Master's thesis

NTNU
Norwegian University of Science and Technology
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Reinventing the Business Model of Local Agriculture

Master's thesis in Technology Management
Supervisor: Jørgen Veisdal
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Abstract

Brazil's Amazon rainforest and California are both ravaged by wildfires. The Amazon fires are caused by high agricultural pressure, whereas the Californian fires are fueled by lack of agricultural pressure. This imbalance is driven by increased competitiveness in concentrated agriculture compared to local agriculture. This paper is trying to identify how local agriculture could become more competitive by internalizing vegetation management. Demand for vegetation management is considerable and growing. Local agriculture could benefit from seizing this demand and thus increase its competitiveness.

Key Words

Local agriculture, competitive advantage, externalities, network effects

Preface

The way we produce food will at some point have to shift back from unsustainable and concentrated production to sustainable and more widespread local agriculture. We will not go back in time. We will find new ways with new technology. How fast we get there does not only depend on political willingness and consumer awareness, but also on local agriculture´s ability to exploit its competitive advantages. This paper is my contribution to cheer local agriculture into future competitiveness.

Writing this paper has most of all been thrilling and fun. Thanks to Arild Aspelund for organizing the excellent Master of Technology Management program during the last two years. Thanks to Jørgen Veisdal who has been supervising me with clear and concise inputs. Last, but not least, thanks to my wife Kari who provided me with time to write and who also helped me with corrections.

Contents

Introduction

Agricultural businesses have for several decades concentrated around productive land areas, whereas less productive areas have been abandoned. The concentration in agriculture has improved cost efficiency, and thus enabled lower food prices. There are however some negative consequences of concentration in agriculture that are not part of the equation when food prices drop.

Consequences that are not being reflected in the price are called externalities, and concentration of agriculture is escalating the level of negative externalities. Too high agricultural pressure is unsustainable and could potentially lead to high costs for society. Deforestation, consumption of groundwater and accumulation of pesticides are typical examples where agriculture causes costs to society. Down-sizing of dispersed local agriculture is also leading to negative consequences. Local agriculture produces benefits to society, like managing vegetation. Downsizing would consequently lead to less benefits in terms of absence of positive externalities.

The purpose of this paper is to explore if local agriculture could become more competitive by capturing value from the positive externalities that it is creating. Capturing value from an externality is also called internalizing an externality. If local agriculture succeeds to become more competitive relative to large scale agriculture, it will gain higher market shares. Higher market shares for local agriculture will in turn reverse the negative impacts of concentrated agriculture. The Research Question (RQ) is therefore focused on how to improve the competitiveness of local agriculture:

How can local agriculture leverage internalizing of externalities towards competitive advantage?

This paper has a traditional outline, where theory and literature are presented initially. The method used in the paper is presented before the context of Local Agriculture is described. The findings from interviews are presented in the Findings section. The following Analysis section provides a market context based on own findings compiled with public sources. The Discussion section employs the theory on the market context in order to explore possible

solutions to the RQ. The RQ and the findings are concluded in the last section together with implications for stakeholders. References and sources are listed in the appendix.

Literature and theory

The purpose of this chapter is to present a selection of literature that provides a theoretical context to the competitive position of Local Agriculture (LA). The Research Question (RQ) pursues competitive advantage and various approaches to the term is therefore elaborated. The RQ also explores if LA could internalize externalities, and theory to define and explain externalities is therefore included. The Sharing Economy, as a relatively new research area, is also being elaborated where in particular Collaborative Consumption is highlighted. Platform theory is described, since it might be a tool for internalizing externalities. Various theories from economics, such as theory of goods and pricing theory, are mentioned to cover the terminology used throughout the paper.

Competitive advantage

Michael Porter defined competitive advantage as ability to perform at a higher level than others in the same market (Porter 1980). Firms could gain competitive advantage by positioning themselves either through cost leadership or differentiation. Profitability through cost leadership would arise from high market share among price sensitive customers combined with low production costs. Cost leadership would presumably rely on economies of scale, where unit costs decline at higher volumes. Successful differentiation implies that less price-sensitive customers are willing to pay a premium for a differentiated product or service. This will allow the firm to get profitability, even at higher costs than its´s cost leading competitors. Porter also mentions focus strategies that are not indystry-wide, but targeted towards niches or segments. This is not a separate strategy for big companies, but business units or small companies could adapt a focus strategy towards a niche.

The Resource Based View (RBV) emerged in the early 1990s. Whereas Porter´s approach was focused on strategic positioning, the RBV was more focused on how to achieve Sustained Competitive Advantage (SCA) through exploiting the strategic resources of a firm (Barney 1991). A firm has a competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by competitors. If competitors are unable to duplicate the strategy, there is SCA. In order to achieve SCA, a firm needs to be in possession of heterogenous and immobile resources to protect themselves from competition. In this context heterogenous means that competitors are in possession of different types of resources, while

immobile means that the resource is impossible or expensive to trade. Strategic key resources should be identified and evaluated through the VRIN-criterias (Valuable, Rare, Imperfectly imitable and Non-substitutable). Based on the evaluation of these criterias, the resources should be developed and protected in order achieve SCA.

The definition of SCA was later elaborated further by clarifying four conditions that need to be met (Peteraf 1993). These conditions were defined as resource heterogeneity, Ex ante/Ex post limits to competition and imperfect factor mobility. Heterogeneity implies that firms of varying capabilities are able to compete in the same marketplace. Firms with unfavorable capabilities will at least break even when marginal costs are equivalent to the price. Firms with superior resources would earn additional profit, and this profit is called a Ricardian rent. Ex ante limits to competition implies that high competition prior to establishing a position with superior resources could jeopardize the potential for SCA. Ex post limits to competition prevent the Ricardian rent from being traded away. If competitors are able to make imitations or substitutes of a certain product, the Ricardian rent could diminish. SCA would therefore rely on imperfect imitability and imperfect substitutability in order to preserve the Ricardian rent. Imperfect resource mobility means that a resource cannot be traded away, or it is less valuable outside the firm. These resources are bound to the firm and could become a source of SCA. A firm would employ such resource where it creates most value. The employment of the resource could be viewed as a kind of opportunity cost in terms of excess value over the next best use. This valuation method is called Appropriable Quasi Rents (A-Q Rents).

