


Article

Climate Variation—A Perceived Drag on Rural Business Performance

Timothy Clune ^{1,*} and Ana Horta ² ¹ La Trobe University Business School, La Trobe University, Melbourne 3086, Australia² Institute of Land, Water and Society, Charles Sturt University, Albury 2640, Australia; ahorta@csu.edu.au

* Correspondence: t.clune@latrobe.edu.au; Tel.: +61-2-6024-9853

Received: 23 November 2020; Accepted: 7 December 2020; Published: 9 December 2020



Abstract: The financial capacity of the Australian agriculture sector to capture the benefits of the growing food and fibre demands of the burgeoning global population has been questioned, particularly in the face of a projected climate change impacts. This paper reports on the first phase of a multi-stage project that seeks to understand the causes of rural business failure, illustrated through the metaphorical voice of the farmer. It has been constructed in three parts comprising an overview of the rationale for the consideration of the rural business failure as it is understood by the operators of stressed rural businesses; description of the method and results; and thirdly, the implications of the results and direction for future research. This paper reports on the analysis of responses of approximately 33,000 clients collected as part of the Rural Financial Counselling Services (RFCS) during the period 2012–2016. A key finding of the paper is the perception that climate variation is the primary cause for the hardship experienced; that is, in the absence of the variable climate operators would not have found themselves in need of the RFCS. However, this result necessarily requires a more objective review before consideration as the basis of new policy.

Keywords: climate; sustainability; resilience; welfare; counselling; policy

1. Introduction

There is an inherent tension between the opportunity presented by the food and fibre demand of a burgeoning global population and the capacity of Australian agriculture to capture that opportunity [1]. This lies not only in the opportunity of the sector to fully recognize the magnitude of the opportunity but extends also to externalities directly impacting sector productivity [1]. This paper reports on the first stage of a multi-phase project to understand and articulate key drivers of rural business failure. This broader understanding is fundamental to the establishment of future policy that is effectively and efficiently supports the agriculture sector [1].

This paper analyses data collected between 2012 and 2016 as part of the delivery of the Rural Financial Counselling Service (RFCS), which provides government-funded independent financial counselling to rural businesses in or at risk of financial hardship [2]. In doing so, it seeks to communicate a collective understanding of farmers directly experiencing, or at risk of business failure. The data analysed has been collected by individual Rural Financial Counsellors (RFC) as part of the implementation of the government program. Rural Financial Counsellors assist clients with a wide range of tasks to enable a clearer understanding of financial position or to access aligned services that reduce hardship, although they are strictly prohibited from providing financial or taxation advice or personal counselling [2]. They provide a personalised, case managed service that is focused on providing immediate assistance, enabling the space for clients to make decisions about their longer-term future [2].

This paper has been constructed in three parts. Firstly, it provides an overview of the rationale for the consideration of the rural business failure as it is understood by the operators of stressed rural

businesses, that is through the collective voice of the farmer. The second part of the paper relates to the description of the method and results. The Third part of the paper considers the implications of the results and provides direction for future research.

Background

The future prosperity of the agribusiness sector has been inextricably linked through policy of the Australian Government to the growing food and fibre demands of a burgeoning global population [3]. The world's population is expected to increase by 10% to 8.5 billion people by 2050 and 42% to 10.9 billion people by 2100, compared with the current population of 7.7 billion people [4]. Much of the growth is projected in parts of the world with limited local capacity to meet the demand, and which rely on imports to meet food security demand [5–7].

Exacerbating the population pressure on global food and fibre production is the reality of a dynamic and changing climate [8]. Despite commitments to constrain increases in global temperature to less than 2 degrees Celsius above the historic baseline [9], such an increase, without adaptation, is anticipated to markedly change food and fibre production as it currently understood [8]. Although disproportionate in its regional impact, climate-related yield reductions of the order of 25% are projected for key staples such as wheat, maize, rice and soy, as well as significant implications for sustainable development of livestock products such as meat and dairy [8].

Despite increasing global food and fibre demand, the capacity of Australian agricultural producers to recognise that potential opportunity may well be at risk, constrained by a lack of financial capacity to effectively respond to an array of existential economic, social and environmental threats [1]. Current Australian Government policy settings recognise this potential risk through a suite of indirect and direct agricultural welfare investments such as tax incentives and access to services such as the RFCS, for rural businesses facing hardship as a result of exposure to the suite uncertainties outlined above [3,10]. While hardship is not specifically defined, it is considered more broadly to reflect a lack of alternative means to access impartial assistance and manage change and adjustment [2]. Although identified as part of a short-term safety-net mechanism to help farmers “get out of trouble and back to viability” [3], the RFCS has been supported by the Australian and State governments to deliver financial counselling services to farmers, fishers and small businesses suffering financial hardship in various formats since 1986, such that its presence is now considered entrenched and its removal would harm regional communities [2].

Given this paradoxical outcome, whereby assistance provided for short-term relief is replaced by broader agricultural welfare dependency, understanding the primary drivers of the hardship is a critical element in addressing the sector's future sustainability and resilience. Particularly given the prominence of this option in current agriculture policy [3] and the likelihood of its continued availability in an increasingly dynamic future climate in southern Australia [11]. Since clients engaged in RFCS program are predominantly self-referred [2], it is important that this is understood in the context of the individual businesses. Data collected by the RFCS program for the period 2012–2016 were made available in the context of project aimed at highlighting key contributions to the failure of farm businesses (HEC18044), with a view to identify key areas for future policy action to underpin a resilient and sustainable agriculture sector. This paper reports on the data analysis conducted to identify and characterize the primary causes of agribusiness hardship for businesses entering the RFCS program. Importantly, this paper has illuminated key drivers of business failure as understood and articulated by operators of stressed rural businesses. These results were used to provide an insight on the efficacy of current and future policies to foster sustainability and resilience in Australian farm businesses.

2. Materials and Methods

2.1. Rationale

Data analysis is considered in the context of the voice of the distressed business operator (referred to as client in the context of this paper). Consequently, to address the research aim, data analysis was based on the responses linked to unique client ID's as recorded in the RFCS program database (representing the total number of business operators that have entered the program). About half of the clients in the program have one record corresponding to a single start and end date. The other half of clients have multiple start and end dates within the four-year period.

