Journal of Agricultural Research, Development, Extension, and Technology, 3(1), 25-43 (2021)

Full Paper

Network effect: A mechanism for the acceptance of orange-fleshed sweetpotato among rural households in Uganda

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Received: March 3, 2021
Revised: May 15, 2021
Accepted: June 10, 2021

Abstract

With vitamin A deficiency enduring as a major public health challenge for developing countries, the need for successful orange-fleshed sweetpotato (OFSP) delivery campaigns to fight the deficiency remains relevant. However, despite decades of OFSP delivery efforts in Uganda, OFSP acceptance is still low. This study examined the role of network effect (Metcalfe's Law) on OFSP cultivation behavior among rural households in Uganda using a mixed methods design. Data were obtained from a cross-sectional survey data of 341 randomly selected farmers drawn from two rural districts in Uganda and an interview with a subsample of 42 farmers. The interviews were analyzed using content analysis where network effect concepts were used as data organizing themes. The study revealed OFSP acceptance to be associated with self-reinforcing socially-oriented factors espoused in network effect tradition. Specifically, mutual observation regarding OFSP agriculture resulted in low OFSP cultivation intensity, thereby making access to vines difficult, slowing experienced gratification of OFSP qualities and the attendant cultivation defections over time. The result has curtailed OFSP acceptance at community level, leading to the conclusion that network effects moderate farmers' decisions to switch from cultivating white-fleshed sweetpotato (WFSP) to OFSP. We recommend the adaption of delivery strategies used in telecommunication innovations in delivery efforts of innovations such as OFSP, in order to nurture self-driven acceptance trajectories of these nutrient rich crops.

Keywords - acceptance, hidden hunger, network effects, orange-fleshed sweetpotato, Uganda

Introduction

Network effects, commonly used to explain how telecommunication innovations such as mobile telephony, flickr, whatsApp and Facebook rapidly gained acceptance, could offer vital insights into understanding the mechanisms involved in the acceptance of bio-fortified crops. Network effects, also known as, Metcalfe's Law, may manifest as direct and/or indirect effect (Fisk, 2020). Direct network effects refer to the inherent feature of some innovations in which adopters' likelihood to accept the innovation increases with the number of adopters (Zhou et al., 2020). These effects are pronounced for socially-oriented innovations where the value to users tends to increase as family, friends and acquaintances join a network (Wirtz et al., 2019). Indirect network effect, on the contrary, occurs where the likelihood of acceptance of an innovation in one user group increases when a new user joins a different user group with which the former is linked (Zhou et al., 2020).

A unique characteristic of innovations with network effects is that their acceptance hinges on rapid attainment of critical mass. Critical mass points to the minimum number of adopters or user groups within the 'community' from whom each adopter derives the value that is linked to network effect (Lechman, 2014). It describes the necessary conditions for collective actions to emerge and become self-perpetuating (Ndaula, 2019). Noteworthy, network effects are primarily associated with new products or those that majorly differ from existing ones, because a mature system would have already assembled the minimum number of users, making it probable for new users to join one at a time (Wirtz et al., 2019). Equally, innovations that

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involve minor upgradings of an existing product do not require major user behaviorial changes or establishment of new product user systems (Allen, 1988).

The orange-fleshed sweetpotato (OFSP), a relative new crop variety that is bio-fortified with ß-carotene, a precursor for vitamin A, has been widely promoted in Uganda for its ability to reduce child mortalities and acquired blindness linked to vitamin A deficiency (Low et al., 2017; van Jaarsveld et al., 2005). Central to associated promotional strategies is working with communities that already produce and consume the conventional/dominant energy-dense white-fleshed sweetpotato (WFSP) to progressively replace it with bio-fortified ones (Asare-marfo et al., 2013). Proponents of OFSP maintain that because it is vegetatively propagated, planting material can be easily shared (Low et al., 2017); further, such materials are usually provided free of charge (Bashaasha et al., 1995). Thus, its impact is likely to spread out cheaply beyond targeted households via vine footprints and social exchanges, particularly where there is a tradition of vine exchange (Yanggen & Nagujja, 2006) or community access to OFSP via gifts (de Brauw et al., 2015).

Scoping studies in Uganda within farming communities and major local food markets, however, continue to show OFSP to have a low profile in farmers' fields and markets. Several students of OFSP associate the low profile of this new variety in the farming communities to be due to shortage of its vines caused by the under-developed sweetpotato seed system (Low et al., 2017; Mwanga & Ssemakula, 2011; Ndaula et al. 2019; Yanggen & Nagujja, 2006). However, it remains unclear how we are to understand the low acceptance of OFSP in households where WFSP cultivation thrives. In particular, this study investigated the mechanisms behind the low acceptance of OFSP in the Kyotera and Buyende districts, which belong to the leading producers of sweetpotato in Uganda (Uganda Bureau of Statistics, 2020). Failure to find answers to this challenge could profoundly keep OFSP cultivation limited to project cycles as reported by HarvestPlus (2017). Notably, if farmers do not grow OFSP, OFSP cannot be expected to reflect in these farmers' diets and to cause meaningful health outcomes at national level (de Brauw et al., 2015). So, suited as it may sound, OFSP would have to compete for space and position in the domain defined by the attributes of consumers, since it significantly differs from WFSP due to its distinct orange colour, a less sweet flavor and high moisture content (Lagerkvist et al., 2016).

A major moderator for the OFSP acceptance process, at least within a limited range, is likely to be network effects. However, a dearth of knowledge exists regarding the role of technology-related network characteristics in the acceptance of OFSP. Of the extant related literature, the focus tends towards harnessing the power of networks, for example, into technology transfer and peer learning (Sseguya et al., 2014), marketing performance (Ochieng et al., 2018) and information delivery about new micronutrient varieties (HavestPlus, 2011; Thuo et al., 2013). Network oriented strategies can put on cumulatively increasing pressure on an individual to accept innovations through the activation of peer networks about the innovations in a social system (Wani & Ali, 2015). OFSP delivery has been linked with wide distribution of free vines through farmer groups and offering of inducement to group members such as caps, t-shirts, and mass media social and behavioral change messages in order to attract the farmers to accept the varieties (de Brauw et al., 2015; Farm Radio International, 2014; HavestPlus, 2011; Low et al., 2017).

Valuable insights may be gained by studying how network characteristics affect decision-making processes regarding OFSP acceptance. This is important, since the relevance of collective power in the acceptance of innovation with network effects emerges after the minimum number of users has been assembled. For innovations that exhibit network effect, aiming to activate peer networks is of less benefit if the minimum number of users has not been attained. By extending this logic, the first footsteps of any innovation delivery need to assess whether network effects are linked with the innovation to be delivered. However, no study has been conducted to assess whether such effects would inherently affect the delivery of bio-fortified crops such as OFSP. Thus, this study sought to describe the role of network effects on OFSP cultivation behavior among rural households in Uganda.