More recently RBV has been subject to criticism (Kraaijenbrink, Spender et al. 2010). One of the most important critiques points out that being in possession of a resource is not sufficient. SCA also depends on ability to deploy the resources through “deployment capabilities”. Another acknowledged critique of RBV focuses on the path from the resources are acquired to value is created, where SCA also depends on this transformational period of resources. The last recognized critique of RBV claims that the definition of a resource is too wide. There is no distinction between those resources that are inputs and the capabilities that enable the firm to deploy such inputs. The lack of distinction makes it problematic to understand how different types of resources lead to SCA.

Externalities

In economics, an externality is the cost or benefit caused by a producer, but not financially incurred or received by the producer (Pigou 2013). The externality is negative if for example the producer causes pollution that harm third parties without being charged. Correspondingly, the externality is positive if the producer creates a good to third parties without charging it. Governments often take actions to internalize negative externalities by for example regulations or taxes. In some cases governments also try to internalize positive externalities through subsidies. However, a firm would also thrive to internalize a positive externality as it would capture more value and that might be why negative externalities are more common.

The Coase Theorem states that trade in an externality would always lead to a Pareto efficient outcome (Coase 1960). A Pareto efficient outcome means that all parties would be better off by trading in the externality. The theorem is however conditional to sufficiently low transaction costs. Transaction costs could potentially get high due to continuously bargaining between a range of parties, thus the transaction costs would in many cases outweigh the benefits.

A network effect occurs when the value of a certain good or service is affected by the number of users. For example, the value of having a phone increases when more people subscribe for a phone. A network externality is a specific kind of network effect where trade is affected by network participation (Liebowitz and Margolis 1994). Positive network externalities could also be divided between direct and indirect effects (Katz and Shapiro 1985). Direct effects are improving the product or the service itself. Indirect effects take place when higher traffic in the network lead to more complementary products or lower prices.

Sharing economy

The sharing economy is a system built around sharing resources. In more recent publications the definition has become narrower, it relates to IT facilitated peer-to-peer (P2P) sharing of underutilized goods or services without changing ownership (Schlagwein, Schoder et al. 2020). Other definitions of the sharing economy include businesses (B2B). Even though sharing economy is not new, it has accelerated over the last decades. The development of

information technology has inarguably been an important enabler for growth in the sharing economy.

Collaborative consumption is related to the sharing economy. It is defined as people coordinating the acquisition and distribution of a resource for a fee (Belk 2014). Collaborative consumption is mostly focused on transactions with change of ownership, whereas most definitions of the sharing economy exclude change of ownership. Thus, it is reasonable to claim that sharing economy and collaborative consumption are complementary in terms of exploiting various types of underutilized goods. The sharing economy covers reusable goods with a long lifetime that are suitable for sharing without change of ownership. Collaborative consumption on the other hand covers goods and services with ultimate consumption where change ownership is a necessity.

Crowdfunding is not directly related to the sharing economy, but it has similarities in the use of information technology. It is defined as an open call through the Internet for the provision of a financial resource in exchange for some form of reward (Belk 2014). Crowdfunding is distinguished from the sharing economy, since the initiative exclusively comes from the supply-side. This is presumably related to the type of the goods being sold. It could be a stake in a project, such as getting free tickets in exchange for building a local theatre. Markets are more likely more efficient if initiatives appear in demand-side. There could however be barriers for consumer initiatives, such as involvement from multiple parties, high complexity and lack of standardization that supply-side initiatives like crowdfunding more efficient.

Platforms

Following the rapid emergence of platform companies such as Google, Facebook, Amazon and Netflix in the 2000s, the focus of strategic research has also shifted. The classic strategy theory is arguably insufficient to explain the dynamics in a platform company. A platform is defined as a nexus of rules and infrastructure that facilitate interactions among network users (Eisenmann, Parker et al. 2011). The platforms also match buyers with suppliers, who transact directly with each other using system resources and are generally subject to network effects

(Hagiu and Wright 2015). Multisided Platforms (MSPs) are technologies, products or services that create value by enabling direct interaction between two or more distinct groups.

More recent research has in particular focused on network effects related to platforms (McIntyre and Srinivasan 2017). In markets characterized by direct network effects and high network intensity there are a considerable first-mover advantage. In such markets the platform companies are incentivized for fast growth to get an installed base of users. In markets with indirect network effects and less network intensity, the quality of the platform tends to be more important. In these markets the users are more tempted by functionality than number of users, and late market entrance is not necessarily a disadvantage. The drivers of quality and indirect network effects are primarily enhanced functionality through complementary products. Whether a platform in such market succeeds would therefore rely on the ability to link up with the right complementors.

Other theories and definitions

Goods are essential in economic theory and relates to items wanted by humans and make the basis for trade. A good could be categorized in terms of whether it is rivalrous and excludable (Samuelson 1954). A good is rivalrous if one consumer prevents or reduces other consumers ability to consume the same good (Weimer and Vining 2017). A good is excludable if consumers could get excluded from consuming it. Goods that are non-rivalrous and non-excludable are often referred to as Public Good. Examples of Public Goods could be air, water or national defense.

Public Goods are often related to externalities, since the cost or benefit caused by a producer is not necessarily incurred or received by the producer. Positive externalities arising from Public Goods are often referred to as a free-rider problem due to access to a good without paying. However, a public good is also well suited for cost sharing due to its non-rivalrous nature. The non-rivalrous characteristic of a good could imply underutilization, which is essential in the sharing economy. Moreover, a public good has an inherent potential to internalize positive externalities. It is not unlikely that improved information technology would enable increased internalizing that would in turn lead to higher supply of public goods.