2.2. Dataset

Data analysis was conducted using a dataset collected by individual RFCS providers and collated and maintained by the Australian Government during the period 2012 to 2016 as part of the formal process of registering and accepting a person or business (herein referred to as clients) into the financial counselling system. The Australian Government provides oversight of the RFCS program through the Department of Agriculture, which is currently situated within the Department of Agriculture, Water and Environment established in February 2020. The dataset was drawn from an archived version of the Australian Rural Counselling (ARC) database, which is the central repository for RFCS client data [2]. The data maintained in ARC comprise records all of the RFC interactions with clients for the period, as collected and uploaded by the RFCs. De-identified data were provided for analysis by the Department of Agriculture, Water and Environment (DoAWE), with individual clients identified by a unique number only. The provided dataset was accessed and managed in accordance with ethics approval HEC18044 granted by the La Trobe University Ethics Committee.

2.3. Data Processing

De-identified data were available for ten distinct modules related to the way the RFC captures and characterizes the interaction with the clients (Table 1). This included the client's postcode, industry sector, financial situation, the reasons for joining the program, and the outcome at the end of the program. Analysis focused on data in the Assessment module, which reported the reasons nominated by the client to join the program (causes of difficulty). Unique client identification numbers were cross matched with the remaining modules to determine other key variables.

Table 1. The ARC dataset (2012–2016) provided for review.

Modules	Content
Action Checklist	RFC details and program actions put in place
Action Milestone	
Action Plan Item	
Case Management	
Activity and Assistance	State, Postcode, Primary Industry (ANZSIC sector and other details related to business structure and property) ^a
Client Details	
Assessment	Causes of difficulty that brought the client to the program
Creditor Liability	Financial (loan) information
Financial Status	Client financial profile details (e.g., gross farm income and net surplus)
Outcome	Final action by the RFC at the end of the program

^a ANZSIC: Australian and New Zealand Standard Industrial Classification.

The Assessment data comprised 977,933 records across eight attributes, which were processed to a final dataset of 88,148 instances attributed to 33,325 unique clients. Data processing included removal of “NULL” records (no data recorded for cause of difficulty) and duplicate client ID's (due to multiple start and end dates in the program database). Data were further processed to remove

records for which causes of difficulty were identified that were not consistent with the identified options. The ARC database was “rebuilt” in 2012 (DoAWE Personal Communication) with the result being that clients of the RFCS rolled over from the previous service provision period (i.e., pre-2012) recorded causes of difficulty that were not anticipated within the context of the 2012–2016 service. Consequently, the assessment of cause of difficulty captured for these clients was reflected in the database as “Data Migration”. This characterisation was associated with 4903 instances.

For each client ID interaction, the cause of difficulty (and hence the reason for participating in the program) was identified by the RFC from a drop-down list as follows:

- Climatic variation
- Low sales/Commodity prices
- Debt levels
- Personal factors
- Enterprise management skills
- Enterprise size
- Increased operating costs
- Financial management skills
- Declining asset values
- Labour/skills shortage
- Regulation/legislation
- Quarantine

To further characterize the client’s profile in terms of their location and industry sector, data from the Client Details module reporting the “home address state” and “primary enterprise ANZSIC”, were merged with Assessment.

The “home state address” refers to the six federated states and two territories in Australia, namely, the Australian Capital Territory (ACT), New South Wales (NSW), Northern Territory (NT), Queensland (QLD), South Australia (SA), Tasmania (TAS), Victoria (VIC) and Western Australia (WA).

The industry sectors are categorized according to the ANZSIC (Australian and New Zealand Standard Industrial Classification) codes, of which 26 activities were included in the dataset, which included: Citrus Fruit Growing; Cotton Growing; Dairy Cattle Farming; Floriculture Production (Outdoors); Grape Growing; Horse Farming; Nursery Production (Outdoors); Nursery Production (Under Cover); Onshore Aquaculture; Other Agriculture and Fishing Support Services; Other Crop Growing n.e.c.; Other Fishing; Other Fruit and Tree Nut Growing; Other Grain Growing; Other Livestock Farming n.e.c.; Pig Farming; Poultry Farming (Eggs); Poultry Farming (Meat); Rice Growing; Sheep-Beef Cattle Farming Sheep Farming (Specialised); Small Business; Stone Fruit Growing; Sugar Cane Growing; and Vegetable Growing (Outdoors).

2.4. Data Analysis

The 33,325 unique client records were aggregated (using Excel Pivot Tables) according to the causes of difficulty reported, their location (postcode and state) and industry sector. The results obtained were compared, whenever relevant, with data available for agribusiness at the national and state level. ArcGIS 10.5 software (esri, Beijing, China) [12] was used to map the spatial distribution of client IDs using their postcode, and the causes of difficulty reported.

Causes of difficulty were statistically compared at the national level (i.e., using all responses) using a chi-square (X^2) goodness of fit test to determine if the response frequency for each cause was statistically different from an expected frequency distribution consisting of all causes being reported equally. At the state level, a X^2 association test was performed to determine if there was a relationship between causes of difficulty reported and the client’s location (state or territory). Likewise, the same test was carried to evaluate if causes of difficulty were associated or not with industry sector. These statistical tests were performed using available functions in R software (R Core Team, Vienna, Austria) [13].

3. Results

3.1. Reasons for Being in the Program

Based on client interactions captured in the Assessment dataset, Climatic variation has the highest number of instances recorded for cause of difficulty (Table 2). It was also ranked as the “main cause of difficulty” for being in the program by 63% of the clients.

Table 2. Main cause of difficulty reported by clients in the RFCS program (2012–2016).

Main Cause of Difficulty	Number of Instances
Climatic variation	22,791
Personal factors	5976
Debt levels	6625
Low sales/Commodity prices	7830
Enterprise management skills	4982
Enterprise size	4496
Financial management skills	1200
Declining asset values	898
Increased operating costs	1342
Regulation/legislation	180
Labour/skills shortage	361
Quarantine	36

The results of the χ^2 goodness of fit test show that the frequency of instances is significantly different (χ^2 (11, $N = 56,717$) = 93,415, $p < 2.2 \times 10^{-16}$) from an expected distribution of all causes having an equal probability of being chosen by the client (equivalent to approximately 4727 instances). The highest deviation from the expected frequency distribution was obtained for climate variation, although smaller deviations were noted for Personal factors, Debt and Lower Sales/Commodity Prices. Although climatic variation seems to justify the importance of the program for the universe of clients captured in the Assessment module, it is relevant to contextualize this result in terms of where the clients come from and the agricultural sector in which they were primarily involved, as presented below.

