

**US Potato Farmers' Marketing Strategies and Preferences for True
Potato Seeds**

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Abstract

This research examines U.S. farmers' preferences for true potato seeds and marketing strategies. An online survey was developed and posted on potato farmers associations' websites and newsletters. In total, 56 surveys were completed. Participants were from Minnesota, Idaho, Washington, Wisconsin, Oregon, and North Dakota. The results show that most farmers are not very knowledgeable about true potato seeds. Seed type is not essential, and what matters the most is the yield and size of potatoes. Even though true potato seed use is hypothetical, labor input, pesticide/fungicide input, and greenhouses for growing seedlings are important factors to consider when farmers choose between it and tuber seeds. This information can help potato seed suppliers determine the market potential for true potato seeds. It also provides breeders valuable information on what attributes to focus on when breeding tuber or true potato seeds. Regarding marketing strategies, we found that the most prevalent business strategies are maintaining/improving customer relationships and product differentiation. The most used communication methods with customers are in-person meetings, phone calls, and social media. Farmers employ various approaches to pricing their products, considering cost, experience, and competitors' prices. Most farmers sell their products via multiple channels to diversify and decrease risks. They update their business plans quarterly or even more frequently, reflecting a proactive approach to strategic planning. The findings have important implications for new and emergent potato farmers and farmers in developing countries.

Keywords: True potato seeds, marketing strategies, yield, seed.

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1. Introduction

Potato (*Solanum tuberosum*) is a globally important food crop renowned for its vitamin C and potassium richness. It ranks as the world's fourth most crucial food crop, following rice, corn, and wheat, and stands as the most consumed vegetable in the United States (Shahbandeh, 2023).

Potatoes are underground stems, not roots. Grown from tubers, unlike most plants, potatoes are produced vegetatively (Kaiser & Ernst, 2018). Potato is grown in cool climates; it grows well in fertile, well-drained, sandy loam soils; thus, poor soil causes seed tuber decay, which results in poor harvest (Brandenberger et al., 2014). The choice of tuber seed variety plays a prominent role in potato production. Potato varieties include early, mid, and late maturity types. Early maturity variety is said to be determinate, and mid and late maturity are indeterminate as they complete their growth phase late in the season compared to early type (Stark et al., 2020).

Understanding the growth stages of the crop is important as this allows farmers to manage pests and diseases promptly for high yield, given that unmanaged pests and diseases cause significant yield loss.

Although most potatoes are grown from tubers, they can also be grown from true potato seeds (TPS). TPS are sexual seeds found in potato berries. The actual seeds, also called botanical potato seeds, form after the flower of potatoes and look like tomato seeds. TPS differs from seed potatoes; genetically identical clones are often produced by planting pieces of potato stem or tubers (Food and Agriculture Organization, 2013). we expect that TPS will be grown in greenhouses and then transplanted to the field, although direct sowing can be done (Muthoni et al., 2014). One way of maintaining good health standards of the early generations of TPS-derived materials is by using nurseries or other well-controlled environments to produce

seedlings and seedling tubers. Unlike the commonly used potato tubers or seed potatoes, true potato seeds are not widely sold in the market. This is partly due to the lack of certification and sophisticated supply system comparable to that of tuber seeds.

Breeders and researchers have studied TPS and found they have multiple advantages, including 1) TPS reduces transportation costs because transportation costs of seed tubers are a significant part of potato production costs (Muthoni et al., 2014); 2) TPS may be more easily stored than tuber seeds (Michiel & Julia , 2022); 3) TPS are less likely to have tuber-borne bacterial, fungal, and virus diseases than tuber seeds. Some tuber-borne diseases can significantly reduce potato yield and quality (Michiel & Julia , 2022); 4) TPS can reduce the risk of losing part or all of the following season's seed tubers in times of shortage (high prices) or famine. This would be particularly important in less developed countries (Mbugua et al., 2014); 5) Hybrid TPS speed up seed multiplication for breeders and shorten the breeding process (de Vries & Stockem, 2022). TPS also has disadvantages, such as long planting seasons and long planting processes because seedlings are first grown from seeds. Based on previous studies, using TPS directly under field conditions has the disadvantage of low germination rates due to its minimal size (Muthoni et al., 2014).

Despite the recognized benefits of TPS, its adoption rate remains very low (Almekinders et al., 2010). Many factors might contribute to this low adoption rate, including challenges in scaling production, limited awareness among farmers, and resistance to change. Furthermore, farmers may have concerns regarding the initial investment required for adopting TPS technology, as well as uncertainties about its long-term efficacy and reliability under varying environmental conditions. Assessing farmers' attitudes towards and concerns about TPS through

targeted research is essential to foster greater acceptance and utilization of TPS among farmers. It is critical to TPS' successful integration into farming systems (Sah et al., 2005).

TPS and tuber seeds might differ in various attributes, and finding the most important attributes for potato growers is of great importance. One objective of this research is to investigate what product attributes matter the most to US potato growers when choosing between TPS and tuber seeds and how much they are willing to pay for these attributes. Some previous studies have examined farmers' preferences for potato attributes. Sah et al. (2005) found that yield was the most crucial potato attribute. Another study showed that farmers' preferences for specific crops are based on production stability within five years, price within five years, the latest amount produced, and the latest price (Neswati et al., 2023). Results from Bala et al. (2020) indicated that yield and resistance to pests and diseases are the most preferable attributes by farmers when choosing potato crop varieties. However, none of these studies have directly compared farmers' preferences for TPS and tuber seeds. We aim to fill this knowledge gap.

The second objective of the research is to analyze US potato farmers' marketing practices and derive implications for African potato growers. Every farmer aims to achieve the highest yield and profitability. It is, therefore, important to establish pathways to achieve this goal, including drafting a strategic marketing and business plan. A business and marketing plan is a road map to work (Bever et al., 2013). Every farmer with a vision for growth or specific goals should prioritize the development of a strategic business and marketing plan. Such a plan is important in minimizing the risk of investing resources in unplanned activities. It provides guidance for decision-making and serves as a constant reminder, especially when shared with stakeholders. Through regular evaluations, a strategic marketing plan enables farmers to pinpoint

areas for improvement and track progress. Documenting all activities, sharing the plan with partners or stakeholders, and continuously assessing and following up throughout the production process are important.

