spray. In other words, respondents believed they felt high pressure over their intention to perform this behavior. Self-identity was 3.63 out of 5 (Sd= 1.13). The mean PBC was 3.39 out of 5 (Sd= 0.91), suggesting that most farmers experienced high constraints in relation to non-use of pesticides. Intention was 3.76 out of 5 (Sd= 1.39) suggesting that most respondents intended to use pesticides. However, the moral norm was 3.54 out of 5 (Sd=1), revealing that most farmers were influenced by a high moral norm and evoked positive (good conscience) to not using the pesticides. This is relatively favorable. Table

**Table1.** TPB variables, number of items, and reliability coefficients.

| Studied constructs | Number of item | Alpha in final sample |
|---|---|---|
| Attitude | 4 | 60 |
| Perceived behaviour control | 3 | 62.3 |
| Subjective norm | 5 | 75 |
| Moral norm | 2 | 76.8 |
| Self identity | 3 | 77.7 |
| Intention | 2 | 64 |





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**Table 2.** The items (statements) indicating each scale in the questionnaire.

| |
|---|
| **Behavioral intention (2 items)** |
| I intend to use pesticides in the next season. |
| I plan to use pesticides in near future for my crops. |
| **Attitudes (4 items)** |
| I think that spraying pesticides is interesting. |
| I think that spraying pesticides is important. |
| I think that spraying pesticides is beneficial. |
| I think that spraying pesticides is wise. |
| **Perceived behavioral control (3 items)** |
| If I wanted to, it would be possible for me to not spray pesticides on my crops |
| It is not possible for me to not spray pesticides on my crops |
| According to my judgment, it is easy for me to not spray pesticides on my crops |
| **Moral norm (2 items)** |
| Non spraying pesticides make me feel like a better person. |
| If I use less pesticides, I feel like making a personal contribution to something better. |
| **Subjective norm (5 items)** |
| My family thinks that I should not spray pesticides on my crops. |
| Most people I value think that I should not spray pesticides on my crops. |
| Agricultural experts I value think that I should not spray pesticides on my crops |
| My intimate friends whose opinion is important for me regarding agriculture think that I should not spray pesticides on my crops. |
| Experienced farmers whose opinion is important for me regarding agriculture think that I should not spray pesticides on my crops. |
| **Self identity (3 items)** |
| I think of myself as a user of pesticides. |
| Using pesticides is an important part of showing who I am. |
| With application of pesticides, I present myself as a good farmer |

3 gives the descriptive statistics and the zero order correlations between the expected TPB components constructed and two additional variables. Correlation analysis (two tailed) was used to analyze relationships between the components.

It can be seen that there were moderate correlations between the attitude and PBC (r= -0.25**), intention and self- identity (r= 30**), a moderate negative correlations between subjective norm and moral norm (r= -0.30**), and between PBC and moral norm (r= -0.39**), while somewhat lower correlations were generally observed between the self-identity and PBC (r= 0.19*). Furthermore, Pearson correlation revealed strong correlation between PBC and intention (r= 0.47**) and between PBC and subjective norm(r= 0.52**). Correlation analysis, also, revealed that there were positive correlations between the intention and age of farmers (r=0.22**) and their experience in farming (r= 0.30**), while there was no significant correlation between intention and their lands, their distance to the store and the Extension Center.

## Intention Regarding Pesticides Usage

To examine the predictors of intention, a two-step hierarchical regression analysis was performed. A hierarchical multiple regression analysis was performed in which intentions to use pesticides was regressed into the revised TPB variables. The results of this analysis are presented in Table 3.

Before running the regression, it was important to make sure whether the measures that were argued on theoretical





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**Table 3.** Pearson correlation test between all variables.[a]

| | Mean (n=150) | SD | Attitude | SN[b] | PBC[c] | MN[d] | SI[e] | Intention |
|---|---|---|---|---|---|---|---|---|
| attitude | 1.92 | 0.87 | 1 | | | | | |
| SN | 4.21 | 1,029 | -0.312** (0.0001) | 1 | | | | |
| PBC | 3.39 | 0.91 | -0.25** ( 0.0001) | 0.52** ( 0.0001) | 1 | | | |
| MN | 3.54 | 1 | - 0.113* (0 .041) | -0.30** ( .0001) | -0.39** (0 .0001) | 1 | | |
| SI | 3.63 | 1.13 | -0.054 (0.545) | 0.106 (0 .225) | 0.19* (0.028) | 0.098 (0.267) | 1 | |
| Intention | 3.76 | 1.39 | - 0.125 (0 .141) | -0087 (0 .294) | 0.47** (0.0001) | -0.132 ( 0.115) | 0.30** (0.001) | 1 |