3.2. Location and Causes of Difficulty

From the 33,325 unique clients registered in the database, 33,310 had a valid state and postcode associated. Clients were predominantly from New South Wales (43.6%), followed by Victoria (25.9%), then South Australia (14.3%), Queensland (10.5%), Tasmania (2.8%), Western Australia (2.6%), and the Northern and Australian Capital Territories (0.1%).

The spatial distribution of clients within each state and territory is demonstrated in Figure 1 and Table 3, respectively. Figure 1 displays the count of unique clients per postcode and Table 3 indicates the number of unique IDs per jurisdiction. The spatial pattern at this scale shows the highest number of interactions being concentrated in regional NSW, VIC and QLD.

Table 3. Distribution of unique clients per jurisdiction.

Jurisdiction	Number of Clients
NSW and ACT	14,564
VIC	8642
SA	4755
QLD	3512
TAS	935
WA	863
NT	39
Total	33,310 ^a

^a Reflects the storage of data in multiple sites within the database, with the absence of postcode data for some clients.

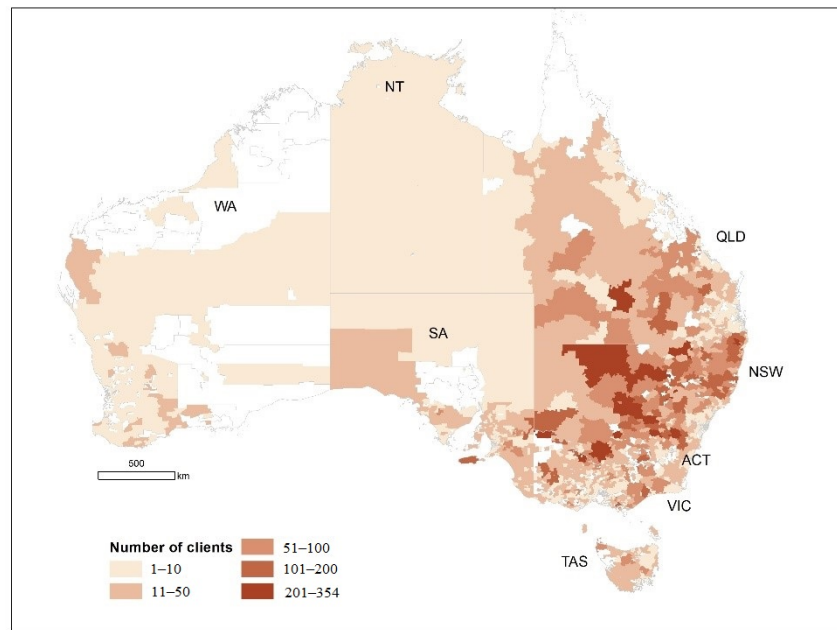


Figure 1. Spatial distribution of the clients registered in the database per postcode.

In terms of the causes of difficulty reported for states and territories, Climatic variation collected the highest number of instances for all except Northern Territory, Western Australia and Tasmania. Although numbers for Climatic variation were not markedly different from the primary causes in WA and Tasmania, it was not a feature of hardship in the Northern Territory results (Table 4).

The relationship between causes of difficulty reported and each State/Territory was explored further using a X^2 association test, with a null hypothesis that causes of difficulty cannot be associated to the State/Territory for which they were reported (based on the number of instances recorded).

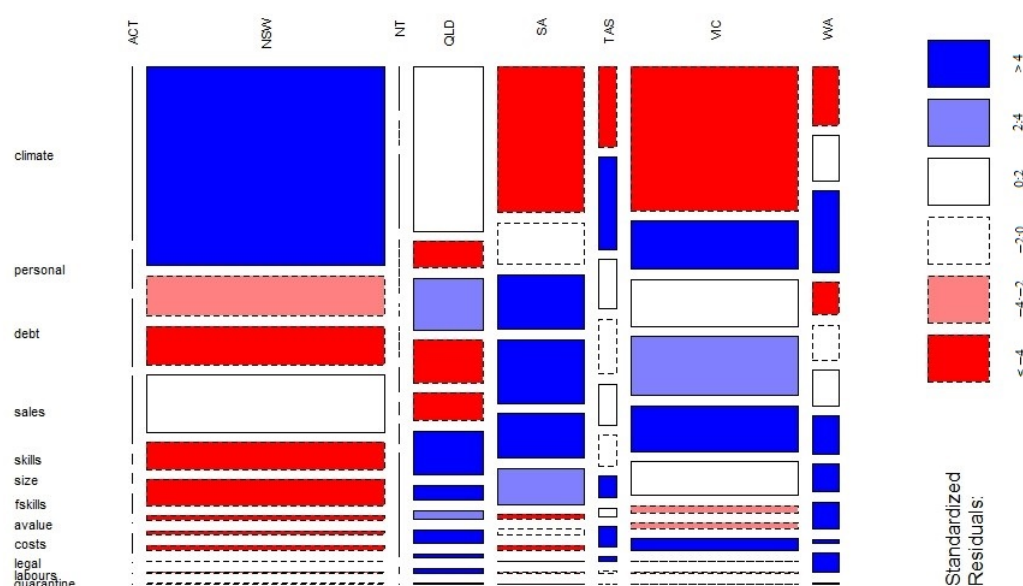
The mosaic plot in Figure 2 illustrates the conditional relative frequency of each cause per State/Territory. Column width is proportional to the percentage of instances allocated to each state (based on the overall number of instances) which highlights NSW and VIC as the states with the highest number of records. On the other hand, column height represents the relative frequency of each cause within each state (so, for example, Climatic variation was the most reported cause for NSW but not for WA). Each column box is coloured according to the difference between the observed and expected frequency values (residuals), with blue noting observed values higher than what was expected if the distribution was random; red representing observed values lower; and no coloured cells identifying observed values matching an expected distribution. In terms of causes reported overall, Quarantine, Labour/skills shortage (labours), Regulation/legislation (legal), Increased operating costs (costs), Declining asset values (avalues) and Financial management skills (fskills) are less important (aligned with Table 3 numbers). These categories were removed for running the X^2 test, as were the data for the ACT and NT given the significantly low number of records for these jurisdictions.