Farmers in developing countries face a critical shortage of resources and infrastructure necessary for efficient and economically sustainable agricultural practices. Their limited access to a knowledge base about marketing and business strategies, modern equipment, advanced farming techniques, and financial support significantly lowers their productivity and ability to compete in the global market. In this context, there is a great value in learning from the experiences and strategies of US farmers who have overcome similar challenges through innovation, collaboration, and strategic planning. The US agricultural sector has developed and adopted sophisticated marketing strategies in today's dynamic and interconnected global economy. These strategies include various techniques such as digital marketing, supply chain management, and customer relationship building. US farmers leverage technology and their experiences to identify customer preferences, analyze market trends, and optimize their marketing efforts for maximum profits. These experiences can provide insights to farmers in less developed countries with limited access to advanced marketing knowledge and resources. Due to traditional established farms, marketing and business strategy approaches in developing countries are not in use. For instance, in most African countries, potato growers do not keep a record of their expenses, which implies little control over the price of their products; they lack sales projection. They have a single market channel for their product. Local farmers do not do marketing research to understand consumer needs. The farms do not have a business plan available or promote and advertise their business. Learning from the experiences of US farmers

could help farmers in less developed countries. Thus, the second objective is to increase the revenue for farmers in less developed countries who can learn and implement the successful marketing strategies of US growers.

2. Materials and Methods

Choice experiment

This study uses choice experiments to analyze the farmers' strategies for success and their preference and willingness to pay for TPS in the United States. Choice experiments are commonly used in economics to analyze farmer preferences and behavior. In a choice experiment, individuals are presented with a series of hypothetical scenarios where they must choose between alternatives, each characterized by varying attributes or characteristics. By systematically varying these attributes and observing individuals' choices, researchers can estimate the relative importance of different attributes and how changes in these attributes affect individuals' decision-making processes. Choice experiments allow researchers to quantify preferences for specific goods or services, evaluate the potential impact of policy interventions or changes in market conditions, and forecast demand for new products or services. Overall, choice experiments provide valuable insights into farmer behavior and can inform decision-making in a wide range of economic contexts.

Our choice experiment consisted of eight scenarios, each comprising three options: option A, option B, and option C (opt-out). Each option was represented as a combination of a series of attributes. The attributes were seed type (tuber seeds or TPS), potato size (70% A's and 30% B's, 80% A's and 20% B's, and 90% A's and 10% B's), yield loss due to

physiology/maturity (10%, 15% and 20%), and seed cost to produce per hundredweight of potatoes (\$13, \$15, and \$18). Participants were asked to choose their preferred options. An opt-out option was also included to mimic actual purchase settings, enabling participants to opt out when they disliked option A or option B. The attributes and attribute levels were determined by literature review and consulting with experts in the potato industry.

We also analyzed US farmers' marketing practices and derived implications for potato growers in developing countries. The survey includes questions about the 4 Ps of marketing: product, price, promotion, and place. Specifically, we asked about potato farmers' pricing strategies, where they sell their products, promotion strategies, and how to communicate with customers, to mention a few. Attitudinal and multiple-choice questions were asked to determine their marketing strategies.

Mixed logit model

The mixed logit model is widely used to estimate discrete choice data. Let $n = \{1, \dots, N\}$ denote the participant n and $j = \{A, B, C\}$ indicate the three options in each choice scenario $t = \{1, \dots, J\}$. Assuming the participants' utility is linear, as shown in equation (1).

$$U_{njt} = \alpha_n p_{njt} + x'_{njt} \beta_n + \epsilon_{njt} \quad (1)$$

In Equation (1), p_{njt} is marginal dis-utility of cost, x'_{njt} is the set of attributes and β_n is a vector of associated marginal utility for product attributes. Participants choose the most preferred alternative (option A or B) or opt out (option C) for each choice set. t .

Let $y_{njt} = 1$ indicate if the option j of scenario t is chosen. Assuming ϵ_{njt} is the random utility shock of Type I Extreme Value distributed and utility of opt-out is normalized to 0,

participants' probability of choosing the option j of scenario t given α_n and β_n is as follows (McFadden, 1973):

$$Pr_{nt}(y_{njt}|x_i, \beta_i) = \frac{\alpha_n p_{njt} + x'_{njt} \beta_n + \epsilon_{njt}}{1 + \sum_{k \in \{A, B\}} \alpha_n p_{nkt} + x'_{nkt} \beta_n + \epsilon_{nkt}} \quad (2)$$

The conditional likelihood is defined as

$$L_n(y_n|x_n, \beta_n) = \prod_{t=1}^T \prod_{j=1}^J \{Pr_{nt}(y_{njt}|x_i, \beta_i)^{y_{njt}} (1 - Pr_{nt}(y_{njt}|x_i, \beta_i))^{1-y_{njt}}\} \quad (3)$$

In practice, this study assumes that parameter vector (α_n, β_n) is multivariate normal distributed with parameter θ having a mean, μ , and variance-covariance matrix, Σ . In addition, we assume that there is no correlation between parameters, i.e., Σ is diagonal. One can then derive the unconditional likelihood function as Equation (4).

$$L = \int_{\theta \in \Theta} L_n(y_n|x_n, \beta_n) dF(\alpha_n, \beta_n|\theta) \quad (4)$$

In Equation (4), $F(\cdot)$ is the probability function of parameters (α_n, β_n) . The parameters (α_n, β_n) were estimated by maximum likelihood estimation. The above mixed logit model relaxes the independence of irrelevant alternatives (IIA) assumption (Revelt and Train, 1998; McFadden and Train, 2000).

The willingness to pay is defined as the marginal rate of substitution between attributes and cost, i.e., $-\frac{\beta_i}{\alpha}$, where β_i is the mean marginal utility of attribute i and α is the mean marginal dis-utility of cost.

3. Results

Summary statistics of participants' socio-demographic background and characteristics

An online survey was developed and programmed in Qualtrics™, a professional survey platform. A survey link was posted on potato farmer's association websites and newsletters. The data was collected in November 2023. Fifty-six Minnesota, North Dakota, Wisconsin, Washington, Oregon, Idaho, and New Mexico potato growers completed the survey. The summary statistics of participants' socio-demographics and other characteristics are shown in Table 1. The average education level of the participants was some college degree, and the average age was 44 years. And 80% of the respondents were male, and 20% were female, which is consistent with the U.S. census data (U.S. Department of Commerce, Census Bureau, 2014) as there are more male farmers than female farmers. In terms of marital status, 82% of participants were married. On average, participants had 14 years of farming experience. The average farm size was 575.89 acres, and the potato area was 189.62 acres. About 45 % of participants sold their potatoes in the fresh market, 14% through the chipping market, and 21% through the processed market. Regarding TPS, 13% of participants mentioned they had used them.

Participants' business and marketing strategies

Serving as a roadmap for success, a farm's business strategy and plan outline the business principles, goals, and action steps necessary to achieve sustainable growth and competitive advantage in the marketplace. Business strategies vary from one farm to another, based on a farmer's goals and success definition. In our survey, participants were asked about their business strategies, and according to their responses (Figure 1), 66.07% focused on maintaining customer relationships, 62.50% on product differentiation, followed by 58.93% focusing on improving potato price strategies, and 53.57% on enhancing customer services.

