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When natural resources run out, market knowledge steps in: Lessons on natural resource deployment from a longitudinal study in a resource-scarce region of Ethiopia

Desalegn A. Gugissa[1] | Paul T.M. Ingenbleek[1] | Hans C.M. van Trijp[1] | Mebrahtu L. Teklehaimanot[2] | Workneh K. Tessema[3]

[1]Marketing and Consumer Behaviour Group, Wageningen University, Wageningen, The Netherlands

[2]FDRE Meles Zenawi Leadership Academy, Addis Ababa University, Addis Ababa, Ethiopia

[3]Addis Ababa University, Addis Ababa, Ethiopia

Correspondence
Desalegn A. Gugissa, Department of Management, Kotebe Metropolitan University, Addis Ababa, Ethiopia.
Email: ddesalegnamlaku@mail.com

Paul T. M. Ingenbleek, Marketing and Consumer Behaviour Group, Wageningen University, Hollandseweg 1, Wageningen 6706KN, The Netherlands.
Email: paul.ingenbleek@wur.nl

Abstract

With the increasing scarcity of natural resources, the ability to maintain quality standards during resource-scarce times becomes more critical for business performance. Theories on managing resource scarcity cannot be easily tested in contexts where resources are still abundant. This study therefore turns to an emerging market context in which natural resource availability naturally varies strongly between seasons, namely, that of Ethiopian pastoralists who for many generations learned to adapt to natural resource scarcity. Central to our theory is the natural resource deployment capability, which is the ability of a business to make efficient and effective use of available resources to maintain business performance during resource-scarce times. Using three-wave longitudinal data from 120 pastoral family-based livestock businesses, the study shows that when resources are scarce or extremely scarce, market knowledge helps to better deploy the scarce natural resources, leading to higher product quality. The findings imply that businesses with a better understanding of markets have stronger natural resource deployment capability. The lesson for businesses that are confronted with approaching resource scarcity is therefore to strengthen their ability to deploy resources efficiently and effectively by strengthening their market knowledge in which such capability is rooted.

KEYWORDS
capability, market knowledge, natural environment, pastoralism, product quality, resource deployment, resource scarcity management, sustainability

1 | INTRODUCTION

With the increasing scarcity of natural resources, the development of business strategies to deal with this scarcity becomes a key concern (Beermann, 2011; Mårtensson & Westerberg, 2016). Due to drought, in 2012, the water supply to rice farmers in Texas was, for example, cut off, which reduced yields (Phillips, Rodrigue, & Yücel, 2013). As another example, Dutch industry saw itself confronted with a sudden decrease in gas supply after increasing occurrence of earthquakes in the gas winning regions during the last two decades (Schmidt, Boersma, & Groenewegen, 2018). The standard response from strategic management to such scarcity of natural resources is to strengthen access to resources through power or strengthening stakeholder relations (cf. Pfeffer & Salancik, 2003). Consistent with this advice, firms

and governments facing realistic scenarios of acute resource shortages have started to secure access to the world's remaining resources of metals, agricultural lands, and water (Moyo, 2012). In more peripheral parts of the global economic system that lack the power to exercise control, direct threats of resource shortages may already be more acute. For example, in Africa, droughts in grain-producing nations caused an increase in food prices and stockouts in bakeries and empty bread shelves in supermarkets (Berazneva & Lee, 2013). With a continuing increase in resource consumption, such shortages will gradually spread to more affluent parts of the world, putting more pressure on companies that rely on policies to secure access to the scarce resources. These companies should, therefore, think strategically about how much resources they necessarily need to use for which purposes.

The existing literature on business strategy and sustainability tends to see natural resource availability as a long-term sustainability objective (Bansal & DesJardine, 2014; Dyllick & Hockerts, 2002) rather than an issue that needs acute attention. This bias is logically explained by the fact that studying acute scarcity is virtually impossible in the resource affluent environments in which the business literature has its roots. In another line of research, authors have argued that resource scarcity can also trigger product innovation because acute scarcity requires creative solutions (e.g., Cunha, Rego, Oliveira, Rosado, & Habib, 2014; Troilo, De Luca, & Atuahene-Gima, 2014). Stretching this line of thinking further, Radjou, Prabhu, and Ahuja (2012) look at resource-scarce contexts in emerging markets to derive valuable lessons for innovation that may also be implemented in contexts that are still resource-rich. These works have in common that they address the side-benefits of resource scarcity but do not address the direct threat of scarcity to ongoing operations.

This study focuses on the ability of businesses to survive in natural resource-scarce environments by making efficient and effective use of the limited available resources (cf. Kor & Mahoney, 2005; Slotegraaf, Moorman, & Inman, 2003). We refer to this as *natural resource deployment capability*. The concept extends beyond the concept of resource utilization (Slotegraaf et al., 2003), in that it does look not only at the efficiency of natural resource usage but also at the effectiveness. We therefore relate natural resource deployment capability to product quality, showing that businesses that are more capable of deploying natural resources better manage to maintain their product quality standards when resources become scarce. Following the knowledge-based view of the firm, we further focus on market knowledge as a key antecedent of natural resource deployment. This is because as a foundation for capabilities that create value for customers (Slater, Olson, & Eibe Sørensen, 2012), market knowledge brings refined insights into the quality-sensitivity of different customers or customer groups. By doing so, the study answers the questions: Does natural resource deployment stabilize quality? Does market knowledge strengthen the resource deployment capability? How do these relationships hold across resource-rich and resource-scarce times?