Climatic variation (climate) stands out as the main cause of difficulty reported by NSW clients but less pronounced for the other jurisdictions. In VIC, Personal factors (personal) and Enterprise management skills (skills) are highlighted as important as well as Low sales and commodity prices (sales), complementing the numbers reported in Table 4.

The results of the X^2 association test (X^2 (25, $N = 52,606$) = 2395, $p < 2.2 \times 10^{-16}$) indicate that causes of difficulty are related to client's state in a statistically significant manner, refuting the null hypothesis that causes of difficulty identified as reasons for being in the program are independent from the client's location.

Table 4. Top 3 causes of difficulty reported by State/Territory with correspondent number of instances (% calculated based on the total number of instances registered per State/Territory).

Top 3 Causes of Difficulty (States and Territories)	Instances (%)
ACT	
Climatic Variation	43%
Debt Levels/Low sales and Commodity prices	17%
Personal Factors	10%
NSW	
Climatic Variation	49%
Low sales and Commodity prices	14%
Personal Factors	10%
NT	
Regulation/Legislation	26%
Debt Levels	18%
Low sales and Commodity prices	14%
QLD	
Climatic Variation	41%
Debt Levels	13%
Enterprise size	11%
SA	
Climatic Variation	36%
Low sales and Commodity prices	16%
Debt levels	14%
TAS	
Personal Factors	23%
Climatic variation	20%
Low sales and Commodity prices	14%
VIC	
Climatic Variation	36%
Low sales and Commodity prices	15%
Personal Factors	12%
WA	
Debt Levels	20%
Climatic Variation	15%
Personal Factors	11%

**Figure 2.** Mosaic plot representing contingency table of number of causes reported for each State/Territory.

χ^2 residuals provide further insights on the nature of the association between the two variables, causes and client's location. Figure 3 displays graphically the magnitude and direction of χ^2 residuals, with blue indicating a positive association between cause and state; and red denoting a negative association (or no association) between variables. The analysis of Figure 3 is aligned with the descriptive analysis provided by Figure 2. Climatic variation (climate) is strongly associated with NSW, but not with WA and TA. Personal factors (personal) are strongly associated with clients in TAS, and Debt levels (debt) with clients in WA.

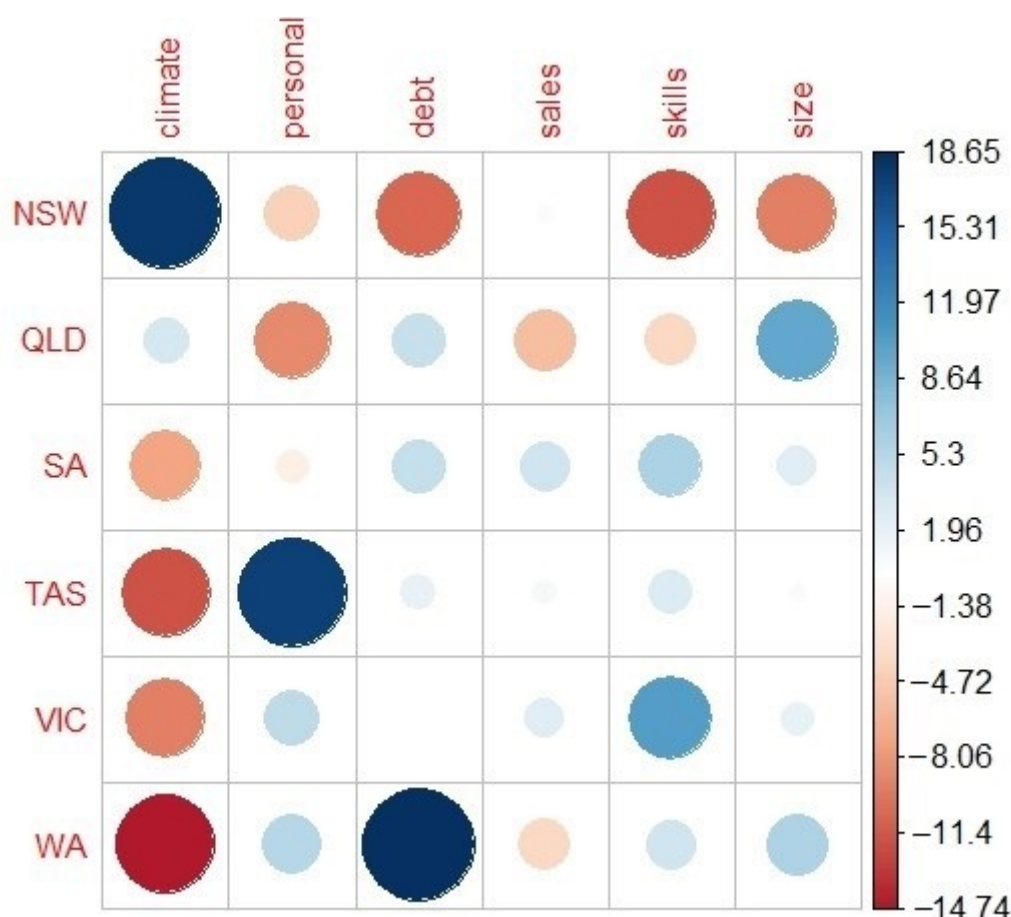


Figure 3. Relative relationship between perception of causes of difficulty as expressed by State/Territory decision-makers. Association magnitude (dot size) and direction (blue: positive; red: negative with darker colours indicating stronger association) between cause/state given by χ^2 residuals.

3.3. Primary Industry Sector and Causes of Difficulty

Based on client interactions recorded and their industry sector, cattle farming is the most represented sector in almost all states and territories, excluding SA and WA where grain growing is the most common industry sector according to program database (Table 5).

The relationship between industry sector and reported causes of client difficulty was evaluated with a χ^2 association test, with a null hypothesis that causes of difficulty cannot be associated to any specific industry sector (based on the number of instances recorded for each sector type). Based on the previous analysis and to be able to run a valid test, only the causes of difficulty Climatic variation (climate), Debt levels (debt), Enterprise management skills (skills), Enterprise size (size), Low sales and commodity prices (sales), and Personal factors (personal) were retained. Industry sectors were also removed when the number of instances allocated to at least one cause was less than five. Data for the assessment at a national level and a representative State level are presented in Figure 4a,b, respectively.