The term reservation price describes the limit on the price of a good or a service (Myerson 1981). On the demand-side, it is the highest price that a buyer is willing to pay. On the supply-side it is the lowest price that the seller is willing to accept. Value creation is the total value created in a good or a service. Value capturing is the value received by one of the parties. If the seller sells a good to a buyer at the buyer´s reservation price, all the value is captured by the seller. Correspondingly, if the good is sold at the seller´s reservation price, all the value is captured by the buyer.

Entrance barrier is a term from competition theory that relates to the fixed cost that must be incurred by a new entrant regardless of production or sales activity. The fixed cost is not necessarily a fee, but it could for example be compliance of regulation or industry standards. Entrance barriers limit the competition by protecting incumbent firms from new entrants.

Economies of scale is a term from microeconomics and describes the cost advantage of scale. The cost per unit would consequently decrease with increased output. Markets with a high degree of economies of scale would typically lead to concentration of production among large producers with subsequent high entrance barriers.

Information asymmetry derives from contract theory and describes transactions when one party has more information than the other. Information asymmetry leads to imbalance between the parties and could potentially lead to market failure.

Opportunistic behavior is used in various contexts but should in this context be understood as a partnership motivated by each partner´s desire to maximize economic self-interest.

Methodology

Research design and context

The Research Question (RQ) explores whether Local Agriculture (LA) could gain competitive advantage from internalizing value from Vegetation Management (VM). Since the RQ describes a hypothetical situation, a quantitative study based on observations (a posteriori) is considered to be less feasible due to lack of data points. Qualitative studies, such as case studies enable wider use of variables than data points. The process of defining relationships between data collections does however become more important.

Case studies cope with technically distinctive situations in which there will be many more variables of interest than data points (Yin 2017). This also enables benefits from developing theoretical propositions in advance to guide design, data collection and analysis. Such an approach does, however, rely on multiple sources of evidence, with data needing to converge in a triangulating fashion. Triangulation could be described as the process of "self-consciously setting out to double check findings, using multiple sources and modes of evidence" to confirm qualitative findings (Miles and Huberman 1994).

Inclusion Criteria

An initial definition of the RQ is important in building theory from case studies (Eisenhardt 1989). The rationale for defining RQ is the same as in hypothesis-testing research. Without a clear research focus, it is easy to become overwhelmed by the volume of data. If necessary, RQ could also be formulated as different Research Problems (RP) together with relevant variables if possible.

The RQ in this paper is exploring how LA could gain competitive advantage from internalizing VM. This RQ makes the basis for several Research Problems. First of all, it is important to provide some kind of evidence that there is viable demand for VM. If demand for VM is insignificant, there would be nothing to internalize, and thus no competitive advantage. Inclusion criteria to investigate demand of VM is primarily focused on existing buyers. In addition, buyers of services that could be substituted by VM are also included.

Undergrounding of powerlines in California to avoid wildfires and Norwegian agricultural grants to promote self-sufficiency are typical examples of demand that potentially could be substituted by VM. This information is collected from various public reports. The paper also includes an interview with an intermediary of VM and a supplier to cross-check and confirm the information from the demand-side.

Another important RP was to investigate if LA potentially could internalize VM. If LA is uncapable of internalizing VM, there would obviously not be any competitive advantage either. Inclusion criteria for this research problem are sources that could describe the supply-side´s inclination to offer VM. Interviews with intermediaries and suppliers of VM shed some light to this RP.

Data collection

The primary source of data gathered for the study were interviews, which is the most common method of data collection used in case-based research (Eisenhardt 1989). The interviews were conducted by phone or as digital meetings. Each interview lasted from half an hour up to two hours. The interviewees were informed about the purpose of the study and gave consent that the findings could be published. Prior to the interviews, a brief interview guide with some open-ended questions were composed. However, the interviews gave deeper insight, so topics beyond the initial interview guide were also discussed.

Limitation

Interviews as a source of data could be exposed to bias due to poorly articulated questions, response bias etc. Open-ended questions and a less strict interview guide did however seem to mitigate some of this risk.

Investigating existing demand for VM and further triangulation of the findings through interviews was feasible. Studying demand for services that could be substituted by VM was also feasible by use of public reporting. The ability to study demand-side´s inclination to shift from alternative providers to LA for VM services has however been limited due to lack of observations. So has the inclination to use VM as a substitute for other services.

Context

Agricultural production has over decades been subject to concentration within and across country borders. Local Agriculture (LA) in terms of smaller farms have lost market shares to Large Scale Agriculture (LSA). Small farms have been replaced by large farms and rural less productive farming land has been replaced by concentrated and high productive farming land.

The concentration of agricultural production could be explained by an increase in the competitiveness of LSA compared to LA. The shift in competitiveness is most likely driven by multiple factors. LSA has become less labor intensive than LA through a higher degree of automatization. Investments in automatization rather than use of labor implies lower resource mobility. Such shift could increase economies of scale and would in turn generate further concentration. Another possible explanation for the concentration is migration towards more productive land areas. Unfavorable resources are being replaced by superior resources. The migration is enabled by improved transportation and storage and possibly also liberalization of trading agreements between countries.

Negative externalities have surged in the wake of agricultural concentration. Deforestation of rainforest, unsustainable use of groundwater and accumulation of pesticides are some of the consequences of agricultural concentration. Preventing negative externalities is in general a government responsibility in the capacity of making regulations and taxations. Initiatives to impede negative externalities from centralized agriculture are apparently ineffective or absent. There are most likely multiple reasons for weak of regulations, but lack of transparency due to extensive trade between jurisdictions is arguably an important reason.