To answer these questions, this study turns to the context of Ethiopian pastoralists. Pastoralists make a living by raising livestock (e.g., herds of cattle, camels, sheep, and/or goats) in arid lands where natural resources necessary to sustain their livestock production are often scarce and temporally fluctuating (Lee, Neves, Wiebe, Lipper, & Zurek, 2009). Because pastoralists have been breeding and fattening livestock within the constraints of a resource-scarce environment for many generations, they have developed capabilities that enable them to deal with scarce natural resources. The pastoralist context has therefore been used for decades to draw lessons on adaptation to resource scarcity in disciplines such as ecology (e.g., Davies, 2008), anthropology (e.g., Galvin, 2009), and economics (e.g., Barrett, 2008; Barrett & Carter, 2010), but business researchers have developed an interest only recently (e.g., Ingenbleek, Tessema, & van Trijp, 2013). In this complex context, we collected three waves of data from 120 pastoral family-based livestock businesses in periods with respectively low, high, and extremely high resource-scarcity.

This study makes the following contributions: first, we provide insight into a capability that helps businesses to be resilient to resource scarcity, namely, natural resource deployment, a topic that is mostly absent in the debate on business strategy and environment. Second, we show that market knowledge helps to overcome the shortage of natural resources, in that the effect of market knowledge on natural resource deployment is stronger during resource-scarce times. In other words, we show that the effect of market knowledge on natural resource deployment is positively moderated by natural resource scarcity. This result provides a deeper insight into how market insights fuel the managerial decisions on how to deal with acute resource scarcity. Third, we contribute to the knowledge-based view of the firm (Grant, 1996), in that market knowledge is not only a valuable asset to foster innovation and product differentiation (De Luca & Atuahene-Gima, 2007), but it has also another, less recognized role, namely to maintain quality standards by fueling resource deployment capability with customer insights.

2 | CONCEPTUAL MODEL AND HYPOTHESES

2.1 | Natural resource deployment

The strategic management literature sees natural resources broadly as the earth's naturally occurring tangible and intangible entities that have inherent value to be considered as assets by companies (Bell, Mollenkopf, & Stolze, 2013; Hart, 1995). To understand the management of *natural* resources, the literature on the management of resources is a logical starting point. This literature describes resource management as a sequential process. In this process, managers decide for the long term about the structure of their resource portfolio as well as on the bundling of resources to build capabilities. In the shorter term, they can decide about the leveraging of these capabilities to realize a competitive advantage in the marketplace (Sirmon, Hitt, & Ireland, 2007). In the short term, managers' actions are therefore constrained to making the best use of the limited stock of resources controlled by the business (Sirmon, Gove, & Hitt, 2008).

Resources naturally occurring in the natural environment (Bel et al., 2013) are a special category because their quality and availability are to a great extent determined by external forces, like weather and climate and natural presence and depletion (for non-renewable resources) (Haigh & Griffiths, 2009; Linnenluecke, Griffiths, & Winn, 2012). Managers can only reduce uncertainty if they seize control over, or strengthen access to, the supply-bases of such resources as suggested by resource-dependency theory (Pfeffer & Salancik, 2003). If this is not possible or not desirable, their only option is to accept that resource availability has limits and to use the available resources in the most efficient and effective ways possible.

The literature uses the term *resource deployment* to refer to actions that enhance efficiency and effectiveness in utilizing the available resources (Sirmon et al., 2007; Sirmon, Hitt, Ireland, & Gilbert, 2011). Building on these contributions, we extend the concept of resource deployment to natural resources and define it as the ability of a business to undertake actions that help to make efficient and effective use of natural resources in the value-development process in order to maintain product quality during resource-scarce times. As businesses can vary in their ability to do so, resource deployment is also a capability (Demirel & Kesidou, 2019; Wijethilake & Upadhaya, 2020). Existing studies indeed show evidence that human (e.g., Sirmon et al., 2008), surgical (e.g., Huesch, 2013), R&D (e.g., Kor & Mahoney, 2005; Matthew, Bodo, & Bojkowszky, 2012), and financial resources (e.g., Slotegraaf et al., 2003) are associated with business performance outcomes. We follow this approach and extend the concept as *natural resource deployment capability*.

Drawing on Kor and Mahoney (2005) and Slotegraaf et al. (2003) concepts of resource deployment, natural resource deployment capability includes reallocating the available natural resources in ways that create the maximum value for customers, building slack capacity that serve as shock absorbers (e.g., inventories and flexible production process) and strengthening access to alternative resources. Some Ethiopian pastoralists, for example, allocate the maximum of the limited green pasture to livestock selected for markets only, even if this implies that other livestock in their herd will receive not enough pasture to keep them in good shape. This involves planning and reserving

relatively fertile grazing lands for fattening livestock for markets only. The pastoralists also tend to fatten livestock that have smaller pasture intakes (e.g., goat and sheep) than livestock having higher pasture intakes (e.g., cattle). They further build up slack resources such as hey and crop residues of farmers during harvesting seasons, so they can feed their livestock with it during dry times.