Table 5. Top 3 primary industry sectors (ANZSIC) registered by State/Territory with correspondent number of instances (% calculated based on the total number of instances registered per State/Territory).

Top 3 Primary Industry Sector (ANZIC) (States and Territories)	Instances (%)
ACT	
Other Agriculture and Fishing Support Services/Sheep-Beef Cattle Farming	26%
Sheep Farming (Specialised)	19%
Other Crop Growing n.e.c./Other Grain Growing	7%
NSW	
Sheep-Beef Cattle Farming	28%
Other Grain Growing	17%
Sheep Farming (Specialised)	13%
NT	
Sheep-Beef Cattle Farming	54%
Small Business	21%
Other Agriculture and Fishing Support Services/Other Grain Growing/Other Livestock Farming n.e.c.	5%
QLD	
Sheep-Beef Cattle Farming	54%
Sheep Farming (Specialised)/Small Business	9%
Other Agriculture and Fishing Support Services/Other Livestock Farming n.e.c./Other Crop Growing n.e.c.	5%
SA	
Other Grain Growing	32%
Grape Growing	13%
Sheep-Beef Cattle Farming	12%
TAS	
Dairy Cattle Farming	29%
Sheep-Beef Cattle Farming	22%
Sheep Farming (Specialised)	16%
VIC	
Dairy Cattle Farming	27%
Sheep-Beef Cattle Farming	17%
Other Grain Growing	13%
WA	
Other Grain Growing	41%
Sheep-Beef Cattle Farming	17%
Other Crop Growing n.e.c./Small Business	9%

At the national level (i.e., considering all instances reported regardless client's location), the test' results indicate that causes of difficulty reported are linked to specific industry sectors ($\chi^2(95, N = 48,730) = 2537, p < 2.2 \times 10^{-16}$) with a strong positive association between Grape growing and Low sales and commodity prices (Figure 4a). Other statistically significant positive associations were identified between Climatic variation and Other Grain Growing; Enterprise management skills and Dairy Cattle Farming; Enterprise size (size) and Sheep-Beef Cattle Farming; Low sales and commodity prices and Other Fruit Tree Nut Growing/Pig farming; Personal factors and Dairy Cattle Farming/Other Agriculture and Fishing Support Services.

No strong negative relationships were noted between causes of difficulty and industry sectors when data from all states is analysed together. Mild negative associations can be noted for Climatic variation and Dairy Cattle Farming; Personal factors and Grape Growing; Low sales and commodity prices and Other Grain Growing.

At the state level, causes of difficulty were also found to be associated with industry sector (the analysis excluded ACT and NT due to the low number of records). The outcome of association between causes of difficulty and industry is presented for NSW in Figure 4b. The data for the other Australian States/Territories is presented in the Appendix A (Figure A1). The results add other insights to previous findings in regard to the causes for being in the program. While broadly speaking, Climatic variation still explains most of the significant (positive and negative) associations, although in TAS and WA the strongest positive relationship was found to be with Sheep Farming (Specialized) and

Other Grain Growing, respectively. This unpacks an otherwise not important association given that Climatic variation was not related to these states when analysed together with all states, due to the lower number of instances recorded for both TAS and WA (Figure 3). Other causes of difficulty that, based on our dataset, explain business failure are Personal factors for Dairy Cattle Farming in NSW; Low sales and commodity prices for Grape Growing in VIC and Sheep Farming (Specialised) in QLD; and Enterprise management skills for Other Agriculture and Fishing Support Services in SA. Causes of difficulty that resulted as strongly not related with industry include Low sales and commodity prices and Enterprise management skills for Other Grain Growing in both NSW and SA.

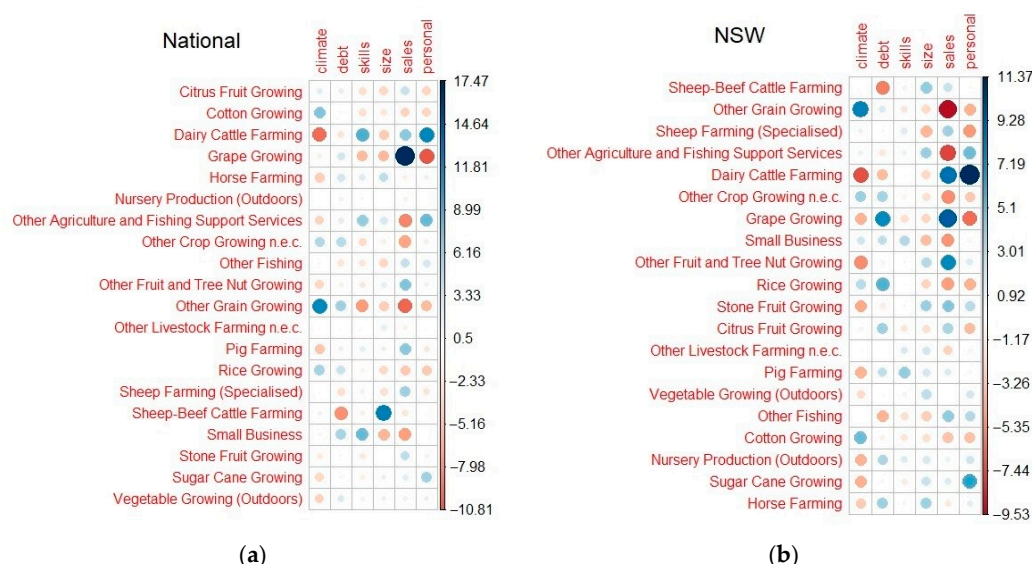


Figure 4. Relative relationship between perception of causes of difficulty when considered as a nationwide cohort (a) and when considered in the context of the jurisdiction of NSW (b). Association magnitude (dot size) and direction (blue: positive; red: negative with darker colours indicating stronger association) between cause/state given by X² residuals.

4. Discussion

Articulating the drivers of rural hardship is an important step in informing future government and industry intervention to underpin the resilience and sustainability required of the farm-business sector if it is to capture the benefits of a burgeoning global population. This paper sought to understand the relative drivers of rural business hardship as interpreted by those operators experiencing the hardship. That is, through the voice of distressed farmers. The data reviewed reflected the collective voice of approximately 33,000 rural business operators seeking the assistance of RFCs across Australia during the period 2012–2016.