Regularly revisiting and updating the business plan allows farmers to adjust strategies and stay aligned with the changing business environment. The survey results show that 7.14% never worked on their business plan, 30.36% of participants worked on their business plan yearly, 25.00% quarterly, 16.07% weekly, 7.14% monthly, 14.14% biweekly or more frequently (Figure 2).

A pricing strategy is a farm's strategy in determining what it will charge for its products and services (Sammut-Bonnici and Channon, 2015). Pricing strategies are crucial for farms as they directly impact revenue, profitability, and market positioning. By implementing effective pricing strategies, farms can maximize revenue while remaining competitive. On average, 78.57% of participants reported setting the price of their produce based on the product's cost, 64.29% based on experience, 51.79% based on how much other growers were charging their products, and 25% reported their prices were determined by other parties (Figure 3).

In terms of market channels, most participants sold potatoes directly to consumers and grocery retailers, followed by brokers who did not assume product ownership, club stores,

supercenters, brokers who assumed product ownership, institutions, natural products/health food stores, processors, and export marketing channels (Figure 4).

Effective communication with customers is essential for building trust, understanding customer needs, providing valuable information, and resolving issues effectively. Through transparent, open, and responsive communication, farmers can strengthen customer relationships, drive customer loyalty, and ultimately achieve long-term success in the marketplace. Regarding how participants communicated with their partners and customers, 67.86% used phones, 62.50% communicated through in-person meetings, 55.36% used email, 53.57% used social media, and 39.20% used farm newsletters (Figure 5).

Promotion strategies are essential for raising awareness about a farm's products and services, attracting customers, and ultimately driving sales and revenue. In terms of where participants advertised and promoted their products, Figure 6 shows that social media had been used mainly by participants (76.79%), followed by magazines (46.43%), industry gatherings (26.79%), new papers (25%), radio (21.43%), academic gatherings (16.07%), and television (12.5%).

Social media provides a platform to connect directly with consumers and showcase the farm's products and practices. Farms can raise brand awareness and foster community engagement through engaging content and storytelling. Additionally, social media allow farms to receive real-time feedback, address customer inquiries, and adapt their strategies to meet evolving consumer needs. Figure 7 shows that 46.43% of participants used Facebook, 46.43% of participants had an updated website, and 41.07% used TikTok, followed by Twitter (33.93%), YouTube (32.14%), and Instagram (25.00%).

Participants' familiarity with and attitudes toward TPS

We asked about participants' familiarity with TPS and the factors impacting their choice between TPS and tuber seeds. As shown in Figure 8, 39.29% of the surveyed participants were somewhat knowledgeable about TPS, 8.93% did not know TSP, 14% were very knowledgeable, and 23.21% were neutral. Regarding the factors governing farmers' choices between TPS and tuber seeds, results show yield was the most critical factor, with an average rating of 3.86 on a 1-5 Likert scale, followed by labor input, the size of the potato, equipment for transplanting seedlings of true seed, fertilizer input, greenhouse facilities, irrigation needs, transplantation cost, and pesticides (Figure 9).

Participants were asked about their attitudes toward TPS by selecting the degree of agreement with a series of questions on a Likert Scale (1=strongly disagree and 5=strongly agree). The average degrees of the agreement was above 3 for the following statements as they were willing to buy TPS only if it was certified (3.8), they did not know where to buy TPS (3.7), they did not know how to grow potatoes from TPS (3.66), potato growing from true seeds were susceptible to diseases (3.53), the cost of using TPS was too high (3.49), the size of true seeds grown from potatoes was too tiny (3.46), the yield from true seed was too low (3.46), potatoes grown from TPS were susceptible to pests (3.43). They did not have the equipment to transplant true seeds seedlings (3.03), and they did not want to use TPS because they had invested in growing potatoes from tuber seeds (3.02).

Mixed logit model estimation results

Table 2 shows the estimation results of the mixed logit model. For categorical variables, a positive and significant coefficient of an attribute level indicates that compared to the base level,

participants were more likely to choose the option with the specific attribute level. A negative and significant coefficient of an attribute level indicates that participants were less likely to choose the option with that attribute level than the base level.

The coefficient for cost is negative and significant, indicating that participants were less likely to choose the option as the cost of the seeds increased. The coefficient of true potato seeds is not significant. This means farmers did not have strong preferences for TPS over tuber seeds. They cared more about the specific potato attributes the seed can produce than the seed type. For potato size, 70% A's and 30% B's are the base levels for estimation. The positive and significant coefficient of 80% A's and 20% B's means farmers liked 80% A's and 20% B's better than 70% A's and 30% B's; the coefficient for 90% A's and 10% B's is the highest, indicating participants liked 90% A's and 10% B's most among the three categories of potato size.

The second column of Table 2 shows the standard deviation of the estimated coefficients. A large and significant standard deviation coefficient of an attribute level indicates that the preferences for that attribute level vary significantly among participants. For example, the standard deviation coefficient of TPS is highly significant, indicating that participants' preferences for TPS varied significantly from person to person. Some participants did not like TPS compared to tuber seeds, but others preferred TPS. Similarly, the significant standard deviation coefficients for potato sizes, 20% yield loss, and seed cost indicate that participants' preferences for these attribute levels varied significantly from one participant to another.

Willingness to pay means how much participants are willing to pay for a particular attribute level compared to the base attribute level. The willingness to pay values are estimated by dividing the coefficient of an attribute by the absolute value of the coefficient of cost, and the

estimation results are shown in Table 3. Because the coefficient of seed type is not statistically significant, the willingness to pay for seed type cannot be estimated. Compared to 70% A's and 30% B's, participants were willing to pay \$3.94 more for seeds that can produce one hundred pounds of potatoes with size of 80% A's and 20% B's. Compared to 70% A's and 30% B's, participants were willing to pay \$7.16 more for potato seeds that can produce one hundred pounds of potatoes with the size of 90% A's and 10% B's. A 10% yield loss is used as the base for estimating the yield attribute. The coefficient for 20% yield loss is negative and significant, indicating that participants disliked the potato seeds that potentially have 20% yield loss the most compared to those with 10% yield loss. The coefficient for 15% yield loss is insignificant, meaning participants were indifferent between potato seeds that generate 10% yield loss and 15% yield loss. The results show that participants were willing to pay \$7.24 less for potato seeds with a 20% yield loss compared to a 10% yield loss. They were willing to pay \$7.16, \$3.94 more for potato seeds that produce potatoes with 90% A's and 10% B's and 90% A's and 10% B's, respectively, compared to potato seeds that produce potatoes with 70% A's and 30% B's.