** $P< 0.01$, * $P< 0.05$. [a] Mean range of all variables are between 0-5. [b] Subjective Norm; [c] Perceived Behavioral Control; [d] Moral Norm, [e] Self-Identity.

grounds, and were indicators of each construct, were acceptably one-dimensional. We therefore carried out a confirmatory factor analysis of the model variables so as to confirm the measurement scale properties (Bagozzi, 1994). In this analysis, all the constructs and reflective indicators were arranged as a measurement model, in which they were allowed to correlate with one another. This validation process should demonstrate and be appropriate for the empirical data and meet the requirements of certain indices. For example, *Chi*-square normalized by degrees of freedom (λ/df) should be less than five (Bentler, 1989); here, it is 2.9. Adjusted goodness of fit index (AGFI) should be larger than 0.8, here it is 0.9 and root mean square error (RMSEA) should be less than 0.10 (Henry and Stone, 1994). Others argue it should be less than 0.08). It is 0.06 here. As such, the results show that the empirical data confirm the acceptability (being one-dimensional) of the theoretically-argued indicators. Furthermore, when the zero-order correlations (Table 3) were not high and were under 0.50, discriminate validity was achieved among the constructs (Kline, 2005, Vassallo *et al*., 2009) and it led to elimination of multicollinearity problems.

The standard TPB variables of attitudes, subjective norms, and PBC were entered at the first step; self-identity and moral norm were entered at Step 2. The standard TPB variables accounted for a significant proportion of variance in intention at Step 1 ($R^2$= 0.53.9, F= 43.779). The addition of the self-identity variable resulted in a further significant increase in variance explained, accounting for an additional 134% of variance in intentions ($R^2$= 0.67.3, F= 41.278). There was partial support for that attitude, subjective norms and PBC were significant predictors of intentions to engage in pesticide usage. Consistent with TPB tenets, when all variables were included in the analyses, all variables were significant independent predictors of intentions. And in the second stage, self-identity emerged as a strong and significant predictor of intentions while moral norm was not a significant predictor of intentions. (Table4)

## DISCUSSION

This paper drew on a well established social–psychological model to examine decisions to engage in pesticides use among Iranian farmers. The purpose of this paper was three-fold: (1) to identify factor/s determining farmers' intention to use pesticides; (2) to examine the use and efficacy of TPB in pesticide usage, and (3) to improve the explanatory power of TPB by





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**Table 4**. Regression analysis for intention regarding using pesticides.[a]

| Model | Variable | $R^2$ | Adj. $R^2$ | F | P-values | Beta | B | Sig. |
|---|---|---|---|---|---|---|---|---|
| Model 1 | Attitude | 0.539 | 0.519 | 43.779 | 0.0001 | 0.151 | 0.345 | 0.027 |
| | Subjective norm | | | | | -0.672 | -1.042 | 0.0001 |
| | PBC | | | | | 0.907 | 1.400 | 0.0001 |
| Model 2 | Attitude | 0.673 | 0.629 | 41.278 | 0.0001 | 0.222 | 0.507 | 0.0001 |
| | Subjective norm | | | | | -0.746 | -1.156 | 0.0001 |
| | PBC | | | | | 0.840 | 1.297 | 0.0001 |
| | Self- identity | | | | | 0.355 | 0.491 | 0.0001 |
| | Moral norm | | | | | -0.119 | -0.175 | 0.058 |

[a] Dependent variable: Intention to use pesticides.

adding two new constructs: moral norm, and self-identity.

Results suggest that the TPB framework is an effective tool for this policy question (second purpose). In a meta-analysis of the TPB, Armitage and Conner (2001) found that the TPB accounted for 39%, of the variance in intention. In our study, the explained variance in intention for the TPB was higher than this finding (53.9%). For the revised TPB (third purpose), predictive validity was even higher (63.7%) and self-identity as new construct can efficiently improve the explanatory power of TPB. In other words, the results revealed that intentions regarding pesticide usage were positively influenced by self identity. As such, the inclusion of self identity added to predictive power and produced a model with better fitness than the TPB. In other words, the model was structured in such as way that a positive change in self-identity toward less reliance on pesticides could positively influence the "intention" to have a specific behavior. Finally, our research revealed that attitude, subjective norm, PBC, and self-identity influenced farmers' "intention to use pesticides".