Reconciling the number of clients, the total number of instances and the total number of farms is a vexed issue. While the number of unique clients utilising the program throughout the five year period (2012–2016) is available, the number of instances is less clear as a consequence of the manner in which the data has been recorded. The data reviewed identified numerous entries (data not shown) in which individual clients had been recorded as appearing to exit the program on a particular date and subsequently re-engaging with the program as a new instance on the following day. This may have been a perverse outcome of service-level interpretation of a desire by the Australian Government to ensure effective and efficient management of clients through the program (DoAWE personal communication). However, it may also reflect broader concerns regarding the historic collection and maintenance of the data. This study has reviewed approximately 33,000 instances captured by RFCs. While this data is the only record of the transactions between the farm business owners and the RFCs, anecdotal evidence has previously questioned the veracity of this data, with errors arising from a limited understanding of either the reason for the collection of the ARC data or the need for its accurate capture [2].

When considered in the context of the total number of farms in Australia during that period, the unique interactions reflect approximately 26% of that number (Table 6). Furthermore, interactions are spread across all industry sectors and throughout the continent.

Table 6. Comparison of instances for the period 2012–2016, expressed as a percentage of total farm businesses as understood by government.

State	Unique Client ID	Total Number Farms (2013–2014) ^a	Percent Farms	Total Farms 2016–2017 ^b	Percent Farms
NSW and ACT	14,564	41,157	35%	26,267	55%
VIC	8642	30,797	28%	21,935	39%
SA	4755	13,349	36%	9661	49%
QLD	3512	26,786	13%	18,514	19%
TAS	935	3947	24%	2449	38%
WA	863	11,925	7%	8873	10%
NT	39	466	8%	373	10%
Total	33,310 ^c	128,489	26%	88,072	38%

^a Refs. [14]. ^b Refs. [15] ^c Reflects the storage of data in multiple sites within the database, with the absence of postcode data for some clients.

The estimation of total number of farms in Table 6 is given via the Rural Environment and Commodity Survey (REACS) conducted by the Australian Bureau of Statistics, which uses an internal assessment of estimated value of agricultural operations (EVAO) to derive the number farms in the survey period based on a financial threshold. In 2013–14 that threshold was >AUD 5000, which [16] was subsequently revised in the 2015–2016 REACS to > AUD 40,000 [17]. Applying the latter valuation to the data, which reflects of the order of 88,000 farm businesses, is beyond the scope of this paper as it requires a far more nuanced understanding of the client businesses than is provided for in the data available for our research. It does, however, demonstrate the challenges of providing effective, evidence-based agriculture policy to underpin a sustainable and resilient sector. Given the ambiguity regarding what constitutes a farm business, it is important that a more rigorous boundary is placed around the terminology to enable a more effective use of the data captured in the delivery of programs such as the RFCS.

A key feature of the data accessed throughout the project was that the businesses participating in the RFCS program perceive that their involvement with the program is a result of climatic variation. That is but for the intervention of the climate, or indeed a changing climate, they would not have required the agricultural welfare support provided by the service. Although not clear if this is interpreted homogenously by farmers in the program, we can assume that changes in climate patterns have somehow disrupted business as usual and prompt the farmers to seek for help. Prima facie this is consistent with the prevailing science and analysis indicating that an increasingly dynamic climate is impacting and will continue to impact farm productivity into the future [8,18]. Consequently, it is reasonable to argue that in the absence of a clear strategy to enable the effective adaptation to, and mitigation of the effects of projected climate change, agricultural resilience in Australia will be markedly impacted. A key outcome of which is the likely need for ongoing agricultural welfare over a longer timeframe. Indeed, it is clear from the current cohort that a lack of capacity or incentive to implement mitigation strategies is limiting resilience. Approximately 75% of the cohort examined in this study were either transferred to alternative government support or remained in the RFCS program at the end of the 2012–2016 period (data not shown). Considering that evidence of financial hardship is a pre-requisite for participation in this program, it could equally be argued that access to such a program risks embedding financial hardship in some businesses. However, there are insufficient data to assess the relative economic performance of the businesses in this cohort, and as such, this element remains an intriguing issue for future research.

It is important to reflect on the meaning of climate variation in the context of the current study. Australia's climate patterns are characterized by frequently occurring extreme events, namely droughts, floods, heavy rainfall and heatwaves [19,20]. It is particularly difficult to identify a long-term rainfall

trend as spatial and temporal rainfall variability change significantly from year to year, season to season, region to region [21]. This determines that an extreme event felt intensely in one part of the country might not be noticed in the other part. Kiem et al. [22] suggest that taking rainfall variability as normal has led to ignoring the importance of its spatial and temporal dimensions when making decision about farming investment or water storage and supply. What can be shown is that the spatial extent of extreme events has been steadily increasing as well as its frequency and duration. Moreover, it has been shown to negatively impact agricultural production. For example, Hochman et al. [23] report that wheat yields declined in Australia by 27% from 1990 to 2015 and attribute that to reduced rainfall and temperature rising. A feature of this change, particularly in south eastern Australia (where most of the agricultural production is concentrated), has been a clear change in rainfall seasonality with amounts of rainfall decreasing during winter/regular growing season [21,24]. Anecdotal evidence provided by RFCs from across the RFCS program (Personal Communication) indicates that the category Climatic variation was used by RFCs to recognise the impacts of a broad range of climate related events impacting business sustainability, including extreme weather events such as fires, floods and storms, as well as complications associated with drought.

Current agriculture policy in Australia, the Agricultural Competitiveness White Paper, is focused on the profitability and resilience of farming families [3]. Although the policy recognises climate as a risk factor, the rhetoric of both the current and broader policy thinking (see, for example, the Australian Government's *Backing our Farmers and Drought Affected Communities* <https://www.pm.gov.au/media/backing-our-farmers-and-drought-affected-communities>, accessed 31 October 2019) is directed at the mitigation of drought impacts as opposed to a broader consideration of the dynamic influences of climate more generally. On that basis, current policy settings may not be sustainable. This policy positioning is in contrast with the broader interpretation of climate change impacts in Australian agricultural environments that relate to a suite of outcomes that are projected to limit the resilience and sustainability of the sector, including temperature increases, changes in amount and distribution of rainfall, and more extreme weather events such as fires and flood [11].