4. Discussions and Conclusion

The main objective of this study is to understand US potato farmers' marketing strategies and business practices and investigate their attitudes towards, preferences, and willingness to pay for TPS. We aim to extract insights from successful farmers' strategies to help potato growers in developing countries who seek to optimize their profitability and meet their marketing objectives. Moreover, the findings on preferences for TPS offer valuable information to potato breeders and suppliers as they develop and supply TPS.

The most prevalent business strategies are maintaining/improving customer relationships and product differentiation. By prioritizing customer relationships, farmers are likely to focus on building trust and loyalty among their customer base. This could involve personalized service, responsiveness to customer needs, and effective communication. Building strong connections

with customers leads to repeat business and potentially word-of-mouth referrals, contributing to long-term success. Implementing product differentiation indicates that farmers actively seek ways to distinguish their products from competitors. This could involve offering unique varieties, superior quality, or specialized services that set them apart in the market. Farmers can attract a broader customer base, command premium prices, and potentially get higher profitability by offering something distinctive.

The most used communication methods with customers are in-person meetings, phone calls, and social media. This implies that building personal relationships and direct interaction play a significant role in customer engagement and satisfaction. Investing time and effort into these communication channels can enhance customer trust and loyalty. Farmers employ various approaches to pricing their products, considering cost, experience, and competitors' prices. Farmers ensure profitability by considering production expenses such as inputs and overhead costs. Based on their industry knowledge and past experiences, pricing allows them to gauge market demand and consumer preferences effectively. Additionally, monitoring competitors' prices enables farmers to stay competitive, adjusting their prices accordingly to capture market share while maintaining perceived value and differentiation. Most participants sell their products via multiple channels to diversify and decrease risks; for example, grocery retailers and supercenters, and some sell directly to consumers. Farmers expose their products to different outlets by selling them through multiple channels, reducing their dependency on any single sales avenue. This approach protects farmers against potential disruptions or fluctuations in any channel. Additionally, diversifying sales channels enables farmers to reach a broader customer base, potentially increasing sales.

Most farmers update their business plans quarterly or even more frequently, reflecting a proactive approach to strategic planning. This frequency suggests that farmers recognize the dynamic nature of the agricultural industry and the importance of regularly revisiting their business strategies to remain competitive. These findings are consistent with those by Fleisher and Bensoussan (2022), who underscored the importance of robust business strategy in agricultural businesses. By prioritizing regular business planning and strategic adaptation, farmers can better position themselves to capitalize on opportunities and tackle challenges in the ever-evolving agricultural business environment.

TPS are not used by commercial potato farmers because they are mostly not available. Some of the TPS we see on the market are small-scaled farmers and mainly used for gourmet potatoes and for fresh market. So it is expected that most farmers are not very knowledgeable about TPS. Potato yield and size are more important to farmers than seed type. Factors such as labor input, pesticide/fungicide usage, and greenhouse space for seedling growth influence farmers' choice between TPS and tuber seeds. This finding resonates with prior research by Sah et al. (2005) that emphasized the importance of yield in farmers' preferences. Farmers prioritize production outcomes; if TPS yield and size surpasses that of tuber seeds, their preference shifts towards TPS. Moreover, a study conducted in Kenya examined how factors such as seed availability, quality, storage systems, and market demand influence farmers' variety selection and seed choices across seasons (Kwambai et al., 2023). Results indicated that farmers' decisions depend on seed health, yield potential, availability of clean seeds, and the number of planting cycles. Farmers are willing to pay more for potato seeds that produce higher-quality potatoes, as indicated by attributes such as size. This suggests that farmers prioritize quality attributes when

selecting seeds, and they also exhibit sensitivity to yield loss, with a significant preference for seeds that offer lower yield loss. The willingness to pay estimates derived from farmers' preferences provides valuable insights for potato seed suppliers regarding pricing strategies. By understanding how much farmers are willing to pay for potato seeds with different attributes, suppliers can tailor their prices to reflect their perceived value. For instance, for farmers who are willing to pay a premium for seeds that produce potatoes with specific sizes (e.g., 90% A's and 10% B's) or lower yield loss percentages (e.g., <10% yield loss), suppliers can adjust their pricing accordingly to capture this added value. To stimulate demand, more competitive pricing strategies are needed for attributes with lower willingness to pay (e.g., 70% A's and 30% B's, 20% yield loss). Additionally, the willingness to pay estimates can inform product development efforts, guiding suppliers in prioritizing investments in research and development to enhance the attributes (such as larger size and lower yield loss) that farmers value most.

The research findings show the need for farmers to be educated regarding the potential benefits of TPS. By educating farmers about the advantages of TPS, such as potential production cost reduction and disease resistance, agricultural organizations and extension services can help farmers make more informed decisions about seed selection. Additionally, policymakers and agricultural stakeholders should focus on implementing supportive policies that incentivize the adoption of TPS. Ultimately, bridging the knowledge gap and addressing farmers' priorities related to production outcomes such as yield can drive wider adoption of TP

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Table 1. Summary ‘Statistics of Participants’ Farming Experiences and Characteristics (N=56).

Variable	Definition	Mean	SD
Education	The highest education level of subjects 1 = Some High School or Less 2 = High School Diploma 3 = Some College 4 = College Diploma 5 = Some Graduate School 6 = Graduate degree	3.70	1.22
Male	= 1, if the subject is male; = 0, otherwise.	0.80	0.40
Married	= 1, if the subject is married; = 0, otherwise.	0.82	0.39
Age	The age of the subject 24 = 18-30 years old 35 = 31-40 years old 45 = 41-50 years old 55 = 51-60 years old	44.16	12.68

	65 = 61-70 years old		
	75 = Older than 70 years		
Experience	Subject's experience as a farmer	14.73	8.63
	2.5 = 0-5 years		
	7.5 = 6-10 years		
	12.5 = 11-15 years		
	17.5 = 16-20 years		
	22.5 = 21-25 years		
	27.5 = 26-30 years		
	32.5 = >30 years		
UsingSeed	= 1, if the subject is using true seed to grow potatoes;	0.13	0.33
	= 0, otherwise.		
TotalArea	The total area of the subject's farm (in acres)	575.89	1261.45
PotatoArea	The total area of the farm used to grow potatoes (in acres)	189.62	311.712
FreshMarket	= 1, if the subjects' potatoes are for fresh market;	0.45	0.50
	= 0, otherwise.		
ChippingPotatoes	= 1, if the subjects' potatoes are chipping potatoes;	0.14	0.35
	= 0, otherwise.		
Processing	= 1, if the subjects' potatoes are russets for processing;	0.21	0.41

= 0, otherwise.

SeedPotatoes = 1, if the subjects' potatoes are seed potatoes; 0.13 0.33
 = 0, otherwise

Table 2. Mixed Logit Estimation Results Based on Choice Experiment Data (N=56).