Conceptual Framework

Network effects are vital in acceptance decisions of innovations. When network effects exist, the growing size of the network of users increasingly creates some kind of utility for each of its users as new adopters join (Zhou et al., 2020). The utility makes

it easier for later adopters to accept the technology (Katz & Sharpiro, 1985). Once the critical mass of users is attained, acceptance continues without the need for external intervention (Lechman, 2014). If early users are not reinforced, however, they are likely to discontinue, decreasing benefits for the remaining users, thus encouraging further defection.

Gallaugher (2008) described the value created by network effects, which subsequently affects acceptance to be coming from three inter-reliant sources: 1) an exchangeable feature such as OFSP vines, which are usually provided free of charge by neighbors (Bashaasha et al., 1995); 2) perception about the potential of the innovation to stay; that is, not to leave adopters stranded and; 3) the existence of complementary benefits or opportunities for other innovators to offer value around an innovation. The crucial issue for dissemination is the underlying incentive that would attract someone to accept such innovations with network effect at initial stages. Markus (1987) argued that initially, when individuals experience low network value, acceptance decisions are made on a predictive basis on whether the new product is likely to take off. The adopters base their choice on what they expect like-minded people would decide to do regarding the new technology (Allen, 1988). Mackie et al. (2015) suggests that when assessing the likely response of peers, one can observe the responses of the reference group and those of the valued individuals to assess whether the reference group and enough of the people one values are accepting the new idea. For switching decisions (such as the decision to switch from a dominant WFSP variety to OFSP), the new offering should be perceived to have relative advantage (Gallaugher, 2008). Rogers (1995) defined relative advantage as the degree to which an innovation is perceived to be better than the one it supersedes. Acceptance decisions, at technology delivery are thus linked to 'take-off expectations'; that is, farmers' prediction that OFSP is likely to take off within their farming community regarding (1) the relative advantage of the innovation and (2) the likely response of the peers via affecting individual network effect components–exchange power, stay power and complementary benefits (Gallaugher, 2008). Network effect is the utility derived from the number of other users of an innovation (Vanberg, 2006).

Initial acceptance assumes prevalence of individual efforts that are characterized by coping strategies that would help individual adopters benefit from a technology before critical mass is assembled. Coping strategies are efforts of individual users to establish their own means to survive along with an innovation with network effect prior to attainment of the minimum user size. Coping strategies that favor an innovation nurture a wave of short-term stimuli for individuals who would then be influenced to accept the innovation through interpersonal exchanges and social modeling (Rogers, 1995). Individuals could also distance themselves from an innovation as a coping strategy (Long, 2001; Mango, 2002), not as a sign of innovation rejection, but to protect themselves from the risk of being left stranded with the innovation, if it were not accepted in peer circles (Gallaugher, 2008).

To avoid relapsing of adopters, critical mass must be attained rapidly (Lechman, 2014). Getting to critical mass is therefore not a fixed obstacle for delivery. On the contrary, it is a special quality for innovations with network effects that demand the use of special strategies that implant such expectations that the innovation is likely to takeoff (Ndaula, 2019). The vital issue in delivery is the need to know if network effects exist, and to determine the source and how adopters could benefit the delivery campaign (Gallaugher, 2008). This study therefore uses network effect concepts to describe the processes underlying OFSP acceptance. Specifically, it sought to find out whether network effects impacted on the status of acceptance of OFSP.

In keeping with the tradition of network effect, take-off expectation was principally expected in this study to affect acceptance through coping strategies and network value (Figure 1). In line with the presented literature above, 'take off expectation' was assessed in terms of relative advantage and likely response of peers while 'coping strategies' was assessed in terms of innovations (pro and against OFSP delivery) related to acceptance before the minimum user size is obtained. The reference group one ascribed to and the valued peers were used to help farmers to assess the likely response of peers regarding OFSP agriculture. This was done because membership to the groups used to deliver OFSP in the study area was known to constitute a few members of the farming communities in which farmers are nested. Also, 'network effect value' was assessed in terms of 'exchange power', 'stay power' and 'complementary benefits'. This study explored questions (RQs) related to (1) how

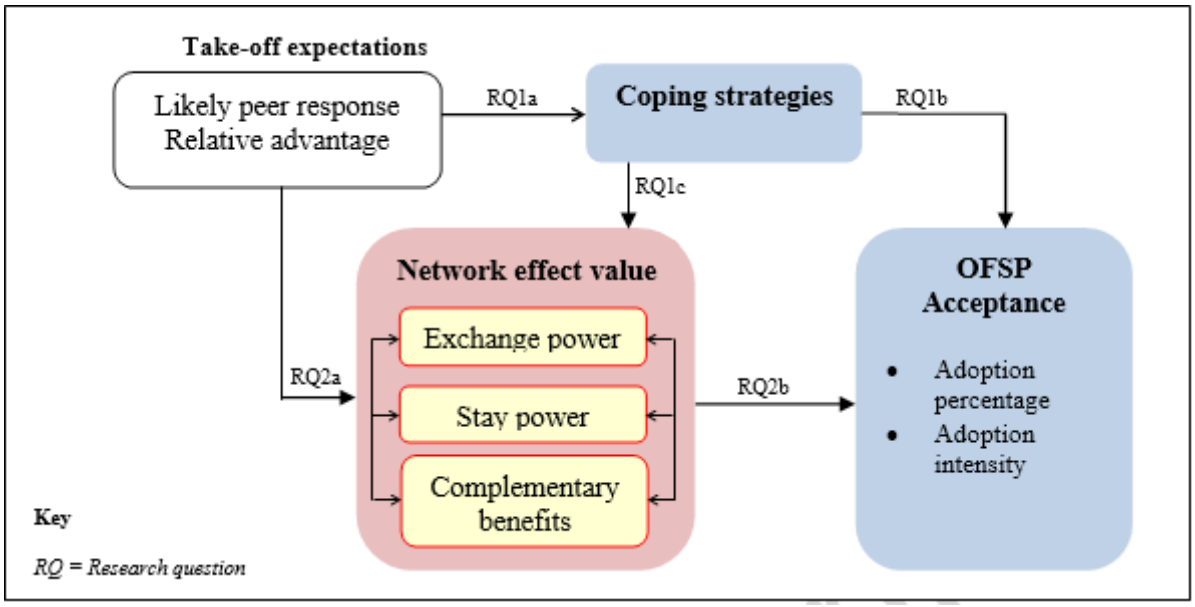

Figure 1. Schematic illustration of the conceptual framework

'take-off expectation' is associated with OFSP acceptance outcomes through 'coping strategies' and (2) how 'take-off expectation' is associated with OFSP acceptance through 'network effect value.' Specifically, this study sought to answer these RQs: RQ1a) how do take-off expectations affect coping strategies? RQ1b) how do coping strategies affect the acceptance of OFSP?; RQ1c) how do coping strategies affect the network effect value? RQ2a) how do take-off expectations affect netwrok effect value; and RQ2b) how do network effect value affect acceptance of OFSP?