While the data in this paper is instructive, it should be considered in both context of its collection and the broader operating social context of the businesses themselves and it is appropriate that the data is interpreted with some caution. The data was collected using a computer assisted personal interviewing (CAPI) technique [25]. While the technique is recognised as being superior to paper-based survey approaches, it is subject to both operator and interviewer action that may bias results [26]. During the initial interview to assess the key issues causing the rural business operator to present on that occasion, a pre-determined list of factors is offered for consideration. In the CAPI model used in the capture of the 2012–2016 data, the list was only presented in descending alphabetical order, with the category of Climatic variation appearing at the top of that list. Consequently, this lack of randomisation of potential response may have influenced the selection of this factor as the primary cause of difficulty experienced by the business operators [25]. While this may be a confounding factor, it does not seem reasonable to suggest that the overwhelming response (63% of clients) noted is due to that issue.

The perception that climate variability was a key driver in their current position may have also been influenced by the availability of direct government support to rural businesses available through a range of drought support programs such as Exceptional Circumstances (EC) and Climate Change Adjustment Program (CCAP) [2]. While this too may have contributed to the result noted, there is insufficient detail in the collated data to consider its impact.

The social context of the business owners may also be a consideration in the identification of climatic variation as a primary cause of difficulty. Recognition as a good operator, providing the economic foundation for the farm business has been identified as a key element of farmer self-actualisation [27]. It is conceivable that individual operators may have selected the category of climatic variation as a primary cause of difficulty resulting in their participation in the program as a means of deflecting attention of the RFC from other issues such as a lack of management skills and expertise. Indeed, these results suggest that a focus on climate in isolation masks the capacity to reconcile the impact

of a suite of other factors that may be impacting business performance, such as personal factors and debt, which were of notable impact in a state-based context. This has important implications for future policy development in that it reinforces the argument for a broader evidence-based, more holistic approach to agriculture policy than has been demonstrated by successive governments in Australia over the past four or so decades [1,28]. It follows, therefore, that the appreciation of the complex social context of farm business failure is an important consideration for future research that seeks to provide the evidence to policy makers enabling them to break from the status-quo and develop policy that supports sustainable and resilient agricultural landscapes and economies.

Agriculture has a long history of successfully lobbying government in Australia for preferential treatment [28,29]. The voice of the farmer in this study is an important addition to the ongoing debate regarding government support for rural enterprises. However, as noted above, the veracity of the data maintained within the ARC database has been challenged [2]. It is imperative, therefore, that the data in this study are considered in a broader, more objective context. That is, that the subjective voice of the farmer is balanced by an objective voice, with significant knowledge and experience working with this cohort. As independent service providers working with multiple businesses using a case management approach, RFCs have a holistic understanding of the financial, social and environmental factors contributing to the hardship experienced by stressed rural businesses participating in the RFCS program [2]. As such, they are a key source of knowledge that could significantly broaden the understanding of the key drivers of rural business failure and, as such, provide important intelligence for future policy development. It is unfortunate that the data management obligations accompanying the implementation of the RFCS program have been so poorly fulfilled. Greater confidence in datasets such as these could have markedly improved the effectiveness of future policy decisions. That opportunity is lost.

It should be noted, however, that the RFC network remains an important source of skills, knowledge and experience that is not reflected in the current dataset. It follows then that a key next step in understanding the core issues driving rural hardship must necessarily include integration of this resource in policy consideration. As such, accessing the extensive skills knowledge and experience of the RFC network is an important and urgent step in the development of robust agriculture policy that will underpin a resilient and sustainable future for the sector.

5. Conclusions

Despite the opportunity presented by the demand for food and fibre to support a burgeoning global population, a cohort of Australian farm businesses are struggling to capitalise on that opportunity. A number of these farm businesses are experiencing significant hardship, with the failure softened only through access to agriculture welfare. This paper has sought to understand and highlight the drivers of significant hardship for these failing businesses, as articulated by farm business operators accessing the RFCS program funded by the Australian Government. It provides an important cross-sectoral assessment of issues limiting profitability and resilience in the Australian agricultural sector, as understood and articulated by operators of stressed rural businesses.

Exposure to climate is a recognised significant risk to the resilience and sustainability of agribusiness in Australia, a fact that is reflected in the access to and provision of agricultural welfare and financial assistance. It is foreseen that frequency and duration of disruptive climate events will increase prompting further climate-related productivity reductions. Consequently, direct and indirect agricultural welfare is likely to remain a much-needed support for Australian farming businesses into the future.

Climate variation was identified as the primary driver of business hardship by the majority of client participants in the program. The inference of this finding being that, were it not for the impact of climate, they would not have required the services of the RFCS program. It is important, however, to understand that this strong voice of the distressed farmer reflects their perception and as such must necessarily be considered within a broader social and business context. While the influence of climate is particularly evident for farmers in the jurisdiction of NSW in the program, other jurisdictions also highlighted the importance of alternative causes of difficulty including personal factors, lack of management skills,

low prices, and debt levels. Hardship was also found to be related to specific industry sectors. Specifically, our study shows that grape growing farmers are more likely to identify low sales and commodity prices as the main cause of difficulty whereas grain growing is related to climate variation. These findings highlight that a more nuanced, broad-based approach to policy than has been demonstrated historically is required to sustain resilient agricultural landscapes and communities in Australia.

A more nuanced approach to future agriculture policy requires substantial research to enable the appropriate recognition of both the financial and social drivers of rural business failure in the context of a dynamic and changing future climate. While existing databases such as that underpinning the RFCS program have enormous potential to support future policy development, the use of such databases should be carefully considered. Issues such as the manner in which the data used in this study were collected and, indeed, its veracity, have markedly impacted the value of the current dataset in contributing to this higher policy goal. Ensuring that these issues are resolved through effective program design and oversight is an important first step.

The focus of this study was to illuminate the key drivers of rural business failure, as understood by business operators themselves. In doing so it has highlighted numerous challenges to the development and implementation of effective policy for resilient agriculture. A key next step for this work is to pursue an objective assessment of the drivers of business failure by capturing the combined experience and insights of the RFCs to provide a reality check to balance the subjective farmer-perceptions expressed here.

Author Contributions: T.C. Conceptualisation, methodology, writing—original draft preparation, supervision, project administration. A.H. Methodology, data curation, writing—review editing, visualization. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: Data for this paper were provided by the Commonwealth of Australia.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A



Figure A1. Conts.