Vegetation Management (VM) is a positive externality related to LA. When small rural farms are closing down, unmanaged vegetation will eventually pile up. The consequence of absence of positive externalities is in this case piled up vegetation that could cause negative effects such as wildfires. The increasing absence of LA has also led to higher demand for VM from third parties that are harmed by the vegetation. The market for VM is growing and could, if internalized, lead to a Sustained Competitive Advantage (SCA) for LA.

To capture value from VM, LA needs to compete with regular contractors with a singular objective to manage vegetation. Grazers are a key resource in LA and additional value created by deployment of grazers in a specific location could be considered as Appropriable Quasi Rents (AQ Rents). If LA needs to do VM regardless, targeted deployment of grazers in order to attract income from VM would increase profits. Thus, optimized deployment of grazers would lead to higher A-Q rents that in turn could imply SCA. Even small amounts of additional income from VM could make a certain LA operation profitable. In markets where labor costs are particularly high, LA could also take advantage of grazers being relatively more cost efficient than manpower.

Findings

The purpose of this chapter is to gather firsthand knowledge of the market for Vegetation Management (VM). The interviews were designed to analyze the demand-side and the supply-side of the market for VM. There are three interviewees that together cover all sides of the market.

August Johan Evensen works in a regional Norwegian grid company (Gudbrandsdal Energi), where he is responsible for a pilot project to contract VM by use of grazers[i]. He was interviewed due to his firsthand knowledge of demand-side´s view on VM. August Johan said: "We spends about NOK 10 000 per km a year to clear vegetation along our power lines. The vegetation is normally cleared in intervals of 5 years. Today we could spend up to 1/5 of our VM budget on grazers to clear low scale vegetation, but the remaining 4/5 needs to be spent on manpower to clear large scale vegetation. However, with sufficient supply of grazers at low enough cost, it could, in theory be more cost effective to spend the entire budget on grazers to keep the vegetation on a continuously low level."

Magnus Gabrielsen is employed in Nofence, which is a tech company that provides virtual fencing through GPS devices attached to grazers[ii]. In the role of providing technical devices to supply-side, Nofence has gained knowledge of the market for VM by use of grazers. Magnus has also participated in a pilot project with Statnett, the national grid operator in Norway, where VM was operated by grazers. Magnus said: "One of the main challenges with VM contracts along power lines is that there are many different landowners. The contracts between the grid company and the landowners allow VM along the power lines. However, VM by use of grazers is not directly specified in the contracts and use of grazers seems to be more intrusive to landowners than use of manpower. Additional effort to make landowners accept grazers have so far been the most important challenge. Also, grazers must be kept in defined zones to reduce risk of contagion, and this could limit flexibility of supply."

Eivind Susort is the founder of Leiegeit.no which is a relatively new startup that intermediates supply and demand of VM by use of grazers[iii]. Leiegeit has gathered information from numerous buyers and suppliers over a couple of years. He has received several hundred

demand requests for VM. Apart from demand related to infrastructure, Eivind has also received numerous demand requests related to increase the recreational value of a certain landscape. Eivind also has grazers himself, and he provides VM services to the local grid company. He confirms that providing VM along power lines with multiple landowners is challenging. He says: “Powerlines in Norway often cross many different properties. Getting permission from landowners to use grazers is normally achievable, but it requires an extra effort. In many cases neither the demand-side nor the supply-side are willing to take the effort to get the permissions and it is therefore hard to get the market to work without an intermediary.” Eivind has also obtained knowledge about the supply-side and their ability to scale up. He says: “The supply-side could scale relatively fast. The suppliers are basically just waiting for demand. However, manageable bureaucracy related to landowners as-well as predictable and steady demand will be crucial to attract supply at scale.”

Analysis

The purpose of this chapter is to explore potential demand for Vegetation Management (VM) by use of grazers. The exploration is based on a compilation of own findings and other publications and sources. The current demand for VM by use of grazers is sparse. However, the potential demand consists of grazers taking a larger share of the market for VM. In addition, use of grazers could seize demand from buyers trying to solve problems related to self-sufficiency of food, dispersed settlement and wildfire risk.

The demand for VM is heterogenous due to different objectives. In a country like Norway most current demand derive from reducing operational risk related to infrastructure as-well as to increase the recreational value of landscapes. In drier climates, such as in the Mediterranean and in the US West Coast, reducing risk of wildfires would be the most prominent objective.

Non-public demand for VM in Norway is primarily related to infrastructure and landscape maintenance. The infrastructure companies in Norway, such as grid, road and railway companies, already spend sizeable amounts on VM. Norway has a total of 130 000 km power lines[iv], 98 000 km roads[v] and 4 000 km railroads[vi]. With a cost of NOK 10 000 a year per km, this would imply that infrastructure companies spend more than NOK 2 bn a year at VM. Local Agriculture (LA) could potentially capture a large share of this income if its services were considered to be competitive. Demand related to increasing the recreational value of landscapes is highly fragmented and immature. There is a potential demand from more than 437 000 cabin owners[vii], tourist destinations, ski resorts, local governments etc. This demand is increasing not only due to absence of LA, but also because vegetation is expanding to recreational areas at higher altitude as temperatures are raising. However, this kind of fragmented demand needs to be structured and aggregated in order to attract supply.

Public demand in Norway is primarily related to agricultural support. Norwegian agriculture receives about NOK 28 bn in annual support, according to OECD estimates[viii]. Around NOK 18bn is given through budgetary support, whereof NOK 11 bn is allocated through agricultural grants (Jordbruksoppgjøret). In addition, there is an estimated deadweight loss of NOK 10 bn caused by import taxes to protect national agriculture produce. Direct grants to

LA are complex and highly fragmented, but the underlying purposes are to ensure self-sufficiency of food and maintain disperse settlement in rural areas. The purposes behind the government spending are not considered to be fulfilled[ix], and the agricultural policy is currently subject to a political debate. If allocation of grants through VM gets considered to be more effective than the current allocations, this would have a significant impact on demand.