2.2 | Product quality and natural resource deployment capability

The conceptual model in Figure 1 depicts the relationships between market knowledge, natural resource deployment capability, and product quality in a context where the availability of natural resources varies across time. The model includes natural resource scarcity as a moderator on the relationships between market knowledge, natural resource deployment capability, and product quality. Because this study primarily emphasizes the impact of market knowledge on product quality through natural resource deployment capability, we present the direct link from market knowledge to product quality by the dashed line (see Figure 1). Thus, our framework controls for ways in which market knowledge affects product quality other than through the deployment of natural resources, like interaction with customers (e.g., Vargo & Lusch, 2008) and pricing strategies (e.g., Ingenbleek, Frambach, & Verhallen, 2010).

To explain the effect of natural resource deployment capability on product quality, we draw on resource management theory. Studies in this line of research suggest that the possession of resources alone cannot guarantee the creation of competitive advantages. Rather, the actions that businesses undertake to manage the use of resources make a difference (Ndofor, Sirmon, & He, 2011; Sirmon et al., 2007). Product quality refers to the characteristics of a product or service that contribute to the fulfillment of the stated or implied customer needs and wants (Kroll, Wright, & Heiens, 1999; Zhou, Li, Zhou, & Su, 2008). If we see the competitive advantage as a market position that is based on effectiveness in terms of the value that is created for the customer (customer benefits), and the efficiency by which the value is created (cf. Hunt & Morgan, 1995), product quality is a key indicator of the effectiveness dimension of competitive advantage. As
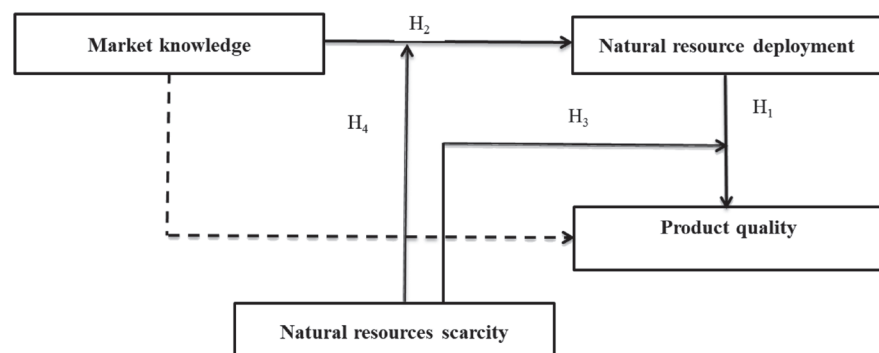
Conceptual model

FIGURE 1 Conceptual model

such, the managerial actions in resource management will also affect product quality. A business that better steers the maximum available green pasture and other inputs such as hey and crop residues to fatten livestock that are intended for customers will in the end offer higher quality to buyers. A business that is more proficient in the deployment of natural resources, keeping everything else equal, therefore offers higher product quality than its competitors. This leads to our first hypothesis:

Hypothesis 1 : The natural resource deployment capability will positively affect product quality.

2.3 | The effect of market knowledge on natural resource deployment

Recall that natural resource deployment is a capability and therefore a bundle of knowledge and skills (Khan, Daddi, & Iraldo, 2020; Teece, 2007). We propose that market knowledge is one of the key inputs to such a bundle. Market knowledge refers to organized and structured information about customers, competitors, and dynamics in the market environment (De Luca & Atuahene-Gima, 2018). The literature suggests that fundamental market knowledge on how markets function, the needs of customers, and the influence of competitors' actions is essential to competitively create customer value (Slater, 1997). Satisfying customer needs with product quality requires a business therefore to understand the needs of its customers, share the knowledge about those needs throughout the business, and make use of it in the managerial decisions that create and offer products and services that satisfy those needs (Slater et al., 2012). Such decisions will also include the coordinated deployment of the available natural resources. Thus, it is the market knowledge of businesses that provides direction for the deployment of natural resources. A business with a better understanding of the needs of specific customer groups can more easily find the opportunities for effective allocation, substitutions, and efficient utilization of natural resources and with that it reduces the likelihood of misfits between customer needs and its deployment of natural resources (Moorman & Day, 2016). Similarly, when a pastoralist has a better understanding of the needs of livestock buyers vis-a-vis other pastoralists, the pastoralist is more likely to better deploy the available green pasture and other resources such as hey and crop residues towards satisfying the needs of livestock buyers. Therefore, we propose that:

Hypothesis 2 : The level of market knowledge will positively affect the natural resources deployment capability.