Figure A1. Relative relationship between perception of causes of difficulty and industry sector, expressed at National as well as State/Territory understanding. Association magnitude (dot size) and direction (blue: positive; red: negative with darker colours indicating stronger association) between cause/industry given by X^2 residuals.

References

1. Clune, T. Conceptualising policy for sustainable agriculture development. *Aust. J. Public Adm.* **2020**. [CrossRef]
2. National Rural Advisory Council. *Report on the Review of the Rural Financial Counselling Service Program, Agriculture, Editor*; Commonwealth of Australia: Canberra, Australia, 2014.
3. Australian Government. *Agriculture Competitiveness White Paper*; Commonwealth of Australia: Canberra, Australia, 2015.
4. United Nations Department of Economic and Social Affairs. *World Population Prospects 2019; Highlights* (ST/ESA/SER.A/423); United Nations Department of Economic and Social Affairs: New York, NY, USA, 2019.
5. Chaifetz, A.; Jagger, P. 40 Years of dialogue on food sovereignty: A review and a look ahead. *Glob. Food Secur.* **2014**, *3*, 85–91. [CrossRef]
6. Sakschewski, B.; Von Bloh, W.; Huber, V.; Müller, C.; Bondeau, A. Feeding 10 billion people under climate change: How large is the production gap of current agricultural systems? *Ecol. Model.* **2014**, *288*, 103–111. [CrossRef]
7. Beghin, J.; Meade, B.; Rosen, S. A food demand framework for International Food Security Assessment. *J. Policy Model.* **2017**, *39*, 827–842. [CrossRef]
8. IPCC. *Climate Change 2014: Synthesis Report*; IPCC: Geneva, Switzerland, 2014; p. 69.
9. United Nations. *Paris Agreement*; United Nations: New York, NY, USA, 2015.
10. Australian Government. Rural Financial Counselling Service (RFCS). 2018. Available online: <http://www.agriculture.gov.au/ag-farm-food/drought/assistance/rural-financial-counselling-service> (accessed on 2 November 2020).
11. Gunasekera, D.; Kim, Y.; Tulloh, C.; Ford, M. Climate Change—Impacts on Australian Agriculture. *Agric. Commod. Forecast. Issues* **2007**, *14*, 657–676.
12. ESRI. *ArcGIS Desktop: Release 10.5*; Environmental Systems Research Institute: Redlands, CA, USA, 2015.
13. R Core Team. *R: A Language and Environment for Statistical Computing*. Available online: <https://www.R-project.org> (accessed on 10 July 2020).
14. Australian Bureau of Statistics. *Agricultural Commodities Australia 2013–14*; Australian Bureau of Statistics: Canberra, Australia, 2015.
15. Australian Bureau of Statistics. *4627.0—Land Management and Farming in Australia, 2016–17*; Australian Bureau of Statistics: Canberra, Australia, 2018. Available online: <http://www.abs.gov.au/ausstats/abs@.nsf/0/5E8858F384C87E8DCA2582B700120AAF?OpenDocument> (accessed on 7 July 2020).
16. Australian Bureau of Statistics. *Farm Management and Demographics, Australia—2014–15*; Australian Bureau of Statistics: Canberra, Australia, 2016.

17. Australian Bureau of Statistics. 7121.0—Agricultural Commodities, Australia, 2017–18, Explanatory Notes; Australian Bureau of Statistics: Canberra, Australia, 2018. Available online: <https://www.abs.gov.au/ausstats/abs@.nsf/exnote/7121.0> (accessed on 10 July 2020).
18. Hughes, N.; Lawson, K.; Valle, H. *Farm Performance and Climate: Climate-Adjusted Productivity for Broadacre Cropping Farms*; Australian Bureau of Agricultural and Resource Economics and Sciences: Canberra, Australia, 2017.
19. King, A.D.; Pitman, A.J.; Henley, B.J.; Ukkola, A.M.; Brown, J. The role of climate variability in Australian drought. *Nat. Clim. Chang.* **2020**, *10*, 177–179. [[CrossRef](#)]
20. Herold, N.; Ekström, M.; Kala, J.; Goldie, J.; Evans, J. Australian climate extremes in the 21st century according to a regional climate model ensemble: Implications for health and agriculture. *Weather Clim. Extrem.* **2018**, *20*, 54–68. [[CrossRef](#)]
21. Ukkola, A.M.; Roderick, M.; Barker, A.W.; Pitman, A. Exploring the stationarity of Australian temperature, precipitation and pan evaporation records over the last century. *Environ. Res. Lett.* **2019**, *14*, 124035. [[CrossRef](#)]
22. Kiem, A.S.; Johnson, F.; Westra, S.; Van Dijk, A.; Evans, J.P.; O'Donnell, A.; Rouillard, A.; Barr, C.; Tyler, J.; Thyer, M.; et al. Natural hazards in Australia: Droughts. *Clim. Chang.* **2016**, *139*, 37–54. [[CrossRef](#)]
23. Hochman, Z.; Gobbett, D.L.; Horan, H. Climate trends account for stalled wheat yields in Australia since 1990. *Glob. Chang. Biol.* **2017**, *23*, 2071–2081. [[CrossRef](#)] [[PubMed](#)]
24. Murphy, B.F.; Timbal, B. A review of recent climate variability and climate change in southeastern Australia. *Int. J. Clim.* **2008**, *28*, 859–879. [[CrossRef](#)]
25. Weeks, M. Computer-Assisted Survey Information Collection: A Review of CASIC Methods and Their Implications for Survey Operations. *J. Off. Stat.* **1992**, *8*, 445.
26. Couper, M.P.; Rowe, B. Evaluation of a Computer-Assisted Self-Interview Component in a Computer-Assisted Personal Interview Survey. *Public Opin. Q.* **1996**, *60*, 89–105. [[CrossRef](#)]
27. Bryant, L.; Garnham, B. The fallen hero: Masculinity, shame and farmer suicide in Australia. *Gend. Place Cult.* **2014**, *22*, 67–82. [[CrossRef](#)]
28. Botterill, L.C. Agricultural policy in Australia: Deregulation, bipartisanship and agrarian sentiment. *Aust. J. Polit. Sci.* **2016**, *51*, 667–682. [[CrossRef](#)]
29. Lloyd, P.J.; MacLaren, D. Relative assistance to Australian agriculture and manufacturing since Federation. *Aust. J. Agric. Resour. Econ.* **2015**, *59*, 159–170. [[CrossRef](#)]

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).