Wildfires in the US is estimated to cost as much as USD 450bn a year[x]. The relationship between absence of LA and wildfires is not necessarily perfectly correlated, but it is widely accepted that piled up vegetation is a prerequisite for wildfires. Even if costs caused by wildfires are high, the demand for mitigating wildfires is sparse. The grid companies in California have however been charged for starting wildfires due to sparks in the transmission net. As a consequence, the grid companies have been imposed to secure the power grid from starting fires. Securing the power lines from risk of fire would in many cases involve undergrounding the power lines. If all power lines were undergrounded costs could amount to USD 240bn[xi]. Californian grid companies´ costs related to mitigate wildfires are undoubtedly raising rapidly and are expected to reach an annual USD 5bn as of 2022. If LA could provide a cost-efficient alternative to mitigate risk of wildfire, grid companies could be inclined to shift spending towards LA.

Discussion

Entrance Barriers

Unequal bargaining power represents an entrance barrier for LA. The market for VM would mainly consist of large institutional buyers and a numerous range of small and diverse suppliers within LA. In order to match demand with supply, a large institutional buyer would need to contract a large quantity of suppliers. Most buyers do not have a setup to handle a large quantity of contracts. The buyers would inarguably prefer a large counterpart to handle its demand in one contract, regardless higher costs. This entrance barrier is currently excluding most LA from the market. However, an intermediary could potentially aggregate supply and relieve the buyers from administrational effort and thus lower the entrance barriers for LA.

Economies of scale

Lower unit costs at higher volumes indicates economies of scale. Supply-side is presumably driven by economies of scale. LA´s initial income derives from its´ food produce. The reservation price for VM is driven by costs related to relocation of grazers into a specific area. If the relocation requires additional transport, fencing, herding etc., the reservation price could surge. On the other hand, if relocations costs were absent, the reservation price would be correspondingly low. LA´s competitiveness in terms of supplying VM is thus a function of relocation costs. Grow in demand would stimulate to a dispersed establishment of LA in order to reduce relocation costs. Dispersed LA would in turn reduce cost of supply that consequently implies economies of scale.

Deployment capabilities indicate the ability to transform resources into a competitive advantage. LA could presumably generate indirect economies of scale in VM by optimizing the mix of food produce and VM. Grazers fed by local vegetation rather than random feeding enables access to higher quality segments. The end products could be marketed in segments with higher margins, such as “locally produced” and “grass-fed”. Such value creation would however depend on monetization of higher quality of feedstock. It could be therefore be argued that increased VM generates additional income through the food produce which in turn reduces the unit cost of VM.

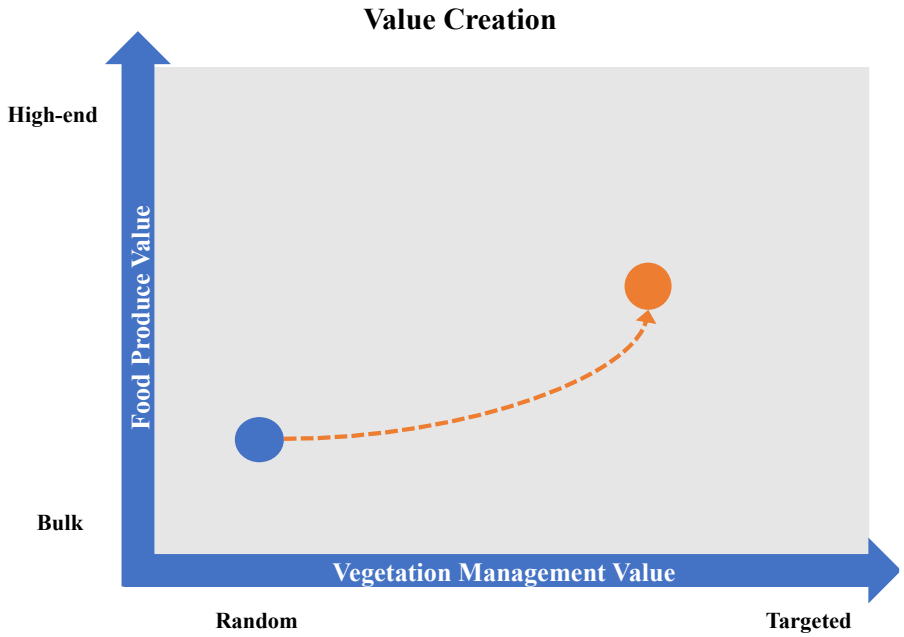

Figure 1: The figure illustrates that value created in Vegetation Management increases the value created in Food Produce that in turn spills over to economies of scale.

Multisided Platform

A Multisided Platform (MSP) is characterized by its ability to match supply and demand through direct interaction between two or more distinct sides. In VM, supply- and demand-side need to be able to interact with each other. In order to match supply and demand, a defined area and a price would therefore need to be agreed upon.

Pricing

The price for VM could be contracted by either input or output. The input could be defined by the number of grazers and the number of days carried out in a specific area. The output could be defined by the size of the area and by operational difficulties such as level of vegetation. Norwegian utilities have traditionally contracted VM by output that reflects the actual demand. However, some utilities have piloted VM contracted by input over the last couple of years. Contracting by input is obviously not preferable to the utilities, but rather a necessity to attract immature and fragmented supply. However, demand-side is rather concentrated and professional and should presumably overcome the barrier of bidding at input rather than output.