Attribute	Mean	S.D.
True Potato Seed	0.028 (0.174)	0.766*** (0.282)
80% A's and 20% B's	0.650*** (0.234)	0.618* (0.351)
90% A's and 10% B's	1.181** (0.494)	2.102*** (0.654)
15% Yield Loss	-0.367 (0.265)	0.350 (0.352)
20% Yield Loss	-1.195** (0.497)	1.573*** (0.493)
Seed Cost	-0.165* (0.089)	0.374*** (0.102)

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Willingness to pay estimates based on Mixed Logit Model results (N=56).

Attributes	Willingness to pay
True Potato Seed	--
Tuber Seed (base)	--
80% A's and 20% B's	3.94
90% A's and 10% B's	7.16
70% A's and 30% B's (base)	--
15% Yield Loss	--
20% Yield Loss	-7.24
10% Yield Loss (base)	--

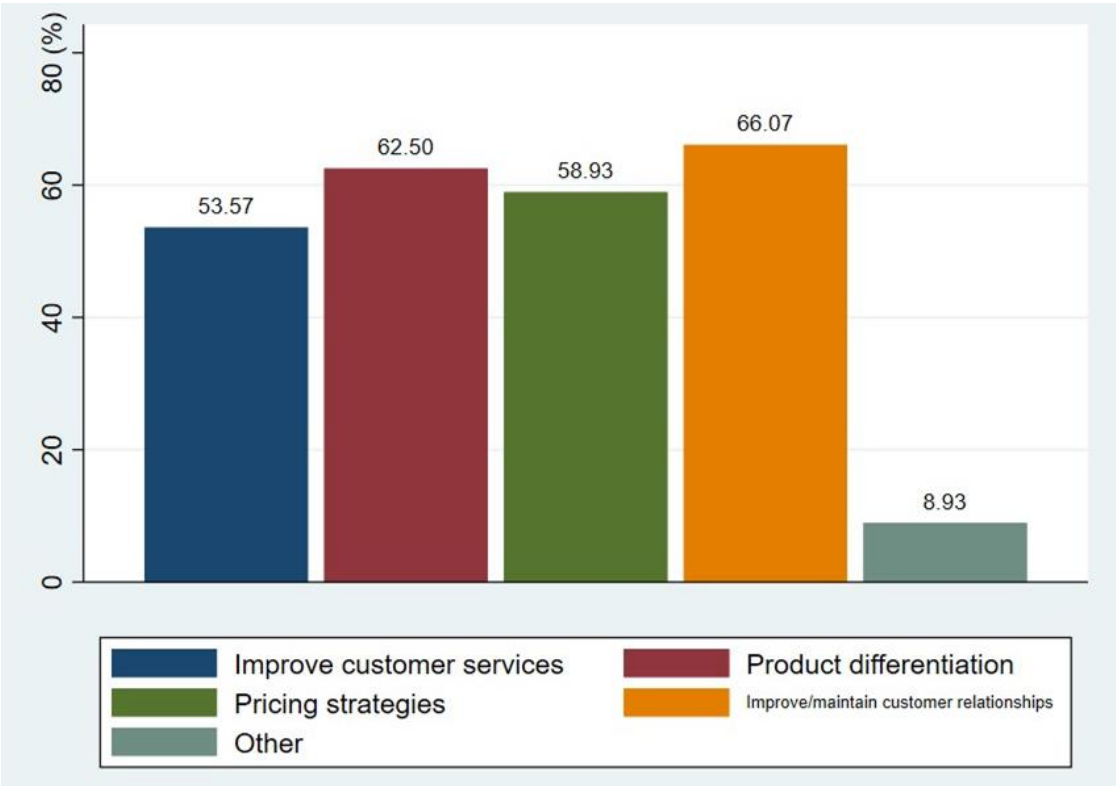


Figure 1. Percentage of participants that adopt different business strategies (N=56).

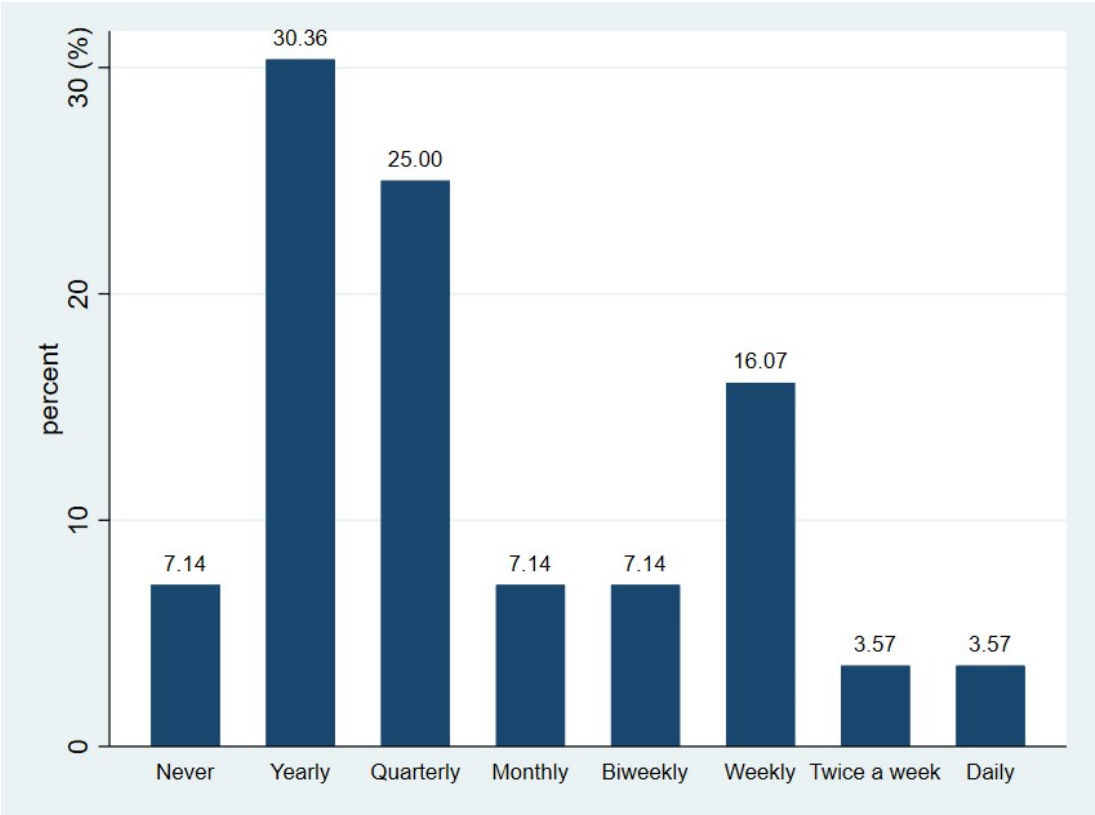


Figure 2. Frequencies of working on their business plans by survey participants.