2.4 | The moderating effects of natural resource scarcity

In resource-rich environments, the decisions on which materials to use to satisfy the needs of particular customer groups are mostly of an operational nature. When some resources get scarce, natural resource deployment becomes a greater challenge because not all the resources for the desired purposes and customers may be available (Sirmon et al., 2007). The process of using market knowledge to deploy natural resources in order to maintain the product quality offered to customers then becomes a process of significant strategic importance. According to the marginal productivity theory, when resources have different availability levels, scarce resources are more productive because of an increased rate of marginal productivity for the scarce resources (Bleischwitz, 2001). The natural resource deployment actions like reallocating, building slack resources, substituting, and the effective use of scarce resources thus become more important for product quality when natural resources are relatively scarce. Focused on the sample of this study, when pastoralists are constrained by the availability of pasture, a pastoralist with a higher deployment capability on pasture will be more likely capable to offer livestock buyers with the quality that they used to, whereas the quality offered by pastoralists that are less capable of natural resource deployment will decline. We therefore hypothesize:

Hypothesis 3 : The higher the level of natural resource-scarcity, the stronger the positive effect of natural resource deployment capability on product quality.

We draw on contingency theory and research on creativity and resource scarcity to hypothesize that the effect of market knowledge on natural resource deployment capability becomes stronger if resources are scarcer. Studies on creativity and resource scarcity suggest that businesses engage more in innovative activities to accumulate resources, improve resource usages, and find substitutions when they operate in a resource-scarce environment (e.g., Baker & Nelson, 2005; Berrone, Fosfuri, Gelabert, & Gomez-Mejia, 2013; Cunha et al., 2014). These studies, however, do not specify the conceptual role of resource scarcity in the relationships that lead to the creative and enhanced use of resources.

Contingency theory may help to fill this gap as it suggests that the business environment, among others, influences the effectiveness of organizational configurations and processes (Schoonhoven, 1981). Resource scarcity therefore acts as a moderator rather than an antecedent of resource deployment capability. Radjou et al. (2012) suggest that the creative ideas on resource usage probably stem from a superior understanding of customer needs, allowing them to come up with resource-efficient solutions that are also valued by the market. Following their line of reasoning, resource-scarce environments are likely to strengthen the relationship between market knowledge and natural resource deployment capability. Thus, when pastoral family-based livestock businesses are more constrained by the availability of pasture, they will utilize their understanding about the preferences and requirements of their livestock buyers to make better natural resource deployment decisions. We therefore hypothesize:

Hypothesis 4 : The higher the level of natural resource-scarcity, the stronger the positive effect of market knowledge on natural resource deployment capability.

3 | METHODS

3.1 | Research context

To test the hypotheses, we collected three waves of data from 120 Borana pastoralists in Southern Ethiopia. During the three waves, the ecological conditions were dry (hereafter t_1), rainy (hereafter t_2), and droughty (hereafter t_3). As a result, the pastoralists were facing relatively distinct levels of scarcity of natural pasture and water at each wave of data collection. To create a panel data set of three seasons at relatively different levels of natural resource scarcity, the study builds on a broader project. Specifically, 60 pastoralists were trained in market knowledge and compared with a control group of the same size. The participants were selected using a multistage sampling procedure from four administrative villages of the region (cf. Teklehaimanot, 2017).

The data at t_1 were collected in March 2015, before the training experiment during a long dry season of the region, that is, a resource-scarce period. The t_2 data were collected on November 2015 shortly after a rainy month in the region, thus denoting a low resource-scarce period. The data at t_3 were collected in August 2017 during a drought, thus representing an extremely resource-scarce period. The timing of t_3 data collection was prudently selected to capture a distinct level of scarcity of natural resources compared with the data at t_1 and t_2. Thus, the natural pasture scarcity level can be comparatively described as extremely high at t_3, high at t_1, and low at t_2. The data were collected using personal interviews that took place in grazing fields. Prior to the interviews, we got into contact with the pastoralists by contacting the development agents in each village. To minimize administrative method bias, we used the same data collection instruments, procedure, and technique used by Ingenbleek et al. (2013) to replace the traditional Likert scale with more visual tasks of choosing from five sticks. The data at t_1, t_2, and t_3 consisted of 120, 120, and 118 respondents, respectively. Two respondents were not reachable at t_3 because they had moved too far away from the research area to be traced.

3.2 | Measures

Multi-item scales (see Table 1 for the items) were used to measure market knowledge, natural resource deployment, and product quality constructs. All the items were measured using a 5-point Likert scale ranging from *strongly agree* to *strongly disagree*. The items were developed based on a qualitative prestudy and formulated as concretely as possible to make them easily understandable to the respondents (Teklehaimanot, 2017). The market knowledge measures tested the pastoralists' level of understanding of how markets function; the customer needs; the influence of competitors' actions, that they need to know to produce, communicate, deliver, and exchange quality livestock in ways that satisfy the requirements of buyers and benefit them (Moorman & Day, 2016; Teklehaimanot, 2017). After deleting the items with variant loadings across time, the measure of market knowledge included six items.