Methodology

Locale

This study was conducted in Uganda, a country that lies between 1°29' South and 4°12' North of the Equator and between 29°34' East and 35°00' East of the Greenwich, among communities that subsist on sweetpotato and in locations where production and consumption of OFSP were being promoted by a not-for-profit, non-governmental organization, HarvestPlus. Between 2012 and 2016, OFSP vines were distributed to 409,711 households under HarvestPlus's Developing and Delivering Biofortified Crops (DDBC) project that aimed to encourage widespread sustained use of bio-fortified crops. By 2013, four regions (13 districts) had been covered.

Research Design

Farmers who were enrolled in the DDBC in 2013 were targeted in this research because of their prior exposure to OFSP for three contiguous years (growing seasons of 2013, 2014 and 2016), which was assumed to have given them consistent experiences and perceptions about OFSP cultivation (Rogers, 1995).

This study purposively selected two regions—the central region, which is at the low end of the Vitamin A deficiency (VAD) incidence continuum, and the eastern region, which is at the high end of the VAD incidence continuum, based on national VAD incidence (Uganda Bureau of Statistics, 2011). Of the two eligible project districts in each of the regions (Kyotera and Masaka in central and Buyende and Kamuli in the eastern), Kyotera and Buyende were randomly selected using a ballot. Kirumba and Bugaya sub-counties were also selected using the ballot method out of the eligible sub-counties in Kyotera district (Kalisizo and Kirumba) and those in Buyende (Buyende and Bugaya sub-counties), respectively. To reach the 918 eligible sweetpotato growing rural households (593 households in Kirumba and 325 in Bugaya sub-counties) that had been enrolled on DDBC in 2013, multi-stage random sampling strategies were employed. This involved sampling from eligible regions, districts and sub-counties prior to using the farmer group registers used to distribute OFSP vines to select

the individual households. To ensure access to comparable data, each sub-county was given a quota of 100 households to interview, which were randomly selected using Microsoft Excel sampling tool. From the 200 eligible households, the two main decision-makers (female and male, making a total pool of 400 eligible participants) were invited to participate in the survey and in-depth research. These farmers were targeted because they were the main decision makers in these sweetpotato growing households. The survey data was collected from 341 randomly selected farmers (85% response rate, 55% of them female and 45% male) between April and May of 2017, a period that coincided with the peak growing season in the study sub-counties. Data were collected in the growing season, because this time coincides with the period when farmers are fully immersed in field decisions and activities, which was deemed to have been the best time for gaining responses to perception and recall type questions. It would also be possible to gain a fair feeling of the place of OFSP within farmers' cropping systems.

The survey results formed the basis of the interview sample. From the survey, the 341 farmers were classified into three stages adapted from Ndaula et al. (2020): 'underconsideration', 'trial action', and 'maintenance'. Farmers in 'underconsideration' (n = 40 or 12%) stage were those who were not involved in any OFSP agricultural activities whereas the cut-off boundary for farmers in the 'trial' (n = 63 or 18%) and 'maintenance' (n = 238 or 70%) stage was involvement with OFSP cultivation six months or below (≤ 6 months) and above six months, respectively. Six months coincided with at least one sweetpotato growing season in the sweetpotato growing cycle. Beyond six months, a farmer would have cultivated two or more contiguous seasons.

It was ensured that farmers in all three acceptance stages were interviewed. From the 341 survey respondents, the study used snowball-sampling methods to obtain the study participants for the in-depth interviews. Snowballing was deemed suitable because exploring mechanisms needed to first ascertain that each of the respondent involved had experienced the behavior and falls in the category of behavioral cluster whose mechanism were being examined (Steinmo, 2008). Respondents identified other farmers with whom they shared an acceptance stage using the village level categories generated using survey data. Data collection continued until additional interviews were deemed to give minimal or no incremental insights. There were 42 final respondents for the interviews: 12 at 'underconsideration', 14 at 'trial', and 16 at 'maintenance' stage. Six key informants (3 females and 3 males) from three OFSP-promoting organizations (HarvestPlus, Volunteer Efforts for Development Concerns [VEDCO] and Community Enterprises Development Organisation [CEDO]) were also interviewed to corroborate farmers' narratives. The interviews were guided by open-ended questions about the farmers' experiences regarding their individual OFSP acceptance trajectories.

Research Instrument

The survey collected information regarding the level of adoption of OFSP, the actions and approval of farmers' peers and social groups regarding cultivating OFSP, the motivation of the farmers' compliance to social pressure, and the relative advantage of cultivating OFSP against the dominantly grown WFSP. Although there are more than 900 sweetpotato landraces in Uganda (Yada et al., 2010), this study considered all OFSP varieties as one in the same way that at farm level, farmers tend to cluster varieties based on their visible trait. The same consideration was also taken in the discourse of de Brauw et al. (2015) and many other scholars.

The level of adoption (percentage intensity) of OFSP of each farmer was assessed through actual mound counts of OFSP and WFSP, rather than through the area allocated to OFSP or WFSP. The former is more accurate than the latter in determining adoption because farmers in the study area are known to cultivate sweetpotato using varying intercropping strategies (Uganda Bureau of Statistics & Ministry of Agriculture, Animal Industry and Fisheries, 2010).

The proportion of OFSP each farmer perceived peers and the members of their farmers' group to be approving of him/her to grow was assessed on an eight-point scale determined as follows. Each farmer was required to simultaneously allocate '7 balls' into two tins, one 'orange, representing the OFSP' and the other 'white, representing the WFSP', to reflect the perceived actions and approvals of important others regarding OFSP and WFSP agriculture. Thus, where OFSP scored zero, WFSP scored seven, where OFSP scored one, WFSP scored six, and so on. For equal rating one ball would remain

unallocated, and a score of 3.5 was assigned to each variety. Cases of farmers who perceived others to be cultivating or to approve of them to cultivate zero OFSP were also captured and led to the final scale levels that ranged from zero through 7.

The motivation of farmers' compliance to social pressure (importance of the group one ascribed to or valued peers in one's farming decisions) was assessed using a seven-point level scale. This was later converted into an eight-point level scale to accommodate incidences of farmers who assigned zero importance to other farmers or group in making own household farming decisions. The final scale ranged from zero through seven. A follow-up open-ended question assessed the incentives (anticipated/actual penalties) a farmer perceived to be associated with non-compliance to social pressure.

To assess the relative advantage of cultivating OFSP, the survey required farmers to rank the importance of various traits (e.g., easiness to preserve last season vines, health benefits, etc.) when making field decisions regarding cultivating sweetpotato (1 = the trait is less important through 7 = the trait is very important). They also ranked OFSP against WFSP on the scale of increasing level of importance (1 = OFSP is less meriting/important than WFSP through 7 = OFSP is more meriting/important than WFSP) using the '7 ball' simultaneous allocation strategy described earlier. The final score of relative advantage was a computed variable, which was a product of individual scores and the importance assigned to the item divided by seven, the maximum scale score. This was done to bring the responses of individual farmers within a comparable range. The mean of 3.5 was to be interpreted as matched perceived performance of OFSP and the dominant WFSP varieties.