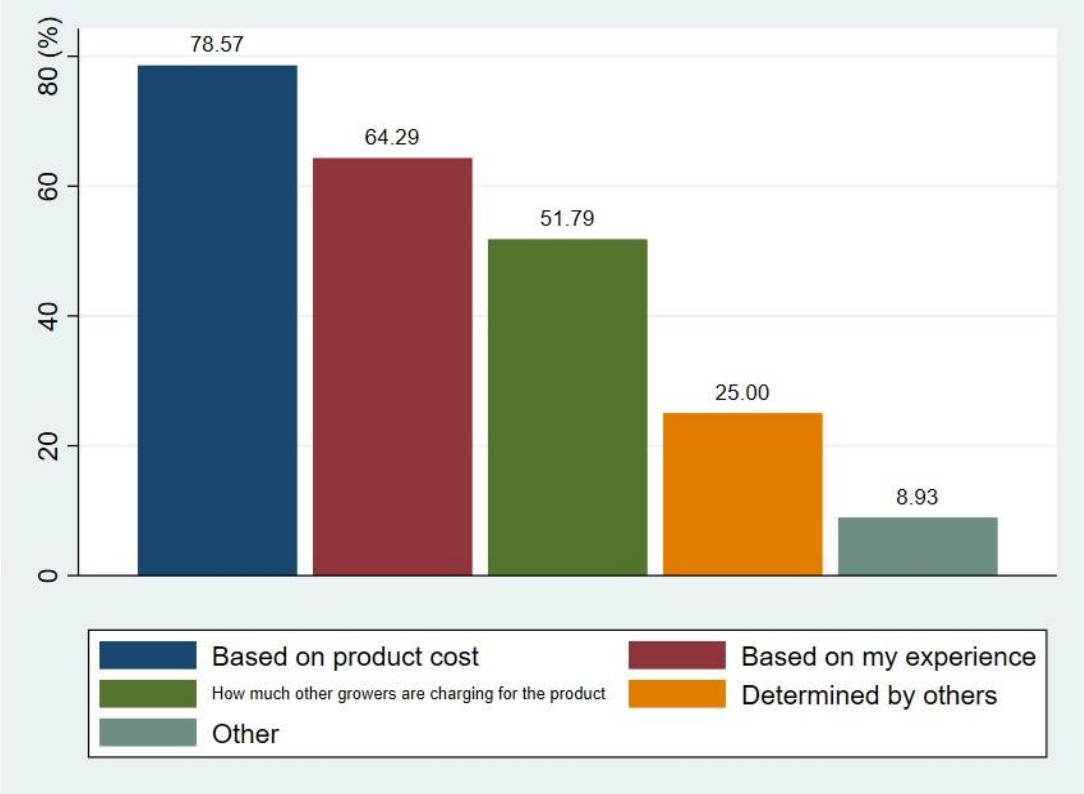


Figure 3. Percentage of participants adopting different pricing strategies (N=56).

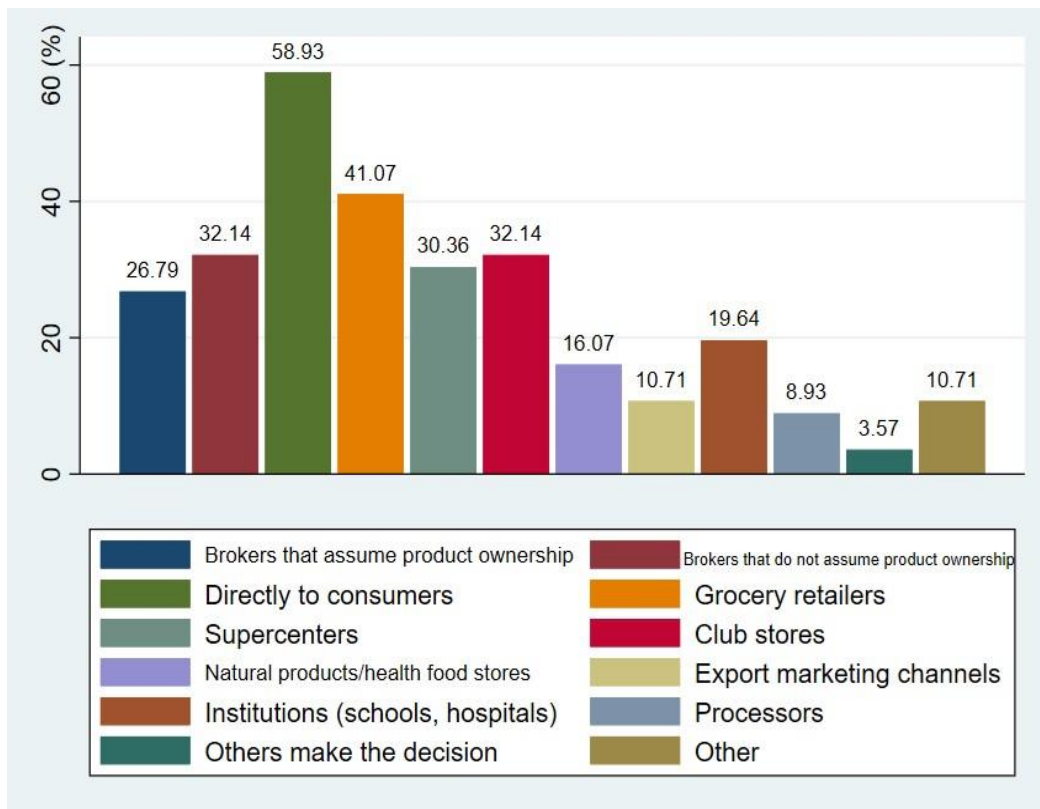


Figure 4. Percentage of participants selling potatoes via different channels (N=56).