There are also other aspects in building a platform, where input-based pricing would be preferable. In an input-based pricing model, grazers would be equipped with GPS trackers to monitor that the stay within the contracted location. In an output-based pricing model a standardized assessment of vegetation could be employed. In most situations a rough assessment through satellite photos would be sufficient. If risk of non-fulfillment is high, the assessment could also be strengthened by photos taken manually or by drones. The main advantage of input-based pricing is however the ability to monitor real-time data on contract fulfillment. In comparison, contract fulfillment in an output-based pricing model could only be checked subsequently. Being able to collect large quantities of data could potentially become a strategic resource that could create a sustainable competitive advantage for the platform. Real-time data reduces asymmetric information between the parties and thus lowers risk of fraudulent behavior that could potentially threaten trading volumes. Input-based pricing also allows a higher degree of automatization through real-time data collection that could enable faster growth of the platform.

Collaborative consumption

Coordination of acquisition between buyers is defined as collaborative consumption. Such coordination requires multiple buyers of a service. In a given area, multiple buyers could have shared interest in VM. For example, if a power line crosses a ski lift, the utility and the ski lift owner would share the interest of VM in this specific area. Consumption of VM for one user does not affect subsequent use for other buyers, which makes VM a non-rivalrous service. This implies that multiple buyers could share the costs without deteriorating each other's value of the service. On the other hand, non-paying beneficiaries of VM are hard to exclude, which makes it a public good that is exposed to free riders.

A Multisided Platform could enable collaborative consumption. Multiple buyers in a specific area could lead to cost sharing without deteriorating the value of VM for any of the buyers. The buyers could however have different objectives and reservation prices.

Sequential stacking of demand could possibly lead to increased demand due to opportunistic behavior. The buyers could be divided into two conceptual groups in order to highlight the

potential of opportunism in collaborative consumption. Buyers with a wide objective would typically be public buyers aiming to maintain dispersed settlement, reduce the risk of wildfires or restore a landscape. Buyers with a narrow objective would typically be private buyers, such as a utility that has a specific demand around its infrastructure. Buyers with a wide objective would maximize value by placing bids over a large area, but sufficiently below the supplier´s reservation to attract bids from other buyers. Areas without additional demand would consequently not attract supply. Buyers with a narrow objective would maximize value by placing a bid that fills the gap between the bid from buyers with wide objective and supplier´s reservation price. Such behavior would imply that collaborative consumption could lead to higher trading volumes.

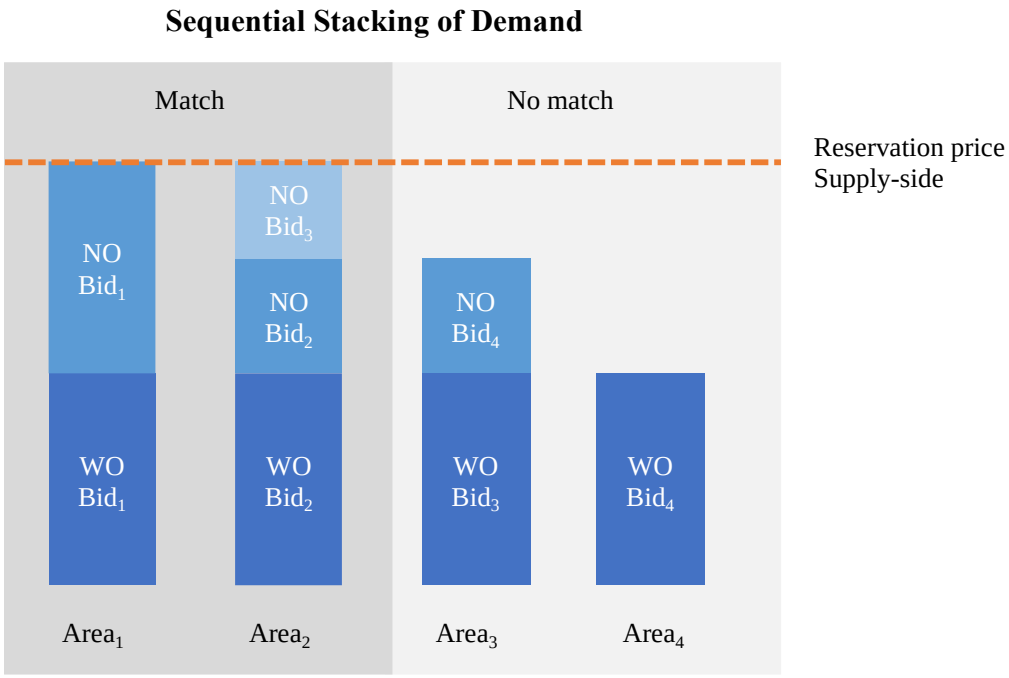

Figure 2: The figure illustrates collaborative consumption through widespread demand from bidders with Wide Objective (WO), whereas bidders with Narrow Objective (NO) only target specific areas. Matching between supply and demand only occur in areas with combined demand from WO and NO bidders.