Data Analysis

The survey data were analyzed using mean perception scores and percentages whereas data from interviews were analyzed through content analysis, sorted out and organized into themes using network effect concepts (exchange power, stay power, complementary benefits). Network effect-related concepts were used in order to instill quality in qualitative processes used in this study as suggested by Bergman and Coxon (2005). Bergman and Coxon observed that researchers' declaration of the lenses used to organize qualitative data displays transparency and gives other researchers an opportunity to understand the context in which meanings were assigned to obtained information. Before the quotes and photographs were used, written permission was obtained from concerned participants and their real names were also replaced with abstract ones to obscure their true identities.

Results and Discussion

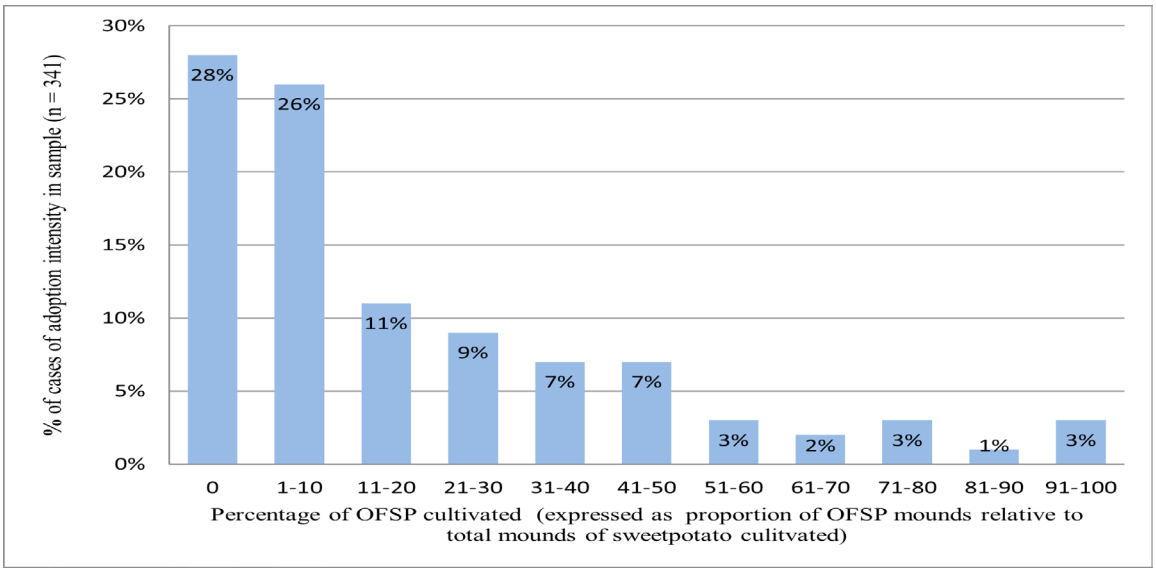

Figure 2. Adoption intensity of OFSP in study area (*N*=341)

OFSP Acceptance Outcomes

Acceptance outcomes are derived from the level of adoption (percentage intensity) of each farmer. Figure 2 shows the proportion of OFSP in relation to total sweetpotato cultivation. The survey revealed that 28% sweetpotato farmers were not cultivating OFSP, while 26% and 11% were cultivating 1% to 10% and 11% to 20% OFSP, respectively. Overall only 12% of the farmers (3% for between 51 to 60% category, 2% for 61 to 70%, 3% for 71 to 80%, 1% for 81 to 90% while 3% was for 91 to 100%) were found to be cultivating more OFSP than WFSP. This suggests that overall OFSP is widely accepted with relatively low intensity compared with the intensity of cultivation of the WFSP it aims to replace.

These results could be interpreted to mean that even though a high percentage of farmers are currently involved with some kind of activity regarding OFSP agriculture, the intensity of adoption remains low. So, within the limits of network effect, the level of OFSP adoption favours self-perpetuation of the dominant varieties that dominate farmers' plots (Lechman, 2014). The findings are consistent with the conclusions of Yanggen and Nagujja (2006) and Mwanga and Ssemakula (2011) that sweetpotato farming communities seem to be accepting OFSP varieties. Most farmers in this study also adopted OFSP cultivation, but they allocated only a small portion of their sweetpotato cultivation to OFSP.

'Take-off Expectation' and Acceptance of OFSP

This section looks at how 'take-off expectation', that is farmers' prediction that OFSP is likely to take-off within their farming community, affects OFSP acceptance. In this study, 'take off expectation' was assessed in terms of farmers' perceived likely response of peers regarding growing OFSP and farmers' valuation of OFSP's relative advantage against the WFSP.

Perceived likely response of peers

Survey results (Table 1) indicate that most of the farmers perceived that peers they valued grew OFSP at low intensity (38.2%) or not at all (13.2%). They also perceived members of the groups they ascribed to, to mostly grow OFSP at low intensity (54.8%). In contrast to farmers' perceptions of the low proportion of OFSP their peers or groups cultivate in their gardens, their perception of approval towards their own OFSP cultivation by peers or members of groups were either moderate or high—65.4% and 69.7%, respectively. The survey results are supported by the interview. For example, farmers at 'maintenance' stage expressed that they based their choices on what they deemed near-peers to be doing regarding OFSP cultivation, as summarized by Mr. Lwanga John, a farmer in Kyotera, during an interview in May 2017. He stated that "most farmers grow less than 10% of OFSP in their sweetpotato gardens; even some of community resource persons who promote these OFSPs do not grow these varieties at all themselves". This could be interpreted as an inverse dissonance; where farmers may perceive peers to be unjustly demanding of them to get involved with OFSP agriculture without themselves pursuing similar activities/goals.

Social Influence on Acceptance of OFSP

Overall, the findings showed farmers to be accepting the OFSP for socially-oriented reasons rather than the technical benefits associated with it. The close similarity of perceived adoption intensity of peers discussed above and the actual adoption intensity observed in the study population (Figure 2), suggest that farmers knowingly or unknowingly watched peers keenly to distinguish what their peers' actions and choices were, so that they act accordingly, which conforms with Allen's (1988) argument. Allen's seminal work suggests that initial acceptance of innovations with network effects is characterized with mutual observation. Mackie et al. (2015) posits that in observing each other's actions, socially-oriented persons aim to make effective action and build and maintain social relationships. Looking up to peers' actions and approval is one important way to effective action when confronted with novel decisions and it helps individuals to keep away from opposing what is socially deemed right (Jolanda et al., 2002). Young (2015) suggests that an individual may comply to social influence as a way to achieve actions that are well coordinated with those of group members, especially where action/inaction is associated with an anticipated social reward or penalty. The intensity of cultivating OFSP (Figure 2) is thus interpreted as an effort by the farmers to align their cultivation behavior with the perception they hold about peers. The individual's actions/inactions may thus be seen as being symbolic; a signal for one's membership in a given group to self and/or to others (Young, 2015). This can be interpreted to mean that to respond to social pressure, one needs

Table 1. Perceived social response of peers regarding orange-fleshed sweetpotato (OFSP) agriculture.