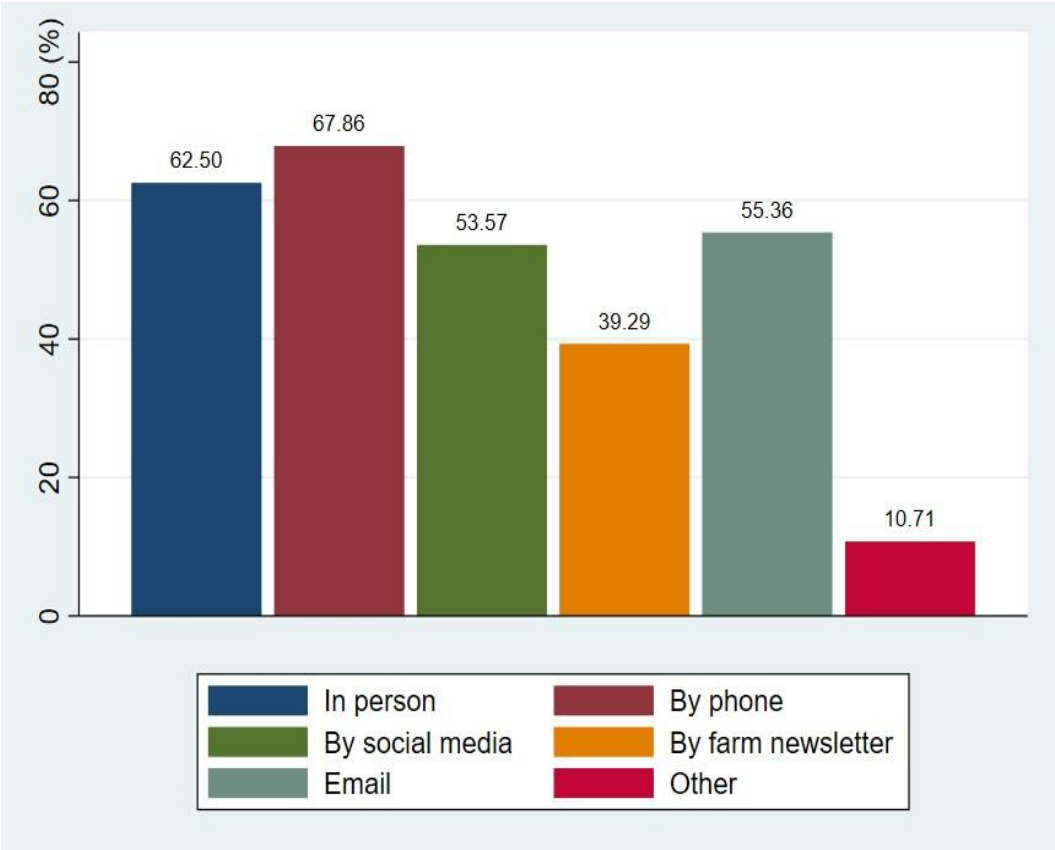


Figure 5. Percentage of participants communicating with their customers in different ways (N=56).

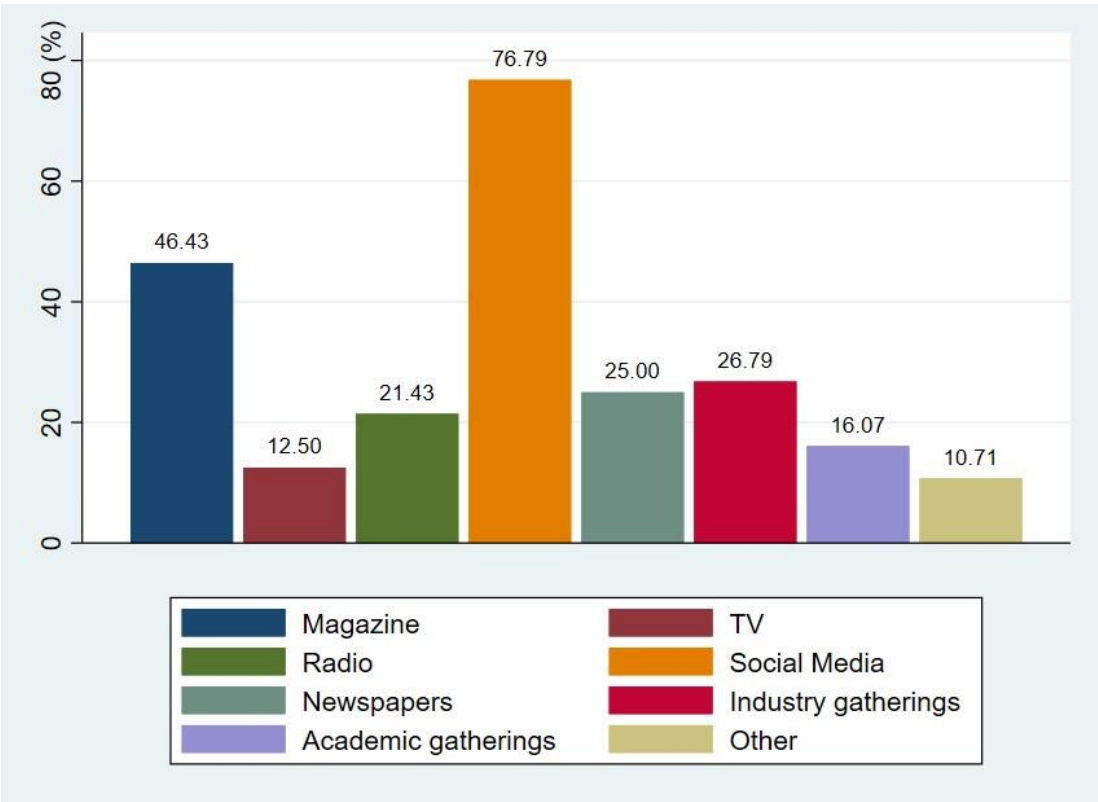


Figure 6. Percentage of participants advertising via different media (N=56).