Natural resource deployment capability was operationalized with five items that indicate the relative ability of pastoralists to use the natural pasture for fattening and thereby increase the quality of the livestock that they have selected for the market, through separately feeding the livestock, assembling feeds, protecting some grazing areas, and reserving feeds. Product quality was measured as relative superior livestock attributes offered to the buyers compared with those of competitors. The measure includes four items pertaining to the relative livestock quality: the body condition, health condition, amount of ticks, and level of quality (Teklehaimanot, 2017).

We assessed the chance of common method bias in our estimates using Harman's one-factor method test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) and a full collinearity assessment approach (Kock, 2015). Both approaches suggest that it is unlikely that the results are affected by common-method bias. To check whether our measurement scales are consistent across the three data waves, we checked the invariance of the items' loading over the times using a likelihood-ratio test between unrestricted and restricted models (Acock, 2013). We first ran a multigroup confirmatory factor analysis by taking data collection movements as a grouping variable without imposing any constraints on the loadings. Then we ran another confirmatory factor analysis by imposing constraints that all the corresponding loadings are the same across t_1, t_2, and t_3. The result of the likelihood-ratio test indicates that the invariance of item loadings across time is satisfied with $\chi^2(24) = 32.67$ and prob > χ^2 is .11.

3.3 | Data analysis

In analyzing the longitudinal data, we anticipated lagged value effects for market knowledge and natural resource deployment capability. This is because capabilities that underlie market knowledge generation and resource deployment are entwined with organizational processes and routines (Day, 2011; Morgan, Feng, & Whitler, 2018). Thus, the processes and routines can serve across multiple periods. So the conceptual model in Figure 1 is portrayed as an analytical model (see Figure 2) by adding two lagged value effects for the constructs. The partial least square structural equation model (PLS-SEM) is used to predict the effects of market knowledge on natural resource deployment. PLS-SEM is a causal modeling approach aimed at maximizing the explained variance of endogenous latent constructs (Hair, Ringle, & Sarstedt, 2011). We used PLS-SEM instead of the covariance-based SEM (CB-SEM) because PLS-SEM achieves more stable estimators than CB-SEM for a wider range of sample sizes

TABLE 1 Model constructs, survey measures, and items' standardized loadings by period

	Loading		
Variable	t_1	t_2	t_3
Market knowledge			
A pastoralist who wants to sell their livestock:			
1. Will benefit more if satisfying the buyers' need is central to their livestock raising practices	.76	.79	.49
2. Will receive a lower price if they sell lower quality livestock compared with other highland farmers	.66	.59	.71
3. Will benefit more if he searches for better breeds that livestock traders look for	.70	.80	.74
4. Should know the specific activities required to raise high-quality livestock	.78	.74	.75
5. Should be able to explain the quality of their livestock to livestock buyers	.78	.70	.77
6. Should accept the first price that the buyers offer for their livestock	.66	.70	.75
Natural resource deployment			
Please consider how you were using natural pasture to feed your livestock in the last year. As compared with other pastoralists, to what extent did you:			
1. Fatten the livestock you selected for the market	.88	.86	.85
2. Separately feed the livestock intended for the market to increase their weight	.86	.77	.86
3. Assemble better feed to fatten the livestock intended for the market	.82	.73	.81
4. Protect a grazing area to fatten the livestock intended for the market	.85	.77	.86
5. Reserve feed during the dry season for fattening	.71	.81	.69
Product quality			
During the last year, as compared with other pastoralists, the livestock that you offered to the market were:			
1. Fattened	.72	.78	.68
2. Healthier	.76	.78	.70
3. Containing no or few ticks	.75	.64	.75
4. Of higher quality for buyers	.67	.75	.78

(Hair, Ringle, & Sarstedt, 2011). The relatively small sample size of our study also makes PLS-SEM more appropriate than CB-SEM (Hair et al., 2012). In our study, the maximum indicators per construct is six and thus satisfies the popular heurism that states that the minimum sample size should be 10 times the maximum number of indicators per construct (Hair et al., 2012). In addition, PLS-SME yields more stable estimators with complex structural equation models (Hair et al., 2012). In the analytical model (see Figure 2), we have 12 latent constructs, which is considered relatively complex (Hair et al., 2012).
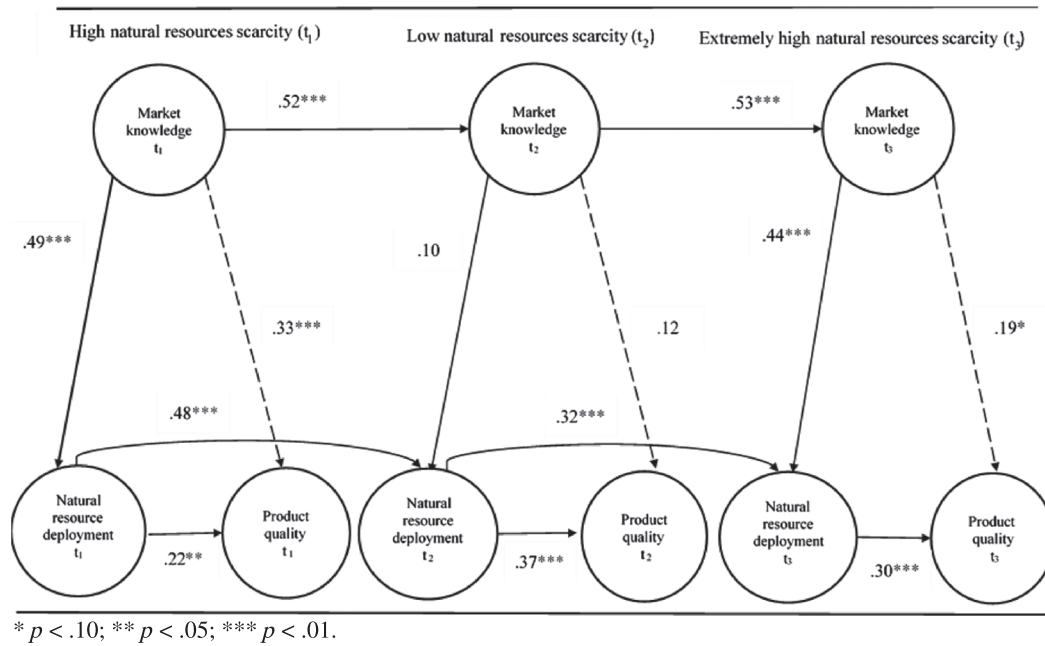
4 | RESULTS