Social influence center	Average percentage perceptions (N = 341)				
	Zero (0)	Low (1-2)	Moderate (3-4)	High (5-6)	All (7)
Peer pressure					
What proportions of OFSP do you think farmers you value are growing in their sweetpotato garden?	13.2%	38.2%	27.6%	21.1%	0%
What proportion of OFSP do you think farmers you value approve you to grow in your sweetpotato garden?	13.2%	21.5%	33.5%	31.9%	0%
Group pressure					
What proportion of OFSP do you think members of your group are growing in their sweetpotato gardens?	4.1%	54.8%	26.8%	14.4%	0%
What proportion of OFSP do you think members of your group approve you to grow in your sweetpotato garden?	4.1%	26.1%	27.8%	41.9%	0%

to be motivated by the value he/she assigns to individuals and/ or groups one ascribes to and the existence of socially oriented reasons that guide their response.

Importance that Farmers Attach to Groups and Peers

Table 2 shows that most of the farmers in this study assign high value to peers (55.7% + 15.2% = 70.9%) and the groups they ascribed to (65.7% + 18.2% = 83.9%) when making farming decisions. Cislaghi and Heise (2018) observed that compliance to valued people's approvals and/or disapprovals follows less from application of sanctions and more from anticipation of them. Table 3 shows the reasons for farmers trying to match their own behavior with those of others regarding OFSP cultivation. These include not wanting to be left out of the information flow, and fear of being expelled from groups one ascribed to, which were mainly inclined to anticipative rather than actual sanctions.

In addition, in-depth interview findings indicated that farmers who accepted to grow OFSP would periodically receive gifts such as t-shirts, tours, bicycles, calendars, caps and free seed. These seeds were distributed by technology dissemination agents (Harvest Plus, through VEDCO and CEDO) through existing social groups or groups created by the technology delivery agencies. The social groups were composed of household decision-makers (male and female) within proximal locations in

Table 2. Importance farmers attach to groups and peers.

Center of influence	Average percentage ranking with 7 denoting highest importance and zero lowest importance (N = 341)				
	0	1 to 2	3 to 4	5 to 6	7
Rank the importance of the group(s) you ascribe to when making decision about farming your household.	3.5%	6.7%	5.9%	65.7%	18.2%
Rank the importance of the farmers you value when making decision about farming in your household.	12.3%	8.8%	7.9%	55.7%	15.2%

Table 3. Farmers' motivation to comply to social pressure.

Motivation to comply to social pressure	Level of importance (percentage, N = 341)	
	Peer pressure	Group pressure
Left out of information flow	47.50%	31.10%
Expel from the group	-	22.70%
Pay fines/penalty	-	12.60%
Members become demoralized	7.70%	9.20%
Loss of trust	7.30%	9.10%
No vines and/ or harvest exchanged	3.00%	7.10%
Taken to disciplinary committee	-	5.90%
Hunger proclaimed on you	5%	4.10%

each village through which OFSP delivery activities were conducted. Farmers who did not grow OFSP would be excluded from receiving any input, which was corroborated by field observations conducted during this study. A number of farmers were found to cultivate a few symbolic mounds of OFSP in a typical garden of over 400 mounds of sweetpotato, which they could quickly display as a way to show their involvement.

Twenty-five of the 30 farmers under the 'trial' and 'maintenance' stages who were interviewed noted that being involved in some kind of OFSP activity was used as a 'currency' for some farmers to acquire inputs supplied via their farmers' groups. "It was also observed as a 'currency' for keeping peace with peers in groups and relatives to farming families, as exemplified in a female farmer's commentary: If you do not plant OFSP at all you get rejected or scolded by other farmers for wanting to starve your family" (Namwanjje R. farmer interview in Kyotera, April 2017). Mr. Somoka, a migrant from Rwanda who worked together with his wife, on Mr. Kyeya's farm who is a sub-county chief, also started cultivating OFSP because their supervisor considered the new varieties to be the best meal for the health of their children.

The above evidence suggests that social rewards and reprimand as well as fear of compromising one's social position were likely responsible for the high percentage adoption and low intensity of OFSP cultivation observed in this study. This could have been as so, because as discussed earlier, having a few mounds of OFSP was sufficient to avoid social sanctions and to benefit from the resources distributed through a farmer's group. These findings are in line with a report of HarvestPlus (2011) in which it was suggested that social networks (family, friends, neighbours) were vitals in the uptake of pearl millet in Pakistan and bean varieties in Rwanda, (although) for the known role these networks played as conduits of farming information (Mittal et al., 2018).

Perceived Relative Advantage

Table 4 presents the importance that farmers attach to various traits and the perceived advantage of OFSP against WFSP for each of these traits. It is revealed that farmers across all stages (N = 341) generally did not find OFSP to be superior to WFSP regarding several technical features deemed necessary when choosing the sweetpotato to grow (Means<3). These features where OFSP was deemed to perform below WFSP include, for example, taste (dry matter and hardness), ease of accessing and preserving vines and most of the varietal performance features when in the field (Table 4). This is at odds with the technical studies (e.g., de Brauw et al., 2015), that sustain that OFSP is superior to the dominant white fleshed sweetpotato varieties regarding these attributes. These perceptions about OFSP could be confounded by earlier beliefs about and/or the co-existence of improved varieties alongside these of OFSP varieties with undesired qualities in farming communities.

The survey findings indicate some consensus, however, across the three acceptance stages (N

Table 4. Perceived importance of various traits on decisions regarding cultivation of orange-fleshed sweet potato (OFSP), and the relative advantage of OFSP against white-fleshed sweetpotato (WFSP) by stage of acceptance and overall.

	Importance attached to criterion		Mean score of OFSP against WFSP by acceptance stage[b]							
			Under-consideration (n = 40)		Trial (n = 63)		Maintenance (n = 238)		Total (N = 341)	
Technical criteria	Mean score[a]	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Easiness to preserve last season vines	5.83	1.11	2.12	1.4	2.28	1.14	2.66	1.32	2.53	1.31
Easiness to access vines	5.71	1.01	1.42	0.91	1.68	0.79	2.17	1.23	1.99	1.16
Health benefits/ value	5.62	1.16	4.51*	1.16	4.21*	1.25	4.37*	1.2	4.35*	1.2
Yield quality	5.58	0.93	3.88*	1.47	3.84*	1.14	4.1*	1.07	4.03*	1.14
Early maturity	5.57	0.95	3.82*	1.28	4.06*	0.92	4.25*	1.1	4.17*	1.1
Storage root size	5.46	1.06	3.64*	1.45	3.95*	1.08	4.12*	1.17	4.03*	1.2
Piecemeal harvesting duration	5.29	0.98	2.92	1.51	3.06*	1.3	3.21*	1.34	3.15*	1.35
Lowest susceptibility to disease	5.26	0.92	2.48	1.16	3.25*	1.17	2.98	1.13	2.97	1.16
Lowest susceptibility to pests	5.25	0.99	2.66	1.35	3.1*	1.29	2.87	1.06	2.89	1.15
Dry matter content	5.21	1.14	2.06	1.28	2.82	1.39	2.8	1.25	2.71	1.3
Lowest fibers in cooked roots	5.21	1.14	2.99	1.26	3.32*	1.12	3.04*	1.37	3.09*	1.32
Likable sugar content	5.16	1.01	2.99	1.54	3.07*	1.16	3.06*	1.28	3.06*	1.29
Likable smell	5.09	1.18	2.79	1.46	2.93	1.29	3.15*	1.28	3.07*	1.31
Acceptable harvest when planted late	5.08	1.09	2.77	1.2	2.93	1.08	2.97	1.26	2.94	1.22
Marketability of surplus	5.05	1.26	3.03*	1.4	2.92	1.36	2.97	1.37	2.97	1.37
High hardness	4.92	1.13	1.83	1.22	2.17	1.17	2.24	1.25	2.18	1.24
Less field operations	4.89	1.20	2.34	1.09	2.69	1.11	2.7	1.08	2.66	1.09
Susceptibility to weeds	4.86	1.29	2.54	1	2.67	1.15	2.67	1.12	2.65	1.11
Likable shape	4.78	1.40	2.74	1.28	2.92	1.21	3.16*	1.29	3.07*	1.28
Likable size	4.74	1.45	2.86	1.26	2.8	1.24	3.14*	1.31	3.04*	1.3
Volume of wasted vines for animal feeds	4.70	1.51	2.3	1.5	2.42	1.4	2.41	1.42	2.4	1.43