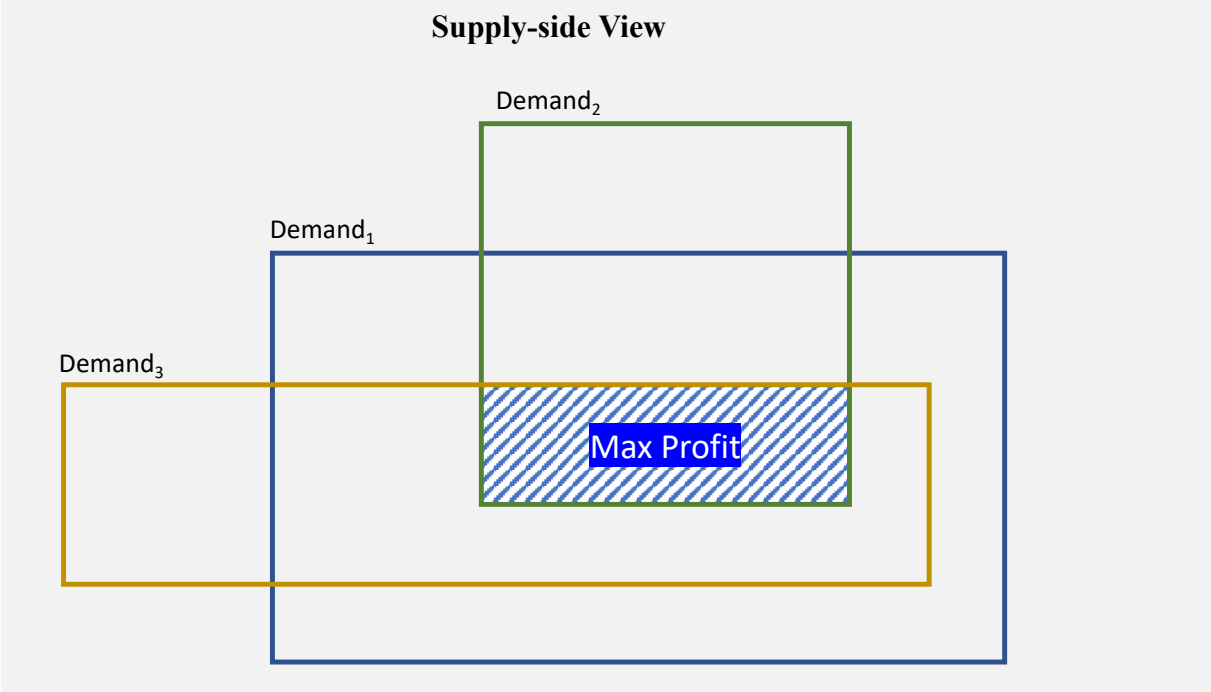

Figure 3: Illustration of supply-side view, where suppliers would maximize income by targeting areas with multiple demand.

Network externalities

If the number of users increases the value and affects trade in a service, network externalities would materialize. Direct effects improve product quality, whereas indirect effects reduce prices or improve complementary product offers. In collaborative consumption, product quality will remain unchanged, but cost sharing would make the prices decline if the number of buyers increase. Price reduction as a consequence of more buyers would in theory lead to more trade in terms of higher demand from existing or new buyers. Since collaborative consumption only affects the price and not the product quality, the network effects are considered to be indirect. Thus, it could be argued that collaborative consumption of VM could generate indirect network externalities.

Crowdfunding

Crowdfunding is a call for financial resources in exchange for some form of reward. Calls could be integrated in a Multisided Platform. A call for funding would necessarily have to be initiated by the supply-side. If demand-side is price sensitive and does not have too specific area requirements, supply-side initiative could lead to more trade. Suppliers are most familiar

with their own reservation prices and could therefore bundle an area package with low cost to operate. Buyers with specific would most likely not join such offer, but in return entrance barriers could be lowered for numerous buyers with relatively low reservation prices.

Property owners

Property rights have proven to be a potential barrier for VM. Property owners should therefore be considered to be included in the platform. If demand- or supply-side controls the property, property right would not be an issue. Should the property be controlled by a third party however, there might be a conflict of interest. Third party could accept VM with or without compensation or refuse any VM at all. Since demand and supply side do not necessarily have a setup to gain access to properties, there is a risk for losing potential trade.

Giving landowners access to the platform could reduce the risk of losing trade. Landowners could monitor activity at the property, and compensations could be facilitated proportional to the VM activity. Prospective compensation could even stimulate landowners to clear their property on the platform, in advance of any VM activity. Landowner participation on the platform would improve predictability of service delivery and thus the service quality. Improved quality as a consequence of additional users in a network could imply that landowner participation would lead to direct network externalities.

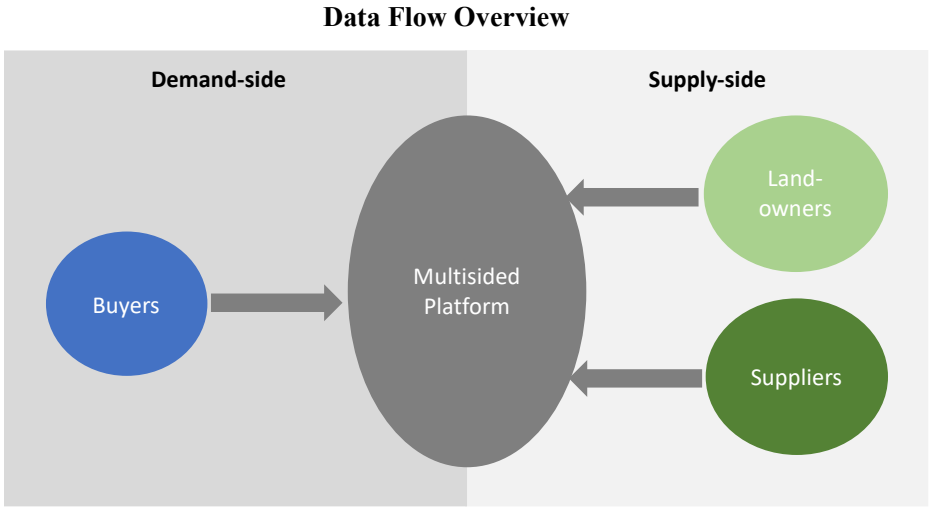

Figure 4: Illustration of Data Flow, where Buyers, Landowners and Suppliers all provide data to the Multisided Platform in order to facilitate matching between supply and demand.