4.1 | Measurement validity and reliability

We verified both the reliability and validity of the reflective outer model. We used Cronbach α and composite reliability to evaluate the constructs' internal consistency or reliability. For all constructs, the Cronbach's α and composite reliability are higher than .70, confirming the constructs' internal consistency (Churchill, 1979; Fornell & Larcker, 1981). As recommended by Hair, Sarstedt, Hopkins, and

Results of Path Analysis

FIGURE 2 Results of Path Analysis *p < .10; **p < .05; ***p < .01

Kuppelwieser (2014), the convergent validity was checked by examining the constructs' item loadings and average variance extracted (AVE). All loadings are higher than the desired .70 loading level, except in three instances, and all AVEs are greater than the required .50 for convergent validity across the three waves of data. The discriminant validity is checked by comparing the interfactor correlation with the square root of the constructs' AVE. All the interfactor correlations are far lower than the square root of AVE for all constructs across the three periods (Table 2).

4.2 | Hypotheses tests

We tested the hypotheses using the model shown in Figure 2. The conceptual model captures the changes in the level of natural resource scarcity with the changes over t_1, t_2, and t_3. It also includes the lagged effects on market knowledge and natural resource deployment because these are resources that develop slowly over time. The levels of market knowledge and natural resource deployment, therefore, depend on the levels in previous periods.

TABLE 2 Descriptive statistics and correlation

Variable	1	2	3	4	5	6	7	8	9
MK_1	.72								
MK_2	.52	.72							
MK_3	.43	.54	.71						
NRD_1	.49	.32	.33	.83					
NRD_2	.18	.25	.29	.51	.79				
NRD_3	.31	.32	.53	.44	.45	.81			
PQ_1	.43	.24	.22	.38	.26	.16	.72		
PQ_2	.20	.21	.30	.22	.40	.20	.26	.74	
PQ_3	.23	.17	.35	.30	.25	.40	.08	.20	.73
M	3.08	3.31	3.21	2.14	2.24	2.45	3.02	3.16	3.15
SD	.86	.91	.77	1.02	.88	.80	.58	.70	.58
α	.82	.82	.80	.88	.85	.87	.70	.73	.71
CR	.87	.87	.86	.91	.89	.91	.82	.83	.82

Note: Values in the diagonal are the square-root of the average variance extracted (AVE) for each construct. MK stands for market knowledge, NRD stands for natural resource deployment, PQ stands for product quality, and their subscript represents the time period. CR is a composite reliability for each construct.

Hypothesis 1 predicted positive direct effects of natural resource deployment on product quality. The hypothesis is supported if the direct effects of natural resource deployment on product quality are positive and significant for the three levels of natural resource scarcity. At t_1, t_2, and t_3, the test results support Hypothesis 1: $\beta_1 = .22$ ($p < .05$), $\beta_2 = .37$ ($p < .01$), and $\beta_3 = .30$ ($p < .01$).

Hypothesis 2 predicted positive, significant direct effects of market knowledge on natural resource deployment. The test results for t_1 and t_3 (time with high and extremely high resource scarcity, respectively) support Hypothesis 2 ($\beta_1 = .49$ [$p < .01$] and $\beta_3 = .44$ [$p < .01$]). However, the test results for t_2 (time with low resource scarcity) show that the effect is not significant ($\beta_2 = .10$ [$p > .10$]).

Hypothesis 3 predicted that the effect of natural resource deployment on product quality is stronger at high resource-scarce times as compared with low resource-scarce times. We tested the hypothesis by comparing the differences in the standardized beta coefficients of

the effects across t_1, t_2, and t_3. The hypothesis is supported if the effect is stronger at t_1 than at t_2 and if it is stronger at t_3 than at t_2 and t_1. However, it is not supported because we did not find any statistically significant positive differences in the effects (Table 3).