[a]Least score = 1, highest score = 7,
[b]Least score = 0.14 (1 = minimum importance x1 = minimum rating)/7= maximum point of the scale, highest score = 6 (7 = maximum importance x 6 = maximum rating)/7 = maximum point of the scale.
*equal or more than 3

= 341) that OFSP was superior to the dominant WFSP regarding yield quality (mean = 4.03, SD = 1.14), healthy value (mean = 4.35, SD = 1.2), early maturity (mean = 4.17, SD = 1.1) and storage root size (mean = 4.03, SD = 1.2). Tension in the findings of the survey was revealed regarding duration of harvesting, fiber content and likable sugar content, which were found to be superior in OFSP among farmers at the 'trial' and those at the 'maintenance' stage but not among farmers who were at the 'underconsideration' stage. Similarly, only farmers who had grown OFSP for more than two seasons (maintenance stage, n = 238), appreciated it as being superior to WFSP regarding likable size (mean = 3.14, SD = 1.31), likable shape (mean = 3.16, SD = 1.29) and likable smell (mean = 3.15, SD = 1.28).

Perceived Relative Advantage Across Stages of OFSP Acceptance

Table 5 presents a content analysis summary of interview data on perceived relative advantage of OFSP and coping strategies. It reveals some tensions about relative advantage of OFSP and decisions regarding farmers' cultivation of these new varieties. For example, 10 of the 12 farmers interviewed belonging to the 'underconsideration' stage did not perceive OFSP to have relative advantage. As exemplified by an observation of a male farmer:

Most OFSP storage roots are not floury (many varieties have low dry matter content) when cooked and most varieties do not resist pests. *Obukeke*

Table 5. Content analysis summary on perceived relative advantage of OFSP and coping strategies.

Concepts	Stage ('underconsideration = 1', 'trial = 2', 'maintenance = 3')					
	Stage 1 (n = 12)	Number of cases	Stage 2 (n = 14)	Number of cases	Stage 3 (n = 16)	Number of cases
Relative advantage	→ Negative (e.g., low dry matter and susceptible to diseases, droughts and rots	10/12	→ Some (e.g., health benefits)	14/14	→ More than one (e.g., health, field performance, yield and consumption benefits)	16/16
					→ Selective acceptance (used as a currency for accessing inputs)	6/16
Coping strategies	→ Avoidance (opted out of growing the new varieties)	10/12	→ Selective acceptance (used as a 'currency' for accessing inputs)	14/14	→ Proactive acceptance (cared for vine preservation plots to guarantee access to planting materials. Some restricted access to their gardens).	7/16

(meaning dried sliced storage root chips), from OFSP also turn black when used to make *amaboya,* a mashed dish made out of preserved dried sweetpotato (Mudhoko Abdul, farmer interview in Buyende, May 2017).

Fourteen of the farmers interviewed belonging to the 'trial' stage were in a state that could be characterized as partial appreciation of the relative advantages of OFSP, probably because their attitude towards OFSP could have been based on secondary information obtained through peers (Ndaula et al., 2020).

Unlike farmers at the 'underconsideration' stage, farmers at the 'maintenance' stage and the key informants attributed the blackening of dried sweetpotato to the use of drying methods and the accumulation of high moisture content at the time of storage. Additionally, farmers at the 'maintenance' stage observed that OFSP was better than the WFSP, except for the broad-leafed OFSP cultivar, which was deemed resistant to drought and was high yielding but was badly flavored and had very low dry matter content. Most farmers fed storage roots of this variety to pigs. They also observed that no farmer can ever desire to grow OFSP, if he/she had initially grown the broad-leafed OFSP. Key informants corroborated this finding and tagged this variety to OFSP community varietal evaluation activities by the National Agricultural Research Organization (NARO). Andrade (2009) noted that the gene for dry matter and ß-carotene (orange color in OFSP) had a strong negative correlation. Ejumula and Kakamega (SPK004), which are OFSP 'landrace' cultivars from Uganda and Kenya, respectively, were isolated, evaluated and officially released in Uganda in 2004 under Uganda's potato breeding program for their simultaneous possession of high dry matter content (>30%) and high β-carotene (>3760 µg/100g fwb) (Kapinga et al., 2010; Mwanga et al., 2007a, 2007b). The selection was done targeting to meet farmers' dry matter expectations in any new sweetpotato variety, given that earlier rejections of OFSP in south Asia and some countries in east Africa in the early 1980s were reported to be due to low dry matter than any other factors (Low et al., 2017). The widely delivered OFSP cultivars through the DDBC projects were 'NASPOT 9 O' and 'NASPOT 10 O' rebranded as 'Vita' and 'Kabode', respectively (Kapinga et al., 2010; Mwanga et al., 2011) and 'NASPOT 12 O' and 'NASPOT 13 O' (Mwanga et al., 2016). The pedigree of these four cultivars is SPK004 (Kakamega) improved through conventional breeding for higher storage root yield and resistant to common field sweetpotato disease. Thus, before the groundbreaking isolation and commercialization of Ejumula, Kakamega and the cousins of SPK004, OFSP most likely featured among farming communities as a less tasty (low dry matter) sweetpotato. Based on farmers' narratives, undesired OFSP varieties continue to endure adverse conditions to survive alongside improved ones. This could probably be confounding farmers' perceptions about the improved disease resistant and tasty (higher dry matter) OFSP, that is 'Kabode', 'Vita', 'NASPOT 12 O' and 'NASPOT 13 O' that were extensively delivered to farmers interviewed in this study.

The above misgiving notwithstanding, the rest of OFSP varieties were observed by farmers with over six months cultivating experience to have relative advantage over the dominant WFSP varieties. These farmers, for example, observed that OFSP is as floury especially when allowed to mature at about 3.5 to 5 months. At 2.5 months, OFSP roots are still immature, even though storage roots would have attained mature size. This could suggest that efforts that carve the niche of OFSP on the basis of early maturity (Low et al., 2017; Mwanga & Ssemakula, 2011) risk having farmers fail to fully appreciate other main qualities, such as dry matter, for acceptance. OFSPs that are harvested early may not reach the same level of quality as those left to mature for longer, and may discourage users from using the technology.