The regression showed that attitude (the extent to which a person believes that supporting pesticides usage will deliver positive outcomes), subjective norm (the extent to which a favorable opinion of others (usually family and friends) increases the intention to conserve), and PBC (farmers' evaluation of the ease or difficulty of not using the pesticides) as the strongest predicators can predict nearly 54% of the variance of intention. Unlike Nancarrow *et al.* (2008) in Australia regarding recycled drinking water and Arvola *et al.* (2008) regarding predicting intentions to purchase organic food, and like Lynne *et al.* (1995), regarding soil conservation, we found that PBC is a significant predictor of intention. PBC refers to the degree to which an individual feels that the performance of behavior is under his/her volitional control. The perceived difficulty (or ease) of none sparing will be expected to have an impact on the possibility of doing this behavior. The significant coefficients for PBC on the prediction of intention indicate that respondents believed that they did have full volitional control over performance of the behavior. Subjective norm was also a strong predictor of intention after PBC. This finding has implications for public policy and the way in which alternative projects for reducing pesticides usage should be communicated in public. From the policy point of view, it is positive that farmers are sensitive to what agriculture professionals, friends, and colleagues say. Thus, we can infer that a not positive opinion of others (usually family, friends, and agriculture professionals) regarding spraying decreases the intention to spray pesticides. As a conclusion, educational interventions should aim mainly at changing colleagues' and friends' attitudes. Furthermore, attitude has shown to have influence on behavioral





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intentions. This relationship has received substantial empirical support. To have a policy implication at this level, we should really understand farmers' attitudes toward using pesticide in order to decrease pesticide use. The evidence for attitude, subjective norm, and PBC exerting a direct influence on people's behavioral intention is extensive (Pelling *et al.,* 2009; Fielding *et al.,* 2008; Terry *et al.,* 1999; Vermeir and Verbeke, 2008; Kaiser, 2006; Kaiser and Scheuthle, 2003; Yazdanpanah *et al.,* 2014) In line with recent extensions of the theory, the model incorporated measures of moral norm and self-identity. Adding self-identity to the TPB significantly increased the explanatory power of the basic model. Overall, the revised model successfully accounted for pesticides usage intentions, explaining a total of 64% of the variance in intention; however, the moral norm did not remain significant predictor of intention. In the line with this finding, on water conservation domain, Lam (2006) found that moral norm was not significant in the intention to carry out that behavior. Self-identity also emerged as an independent predictor of intention, indicating that the stronger the farmers' sense of themselves as pesticides user, the greater was their intentions to engage in this behavior. In other words, farmers who regarded the role of usage as an important component of their self-identity were more motivated to engage in spraying behavior than those who did not. This finding is fully consistent with the logic of identity theory (Stryker, 1968, 1980) and with past research that has incorporated self-identity into the TPB (Armitage and Conner, 2001; Cook *et al*., 2002; Sparks and Shepherd, 1992; Terry *et al*., 1999). The policy that aims to decrease pesticides usage behavior could emphasize that carrying out spraying behavior is not very important to one's self-concept (self-identity). Furthermore, strategies that aim to decrease spraying pesticides tendencies among farmers could encourage farmers to embrace the identity of being organic farmers. The results of the present study also have applied implications that provide suggestions to the type of variables that should be targeted in intervention programs designed to encourage conservation behaviors among farmers. In conclusion, at this level, the results of this study demonstrated that the extended TPB can be used as a conceptual framework for intervention programs aimed at decreasing pesticides spraying intention.

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## چرا آنها همچنان به استفاده از آفت‌کش ادامه می دهند؟ در مورد تولیدکنندگان گوجه‌فرنگی در استان بوشهر در جنوب ایران

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### چکیده

با وجود هزینه‌های زیاد زیست محیطی، اقتصادی، بهداشتی و اجتماعی آفت‌کش‌ها، تحقیقات نشان داده است که کشاورزان در کشورهای در حال توسعه به استفاده از آفت‌کش ادامه خواهند داد.به نظر می‌رسد که ریشه مشکل مربوط به راه تصمیم‌گیری کشاورزان است.مطالعه حاضر با استفاده از یک مدل توسعه‌یافته از تئوری رفتار برنامه‌ریزی شده است.که شامل متغیرهای اضافی از معیار اخلاقی و هویت، به منظور نیت کشاورزان در مورد استفاده از آفت‌کش‌ها در چند مرحله است. که در یک بررسی نمونه‌گیری تصادفی خوشه‌ای از کشاورزان (۱۵۰ نفر) در جنوب ایران انجام شده است.یافته‌ها نشان داد که این مدل باعث بهبود متغیرهای اصلی TPB برای نیت کشاورزان است.تجزیه و تحلیل رگرسیون سلسله مراتبی نشان داد که روش و رفتار، هنجار ذهنی، کنترل رفتاری درک شده و هویت خود می تواند ۶۳٪ از واریانس در مقاصد کشاورزان را پیش‌بینی کند .نتیجه‌گیری نتایج حاصل از این مطالعه نشان داد که گسترش TPB می‌تواند به‌عنوان یک چارچوب مفهومی برای برنامه‌های با هدف کاهش قصد پاشش سموم دفع آفات استفاده شود.



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