Hypothesis 4 predicted that the effect of market knowledge on natural resource deployment is stronger when natural resource scarcity is higher. We tested this hypothesis by also comparing t_1, t_2, and t_3. The hypothesis is supported if the effect is stronger at t_1 than at t_2 and if it is stronger at t_3 than at t_2 and t_1. The results show that the effect drops from $\beta_1 = .49$ ($p < .01$) at t_1 to $\beta_2 = .10$ ($p < .24$) at t_2. There is a positive and significant difference of $\beta = .39$ ($p < .01$) between the two parameters, supporting Hypothesis 3. The effect also drops from $\beta_3 = .44$ ($p < .01$) at t_3 to $\beta_2 = .10$ ($p < .24$) at t_2, resulting in a significant positive difference of $\beta = .34$ ($p < .01$). Contrary to the hypothesis, we however find that the parameter changes between t_3 and t_1 is not significant: $\beta_3 = .44$ at t_3 versus $\beta_1 = .49$ at t_1.

TABLE 3 Results of the hypothesis testing

Structural path	Path coef. /change in path coef.	z-value	Hypothesis testing
Hypothesis 1: Natural resource deployment → product quality at t_1	.22**	2.34	Supported
Hypothesis 1: Natural resource deployment → product quality at t_2	.37***	4.64	Supported
Hypothesis 1: Natural resource deployment → product quality at t_3	.30***	5.12	Supported
Hypothesis 2: Market knowledge → natural resource deployment at t_1	.49***	6.16	Supported
Hypothesis 2: Market knowledge → natural resource deployment at t_2	.10	1.18	Not supported
Hypothesis 2: Market knowledge → natural resource deployment at t_3	.44***	5.79	Supported
Hypothesis 3: Move from t_3 to t_2: Natural resource deployment → product quality	−.08	−0.58	Not supported
Hypothesis 3: Move from t_1 to t_2: Natural resource deployment → product quality	−.16	−1.23	Not supported
Hypothesis 3: Move from t_3 to t_1: Natural resource deployment → product quality	.08	0.59	Not supported
Hypothesis 4: Move from t_3 to t_2: Market knowledge → natural resource deployment	.34***	3.04	Supported
Hypothesis 4: Move from t_1 to t_2: Market knowledge → natural resource deployment	.39***	3.43	Supported
Hypothesis 4: Move from t_3 to t_1: Market knowledge → natural resource deployment	−.05	−.49	Not supported
Market knowledge → product quality at t_1	.33***	3.49	—
Market knowledge → product quality at t_2	.12	1.37	—
Market knowledge → product quality at t_3	.19*	1.92	—
Market knowledge at t_1 → market knowledge at t_2	.52***	6.63	—
Market knowledge at t_2 → market knowledge at t_3	.53***	6.85	—
Natural resource deployment at t_1 → natural resource deployment at t_2	.48***	5.82	—
Natural resource deployment at t_2 → natural resource deployment at t_3	.32***	4.23	—

*$p < .10$. **$p < .05$. ***$p < .01$.

We therefore find support for Hypothesis 3 for the comparison between high or extreme natural resource scarcity and low natural resource scarcity but not between high and extremely high natural resource scarcity.

Because the marketing training was immediately after t_1, it may have affected our results in that it increased the level of market knowledge in the experimental group at t_2 and t_3 but not in the control group. To test whether this research design feature affected the results, we compared the standardized path coefficients between the control and experimental groups of the marketing training using a multigroup analysis. We found no significant differences in the standardized path coefficients for the effect of market knowledge on natural resource deployment between the two groups across t_1, t_2, and t_3. Furthermore, we also compared whether the average level of product quality for the two groups differs across t_1, t_2, and t_3 using post hoc tests. The Bonferroni, Scheffe, and Sidak post hoc tests showed no statistically significant differences in the average product quality across time for both the control and experimental groups. This result implies that pastoralists manage to keep product quality relatively stable across high and low resource-scarce times.

5 | DISCUSSION AND IMPLICATIONS

The results of this study show that pastoralists in natural resource-scarce times prevent a decrease in product quality through natural resource deployment that is rooted in market knowledge. This implies that natural resource deployment capability is more likely to decrease the impact of resource scarcity on product quality when the resource deployment actions such as the reallocation of available resources, creation of slack capacities, and secure access to substitute resources are founded on the understanding of markets. There are three unexpected effects that need further discussion.

First, we did not find a moderating effect of resource scarcity on the relation between natural resource deployment capability and product quality (Hypothesis 3). In our data, natural resource deployment capability has a strong positive effect on product quality, regardless of the natural resource conditions. A possible explanation is that in the pastoralist context, resources are never really abundant, because lands are marginal (cf. Homann, Rischkowsky, & Steinbach, 2008). Also, the quality of livestock that is offered to buyers in resource-rich times is partially determined by resource deployment decisions in resource-scarce times, for example, because young livestock that was assessed to be suitable to sell at the market received special treatment when pasture was scarce, and after fatting in the resource-rich season, it was sold at the market. In this way, resource deployment always affects quality.