The above discussion reveals that for the farmers in this study, the realization of the relative advantage of OFSP is via experiential cultivation; hence before farmers fully appreciate the relative advantage, they could probably grow OFSP at experimental intensity or avoid growing it altogether. As exemplified in a female farmer's commentary: "Compared with WFSP varieties, OFSP is very susceptible to dry conditions. Farmers who do not cultivate in swamp fringes fear growing a lot of OFSP, due to erratic weather, which can result in total loss" (Nakazibwe Summaya, farmer interview in Kyotera, April 2017). However, Rogers (1995) observed that one cannot have meaningful evaluation of an innovation if he/she had not previously encountered it. This could be a major challenge for OFSP delivery, because as most farmers continue to favor the technical features (e.g., dry matter content and resistance to

pest and diseases) of the WFSP varieties, they limit their involvement with OFSP to experimenting with it or as a 'currency' they use to access supplies, failing to appreciate its relative advantages.

Gallaugher (2008) observed that for adopters to accept an innovation with social network effects, the performance of the new variety needs to exceed that of the dominant WFSP to replace it, and that the performance of the new variety should not be imitable. Nevertheless, key informants in this study observed that several qualities of OFSP, such as high yielding potential are not unique to OFSP. The national sweetpotato breeding program at NARO continues to release improved varieties of both WFSP and OFSP (Mwanga et al., 2016). When WFSP varieties are upgraded, it could result into further user network growth of WFSP, making the switch to a favoured bio-fortified varieties increasingly difficult (Gallaugher, 2008). The above findings also suggest that while there are efforts towards improving the technical features of both WFSP and OFSP, farmers accept OFSP more for social rather than technical calculus. The implication is that social calculus is an important entry point for getting the farmers to try out OFSP varieties in order to appreciate its relative advantage.

Photo 1A: OFSP vines found abandoned at delivery centre in 2018 season B and 2019 season A

Photo 1B: Long distance vine vending truck selling to local distributor in Buyende district in April 2017

Photo 1C: A group of women buying vines from long distance vine vending truck in April 2017

Photo 1D: Motorcyclists vending vines from nearby districts into Buyende district April 2017

Photo 1E: A woman and children returning from seeking for vines from friends, April 2017

Figure 3. Photo 1A shows the freely given out OFSP vines abandoned at distribution shades. Photos 1B-1E show white-fleshed sweetpotato vine transaction in Buyende district from neigboring districts, each bag sold at UGX 7,000 (1 USD ≈ UGX 3,500).

Modifying Effect of Coping Strategies on Acceptance of OFSP

This section looks at the first question, on the relationship between acceptance of OFSP and take-off expectation modified by coping strategies. Farmers responded differently during the period of low intensity adoption. Ten out of the 12 farmers interviewed at the 'under consideration' stage who had not appreciated the relative advantage of OFSP (Table 5) avoided taking up these new varieties. For example, several farmers in this category observed that they did not pick OFSP vines from distribution centers because OFSP were not better than the farmers' dominant WFSP varieties. Given that all the farmers who participated in this study had received OFSP vines in 2013, the response of these farmers were probably a result of their earlier negative encounters with OFSP varieties. Little experimentation may have limited the ability of farmers at the 'under consideration' stage to fully appreciate the varieties' features.

Similarly, all the farmers at the 'trial' stage and nine of the 16 farmers interviewed under 'maintenance' stage selectively accepted OFSPs varieties. These farmers often took small quantities of OFSP vines from distribution centers. Large portions of OFSP vines were often left at the distribution center, due to farmers' selective action towards these new varieties (Figure 3 Photo 1A). Farmers selectively accepted OFSP because cultivating OFSP was used as a means ('currency') to access supplies, such as caps, t-shirts and free bean seeds, distributed as part of OFSP promotional efforts by HarvestPlus. Seven out of the 16 farmers interviewed under the 'maintenance' stage, who had grown OFSP for more than one growing season seemed to have appreciated the relative advantage of OFSP and devised means of preserving the vines, as exemplified in a female farmer's commentary below:

> Most of the farmers, who mainly grow OFSP in their sweetpotato gardens, do so, on swamp fringes and have small vine preservation plots intensively cared for between seasons. A few farmers preserve vines under tree shades or on boundaries of their upland gardens, where conditions are either cool or are nearby their household to irrigate. Others stagger sweetpotato vine planting to mitigate possibilities of single operation harvesting
>
> *(Saida Nabirye, farmer interview in Buyende, April 2017).*

Mr. Mabuno, one of the farmers who had cultivated OFSP on swamp fringes in Kyotera for over four seasons, stated that "my vine preservation plot, is my primary interest, I spray it, irrigate it and weed it, in order to ensure that I will be able to plant OFSP in another season". In this study, these farmers who designed vine preservation strategies, shared with those who did not, but needed the vines, through giving them access to vines and storage roots. Farmers, however, observed that this support was restricted, as noted in a female farmer's commentary: "most of the farmers who cultivate on swamp fringes restrict access to their vine preservation plots in the hope of protecting their path to growing into vine sellers" (Teo Nalwadda, a farmer interviewed in Kyotera, April 2017).

The exchange of vines was found to contribute to other farmers' appreciation of the relative advantage and stay power of OFSP. For example, Mrs. Namyalo, a female farmer in Kyotera noted, "I was not into OFSP growing, because many people said it was bad, until when my mother-in-law started sending me storage roots during her harvest along with a few vines".

Rogers (1995) suggests that efforts such as coping strategies used by early adopters, in this case preservation of vines in swampy spaces, can be a conduit that attracts individuals who had not fully embraced the technology/innovation to consider it given the influence of those at 'maintenance' stage who have vines and keep sharing about them. Thus, interpersonal exchanges and social modeling or being examples, plays a pivotal role. In this study, evidence suggests that vine preservation strategies offered other farmers vines and learning sites, particularly about vine preservation and experiential opportunity for appreciating OFSP.

Modifying Effect of Social Network Effect on Acceptance of OFSP

This section looks at the second research question, regarding the relationship between 'acceptance' and farmers' take-off expectation or predictive perceptions regarding the likelihood of OFSP to be accepted by peer-farmers modified by network effect value. Table 6 summarizes the content analysis regarding the network effect on OFSP acceptance. As noted in the conceptual framework section, exchange power (features such as OFSP vines and harvest), stay power (the feeling that OFSP will not leave adopters stranded),

Table 6. Content analysis summary regarding network effect on OFSP acceptance.