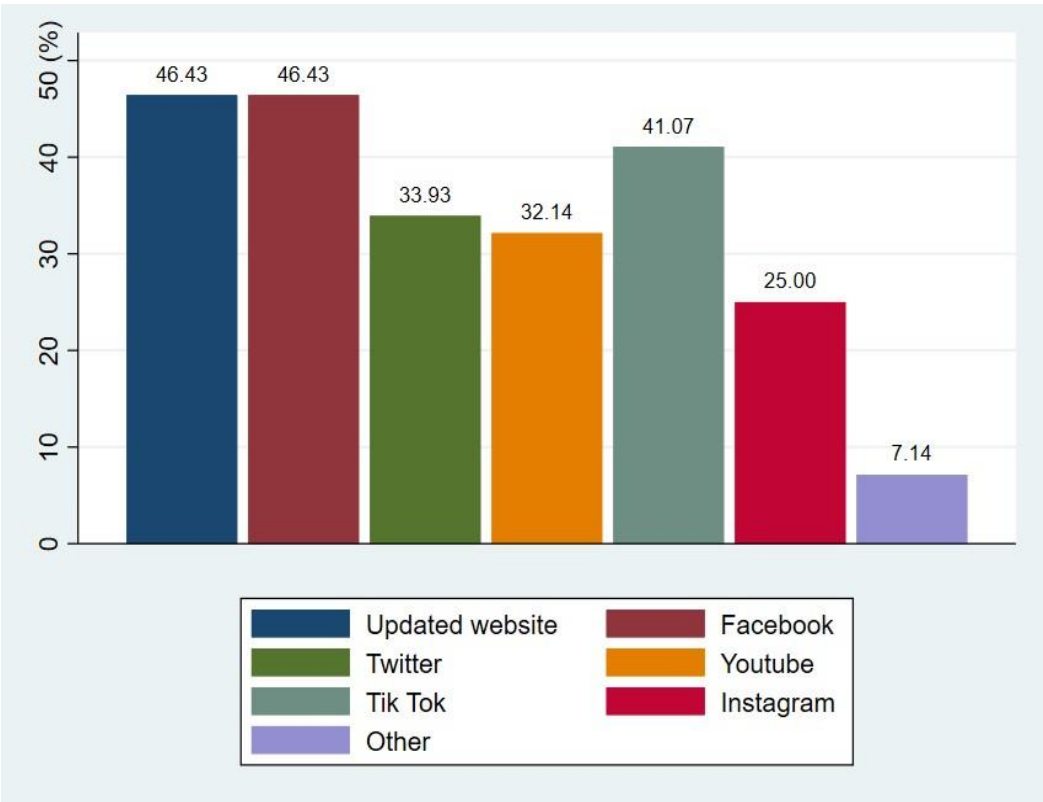


Figure 7. Percentage of participants using different social media platforms (N=56).

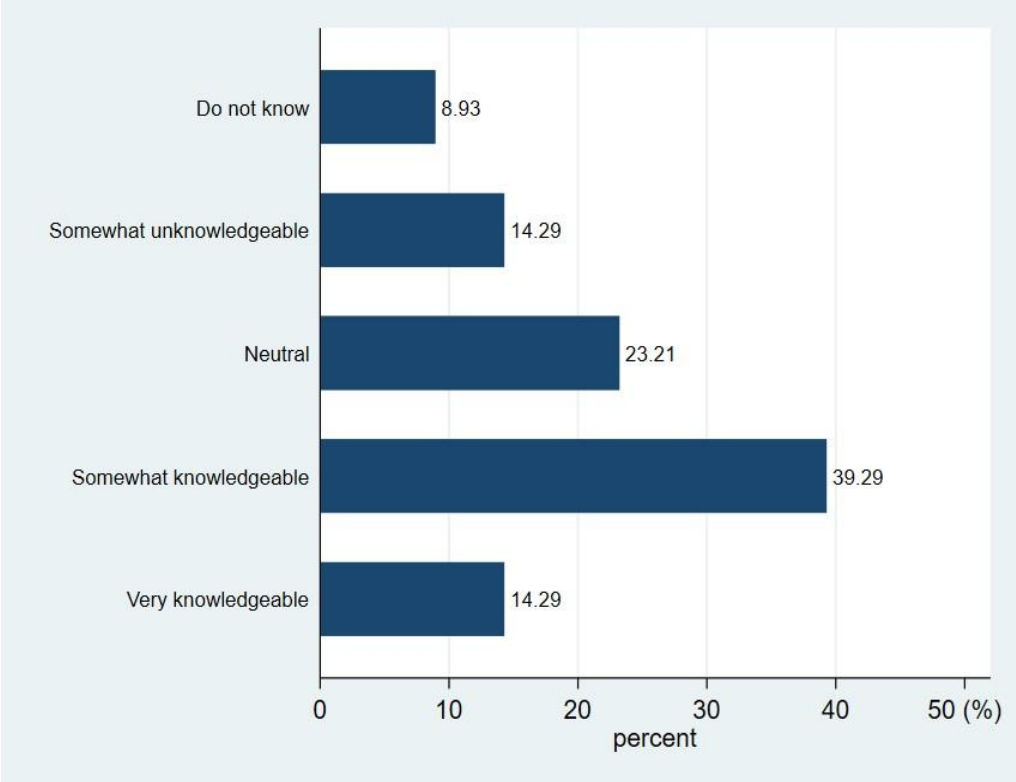


Figure 8. Percentage of participants with different knowledge levels about TPS (N=56).

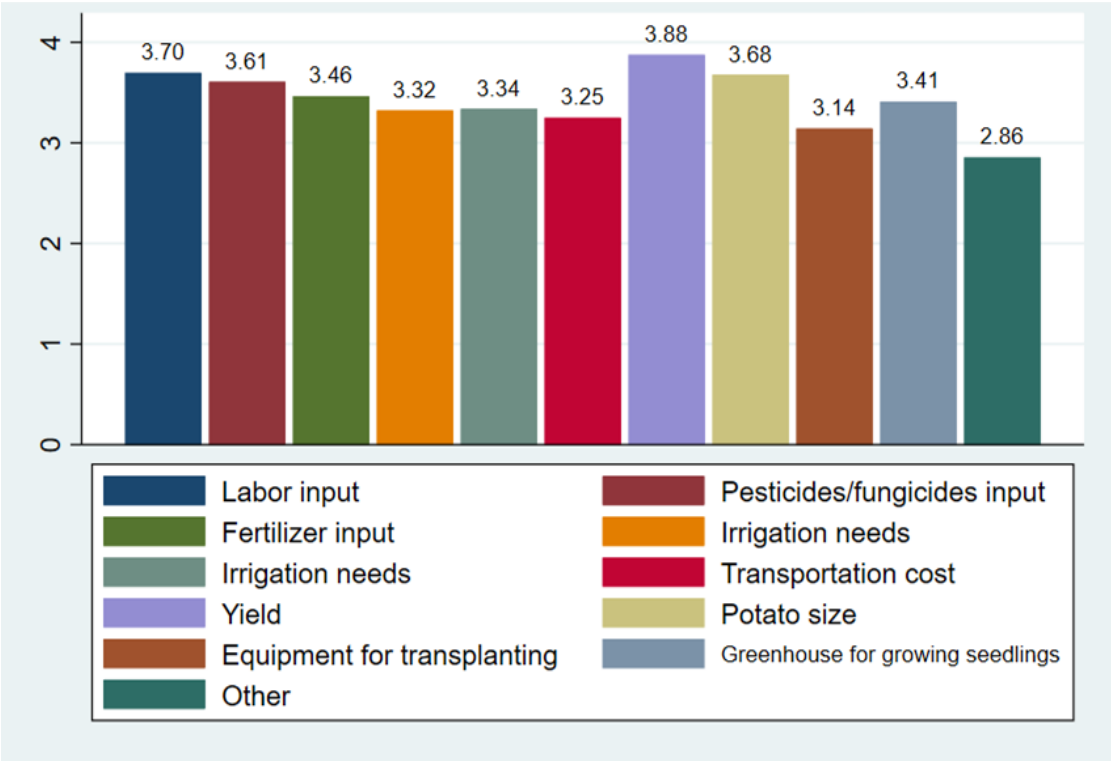


Figure 9. The importance of the factors affecting the choice between TPS and tuber seeds (1=Very Unimportant, 5=Very Important, N=56).