Second, we did not find an effect of market knowledge on natural resource deployment under low resource scarcity, suggesting that market knowledge only strengthens resource deployment when resources are scarce. Vice versa, when resources become more abundant, the level of market knowledge apparently makes no difference, suggesting that more production-oriented ways of resource deployment also lead to desired results. This is an interesting finding because it suggests that market insights make businesses more innovative in dealing with resource scarcity once they are confronted with it (Berrone et al., 2013; Radjou et al., 2012).

Third, we found no significant differences in the effect of market knowledge between high and extremely high resource-scarce times. This finding suggests that the behavioral patterns of coping with resource scarcity do not change as a matter of degree but are rather either present or absent. More specifically, the pastoralists use their deployment capabilities that are rooted in market knowledge in resource-scarce times but do not increase this behavior if the resource scarcity increases further. Extreme droughts are occurring more frequently in the pastoral regions of Ethiopia during the last decade as a consequence of climate change (cf. Homann, et al., 2008). Our results seem to indicate that pastoralists have developed the capabilities to deal with regular droughts but not (yet) with the extreme droughts that they are confronted with now.

This study's findings extend the literature in several ways. First, the study shows that the role of resource scarcity in triggering not only product innovations (e.g., Cunha et al., 2014; Gibbert, Hoegl, & Valikangas, 2014) but also process innovations, specifically, the assembling and integrating of resources as captured in our natural resource deployment capability concept. Second, prior research has examined resource deployment as a functional capability that enables businesses to make efficient and effective use of marketing resources to achieve marketing mix targets in a product group or submarket (Kor & Mahoney, 2005; Slotegraaf et al., 2003). This study extends the research by investigating natural resource deployment as an organizational capability that enables businesses to make effective and flexible use of resources in business processes and is anteceded by market knowledge as an organizational asset. As such, natural resource deployment capability can help businesses to attain and sustain competitive advantages in resource-scarce environments.

The results imply that to minimize quality loss and maintain product quality advantage during resource-scarce times, businesses should carefully consider how they create customer value through the way they manage the deployment of scarcely available resources. The managers should be aware that the effective and flexible deployment of resources considerably contributes to product quality and competitive advantage at times of resource scarcity. If managers anticipate resource scarcity, developing their resource deployment competence will help them to better manage such scarcity in the future. Businesses that are strong in market knowledge will have an advantage because resource deployment is developed from a sharp understanding of markets.

Another implication from our study relates to the importance of market knowledge during resource-scarce times. The lack of market knowledge can create discord between resource deployment and customer preferences, which may lead businesses to waste resources in inefficient or ineffective ways. For that reason, market intelligence

managers should work very closely with operational managers who make decisions regarding the appropriation and utilization of resources, especially when those resources are acutely in short supply.

6 | LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

Our study has limitations that offer directions for future research. First, the study used three waves of panel data. Data collected over a longer period can provide additional insights into the relationship between market knowledge and natural resource deployment. Second, to measure the level of natural resource scarcity, we used a proxy variable, resulting in unequal time intervals across the moments of data collection. Instead of using proxy measures, future research may use direct measures, such as satellite-generated data on vegetation coverage and water availability. Third, we measured product quality through self-assessment. In our data, the level of scarcity for natural pasture decreased from t_1 to t_2 and then increased from t_2 to t_3. The nonlinear nature of the changes in the levels of scarcity for natural pasture suggests that the results cannot be caused by overstatement or understatement. Furthermore, we did not find evidence for a single method bias. Because product quality is primarily based on customers' perception (Kroll et al., 1999), future research may use customer ratings of product quality.

Finally, our study context, Ethiopian pastoralists, also differs in many ways from the corporate high-income market contexts, which is the traditional focus of management literature. To obtain a broader understanding of how the lessons learned in this study translate to other contexts, we encourage more research in different high-income market contexts where businesses deal with temporal fluctuations in the availability of critical resources, for instance, in the agribusiness where the availability of underground or irrigation water is seasonally variable or any type of business for which financial resources, credit availability, or input supplies are variable depending on market conditions.

7 | CONCLUSION

In the current business environment, companies are increasingly confronted with scarcities in natural resources that they implicitly assumed to be infinitely available forever. To understand how companies may deal with such scarcities in a sustainable manner, this article examined the deployment of natural resources in a context that is resource-scarce, namely, that of Ethiopian pastoralists. The results show that natural resource deployment is in fact a capability as it is rooted in skills and knowledge and has a significant effect on the quality that is offered to buyers, also at times that resources are scarcely available. When resources become scarce, market knowledge appears to provide additional insights to pastoralists that enable them to act efficiently and effectively, meaning to provide customers with

the quality that they expect as much as possible in the given circumstances. Therefore, when resources run out, market knowledge steps in.

ORCID

Desalegn A. Gugissa https://orcid.org/0000-0001-5721-6433
Paul T.M. Ingenbleek https://orcid.org/0000-0001-8793-716X
Hans C.M. van Trijp https://orcid.org/0000-0003-2323-4064
Mebrahtu L. Teklehaimanot https://orcid.org/0000-0002-8823-2572

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