Concepts	Stages ('underconsideration = 1', 'trial = 2', 'maintenance = 3')					
	Stage 1 (n = 12)	Number of cases	Stage 2 (n = 14)	Number of cases	Stage 3 (n = 16)	Number of cases
Exchange power	→ None	12/12	→ Some (vines)	12/14	→ Some exchanged vines	9/16
					→ Some exchanged both storage roots and vines	7/16
Stay power	→ Not likely to stay (drought susceptibility, no market for storage roots)	12/12	→ Partially convinced due to drought susceptibility but favoured for its high yielding	12/14	→ Some exchanged both storage rootsand vines	10/16
					→ Partially convinced due to its drought susceptibility but favoured for its high yielding	6/16
Complementary benefits	→ None	12/12	→ Hopeful for markets, value additional but vines not grown by seed multi-pliers	14/14	→ Multiplicity (value addition and markets, but vines not grown by seed multi-pliers)	14/16

and complementary benefits (the opportunities for innovators to offer value around OFSP) were used to explain the role of network effects.

Exchange Power

Farmers at the 'under consideration' stage were not involved in vine or storage root exchange, as exemplified by the commentary of Mr Waiswa Ivan, a farmer, interviewed in Buyende, May 2017: "farmers who are not growing OFSP do not deserve our kindness during harvest because they always abandon OFSP vines to be wasted at distribution centres". Mrs. Mwanje, a farmer, interviewed in Kyotera in April 2017 also noted, "If a farmer was not growing OFSP, we would not give him/her storage roots as gifts during harvesting". Consistent with the above narratives, 12 of the farmers at 'trial' stage indicated having received gifts in form of storage root and/or vines from peers at 'maintenance' stage while farmers at the 'maintenance' stage mostly exchanged vines (9 out of 16) and storage roots (7 out of 16) with peers at the same stage. Mrs. Namatovu Peace a female farmer in Kyotera, April 2017, observed that, "exchanging vines and storage roots preserve the vines of desired varieties". This suggests that social vine exchange socially validate the quality of the variety, whose vines are then preserved. This also indicates that an increase in the number of farmers who consistently grow OFSP increases the number of farmers with whom individual farmers can exchange vines and storage roots, weakening the need for external vine support.

Probably due to the low levels of adoption, it was difficult for farmers in this study to access OFSP vines. This limited the social validation of the quality of OFSP and thus growing and expanding of the size of OFSP plots, as noted in a female farmer's observation:

> It is difficult to obtain enough vines from two or even ten OFSP mounds most farmers are cultivating. Also, unlike for conventional varieties, no one can allow you to obtain vines in their OFSP garden without restrictions. Some farmers even ask for money in exchange for vines
>
> *(Mrs. Nassolo, a farmer in an interview Kyotera, May 2017).*

Allen (1988) posits that an adopters' network that is small or in cases where early adopters discontinue because they are not reinforced to render a bigger network subsequently small, early users are likely to discontinue using the innovation further. This is so, because as the network size contracts, it becomes difficult for the early and joining adopters to access network-based utility. All the farmers in this study linked the challenge of access to vines to the property of OFSP; it matures early and its vines are less resistant to dry conditions, which makes them to store poorly in the field (Mwanga & Ssemakula, 2011). Thus, as an early maturing variety, OFSP needs a longer vine preservation period, as a female farmer noted:

> OFSP matures early, making it difficult to keep its vines into a new season given that at certain time the entire sweetpotato garden is harvested at once. And because it is grown on small scale, this makes efforts to preserve its vines into the next season very difficult; its vines end up succumbing to droughts unlike the conventional variety that stay in fields longer
>
> *(Nanku Justine, farmer interviewin Kyotera, May 2017).*

Stay Power

Table 6 shows that no farmer belonging to the 'underconsideration' stage thought OFSP were likely to stay, because the OFSP varieties were susceptible to droughts and lacked markets. Twelve out 14 farmers at 'trial' and six out 16 farmers at 'maintenance' stage were partially convinced regarding likelihood of OFSP to stay. This was because OFSP to them was susceptible to droughts but high yielding.

Alternatively, 10 out of the 16 farmers interviewed belonging to the 'maintenance' stage were positive that OFSPs will stay, primarily because it had superior yield quality. As noted in a female farmer's commentary, "With the rampant famines, no farmer will have any option but to grow OFSP, because it is high yielding and grows fast" (Nalongo Sarah, farmer interview in Kyotera, May 2017).

Complementary Benefits

No farmer at the 'underconsideration' stage found sweetpotato value chain actors, such as markets and value addition trainings, in the OFSP product line. Mr. Jakana Solomon, a farmer for example, observed in an interview held in Kyotera that: "old varieties can easily be sold. For OFSPs only farmers living along the road side are able to find market." The program director at VEDCO, a local

non-Governmental organization, noted that access to market and value addition awareness raising activities, were done during the early stages of delivering OFSP under the DDBC project, although it still attracts the interest of farmers.

All the farmers at the 'trial' stage were optimistic that they would access markets and value addition, but were concerned that vine vendors did not deal in OFSP vines. Field observations and interactions of the researcher with vendors and farmers who were transporting vines into the study area confirmed the dominance of WFSP because OFSP did not have markets within vendors' targeted villages (see Figure 3 Photo 1B to E). All farmers at 'maintenance' stage noted that OFSP has several complementary benefits. Most of them noted that they accessed high value markets through specialized buyers like schools and those who had knowledge for processing OFSP storage roots into value added products such as doughnuts and pancakes [(see Owori et al., 2007) for possible products made out of OFSP]. These farmers also observed that commercial WFSP sweetpotato vine multipliers and vendors were not involved in OFSP, due to the low demand for OFSP vines as the main reason. The evidence suggests that complementary benefits are poorly felt by farmers supplying vines and buyers of excess storage roots within the study area.

Conclusions and Recommendations

The key aim of this paper was to describe the role of network-related characteristics on OFSP cultivation behavior among selected rural households in Uganda. This study found the acceptance of OFSP to be associated with OFSP's relative advantage and farmers' expectations regarding the likelihood of OFSP to be accepted within their farming communities. Farmers, however, were found to accept OFSP more for socially-oriented reasons than for its relative technical performance. This leads to conclusions that farmers observe each other's actions regarding OFSP agriculture and modify their own actions accordingly. In addition, 'exchange power', 'stay power', and 'complementary benefits' were associated with OFSP acceptance. One can thus conclude that network effects play a vital role in moderating the effect of farmers' decisions to consider OFSP cultivation. Thus, the likelihood of OFSP acceptance increases as the number of farmers cultivating OFSP for more than six months increases within the farming community. This implies a need to harness network effects for delivery programs of innovations like the development of superior OFSP varieties. The study supports strategies that:1) build confidence among farming communities that OFSP is likely to stay, through building an impression that every person who matters is cultivating the varieties; 2) support farmers' innovative ways for coping with inaccessibility to vines as an opportunity to offset the need for a speedy assemblage of the minimum number of adopters; and 3) encourage sweetpotato value chain actors, such as vine vendors, and storage root marketer, to incorporate OFSP within their product line portfolios.

Acknowledgement

This work was supported by the DAAD-RUFORUM in-country scholarship under grant number 91602332; and European Union, Intra-ACP ARISE Mobility scholarship.

Disclosure Statement

No potential conflict of interest was declared by the authors.

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