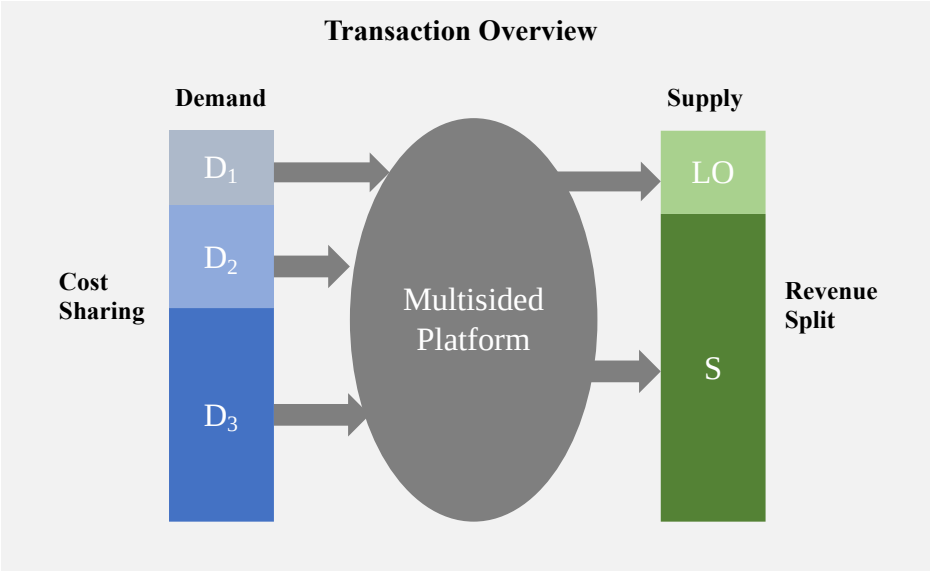

Figure 5: Illustration of a transaction with cost sharing on Demand-side (D) combined with a revenue split between LandOwner (LO) and Supplier (S).

Conclusion

This paper has explored whether Local Agriculture (LA) could leverage internalizing of Vegetation Management (VM) towards a competitive advantage. The research has explored the market for VM, whereas the discussions have been focused on how LA could become a competitive supplier of VM in a manner that leads to competitive advantage.

If LA should leverage VM towards a competitive advantage it would rely on a sizeable demand for VM. The research in this paper has found that there is a viable and growing demand from in particular infrastructure companies. This demand is currently serviced by manual labor but could in theory be replaced by LA at competitive terms. Areas where VM operated by LA could potentially substitute other services have also been investigated. Examples of areas where LA could appear as a substitute for current solutions are reduction of wildfire risk, improved self-sufficiency and increased dispersed settlement. These areas are associated with high willingness to pay and if LA manages to establish a competitive solution to these problems, demand would increase correspondingly.

LA´s ability to internalize VM depends on competitive supply even at high demand. LA is currently not a significant supplier of VM, most likely due to entrance barriers caused by a concentrated demand-side and a highly fragmented supply-side. If LA should overcome these entrance barriers, the supply needs to be sufficiently organized in order to attract the demand-side.

A platform as an intermediary could possibly offset these entrance barriers. The platform could facilitate matching of supply and demand and thus make VM delivered by LA more attractive to the demand-side. The platform could even stimulate demand further by facilitating collaborative consumption, where multiple buyers share costs. VM, as a public good, is particularly suited for cost sharing since joint consumption does not deteriorate any of the buyers´ value of the good. Collaborative consumption is a source to network externalities in terms of more users leading to lower prices for each buyer. The research found that lack of landownership management could represent a barrier to VM services. Landowners should therefore be considered to be included as a third side in the platform.

LA might benefit from economies of scale if it gets a footprint within VM. LA´s costs related to VM are primarily related to relocation of grazers. Increased supply would possibly lead to more dispersed settlement that would in turn reduce relocation costs. Moreover, a higher share of VM in LA would enable higher profit margins in the food produce through high-end quality segments such as “grassfed” and “locally produced”. This increased profit would in turn spill over to VM and thus be leveraged towards a competitive advantage.

Implication for policy makers

Norway already spends sizeable amounts on its agriculture. The most important objectives behind the agricultural policies are to ensure self-sufficiency of food and dispersed settlement. The current allocations are complex and emphasize agricultural output rather than use of domestic land areas. Since the effect of the current policies are weak, it should be evaluated. VM in targeted areas is most likely a more effective driver than agricultural output to achieve the political objectives. VM should therefore be considered as the major criteria for allocation of grants going forward. In addition, the policy makers should consider to structure allocations to VM in a way that enables collaborative consumption with non-public consumers, and thus create even larger domestic agricultural activity.

US does not grant any significant agricultural support. However, regulations imposed to grid companies in order to mitigate wildfire risk should be evaluated. Solutions to mitigate wildfire risk should not be limited to secure own equipment from starting fires, since use of grazers could potentially give the same risk reduction at a lower cost. Such adjustment of the regulation could reduce costs to the grid companies and shift a large amount of demand towards LA.

Implication for managers

Managers in infrastructure companies could potentially lower their cost base by contracting VM from LA. Such cost reduction would however rely on sufficient supply. Some Norwegian grid companies have already piloted some minor projects by use of grazers. Managers should continue to explore how to scale supply-side by offering predictable demand forecasts. Managers with large demand might also benefit from taking an active role in the

establishment of an intermediary that could lower the bureaucratic burden for their counterparties.

Implication for research

Research related to the sharing economy, collaborative consumption and crowdfunding has essentially been fueled by the emergence of information technology. New technology enables more trade due to improved communication between the supply- and demand-side. The research of sharing economy is concerned with underutilized assets without change of ownership. The research of collaborative consumption covers joint acquisitions, with change of ownership. The research of crowdfunding covers supply-side initiatives for joint acquisition.

The research mentioned above does not have a particular focus on public goods. Research on public goods has so far mostly been concerned with how to avoid freeriding. An exploration of public goods in light of the prevailing information technology would most likely uncover an increased potential for collaboration between individuals and governments. If such collaboration leads to cost-sharing, there would be network effects, since more users lead to a lower price for each buyer. Cost sharing would enable governments to accomplish more by spreading their spending on a wider range of public goods, than without cost sharing. Thus, the following research question could complement the research related to trade enabled by improved information technology: “How can governments increase value for tax-payers by sharing costs of public goods with third parties?”

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