Is the Northern Rivers food system resilient?

Northern Rivers food security scoping study

June 2023

Plan C, Wild Community, UTS and NRCF acknowledge the Bundjalung people whose ancestral lands are the Northern Rivers. We would also like to pay respect to the Elders both past and present, acknowledging them as the traditional custodians of knowledge for these lands.

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Plan C is a community organisation with a mission to build the resilience and regenerative capacities of Northern Rivers communities in the face of future disasters and crises. It is currently involved in projects including the establishment of a network of 300+ Community Carers and Responders in the region, as well as the organisation of the monthly public event "Facing Up: How do we live in the midst of the ecological and climate crises?".

Wild Community is a social enterprise creating a healthy society for all beings through championing the development of ecovillages and regenerative agriculture projects. Currently a start-up, Wild Community will consist of an investment fund, a philanthropic not-for-profit and a solution hub providing consulting, coaching, education and services to the ecovillage movement.

The Institute for Sustainable Futures (UTS-ISF) is an independent research institute within the University of Technology Sydney. We conduct transdisciplinary, project-based research in line with our vision of creating positive change towards sustainable futures.

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Executive Summary

Shocks and disruptions present a rare opportunity to reflect on and re-vision the resilience of a food system and identify key levers to be activated, funded and implemented to enhance food security. Reorientation of how and why we grow, distribute and consume food in the Northern Rivers (NR) is urgently needed to adequately address rapidly increasing food insecurity affecting disadvantaged communities. This study has shown, through stakeholder interviews, that the Northern Rivers food system (NRFS) is highly vulnerable to shocks and stresses such as the COVID pandemic and the 2022 flood disasters. Champions are already implementing disaster-resilient food solutions through community and social networks to build a circular and place-based regional food system in the NR.

A coordinated government approach to disaster food security is lacking in the NR and currently relies on the community to step up to address this in an ad hoc manner. There is a clear need for more coordination and infrastructural support for the NR's food system in times of disaster, and for long term resilience building, through an inclusive and collaborative governance process. Visioning and developing a strategic Northern Rivers Food Plan is strongly recommended to enable a clear and cohesive response to acute food security threats and ensure the NR food system can provide food for future generations in the face of increasingly severe disasters. Establishing a Northern Rivers Regional Food Policy Council could facilitate the development of participatory governance of strategic food system planning.

The Northern Rivers Food Security Study aimed to develop an understanding of regional food networks in the NR, identify food security challenges and opportunities during recent disaster events and provide recommendations for developing greater resilience within the regional food system. This report is for NRFS stakeholders, policy makers at local, state and Federal levels, those affected by food insecurity and community members interested in understanding more about the NRFS.

This project was a scoping study and situational analysis of the NRFS. Current literature related to local and regional food in the Northern Rivers was reviewed and 22 interviews with key food system stakeholders from Byron and Lismore local government areas were conducted. The interview results were then analysed across the four pillars of food security (availability, accessibility, utilisation and stability) to identify key themes. These were then documented according to the situational "state" of the NRFS including a) everyday state b) disaster state and c) recovery state.
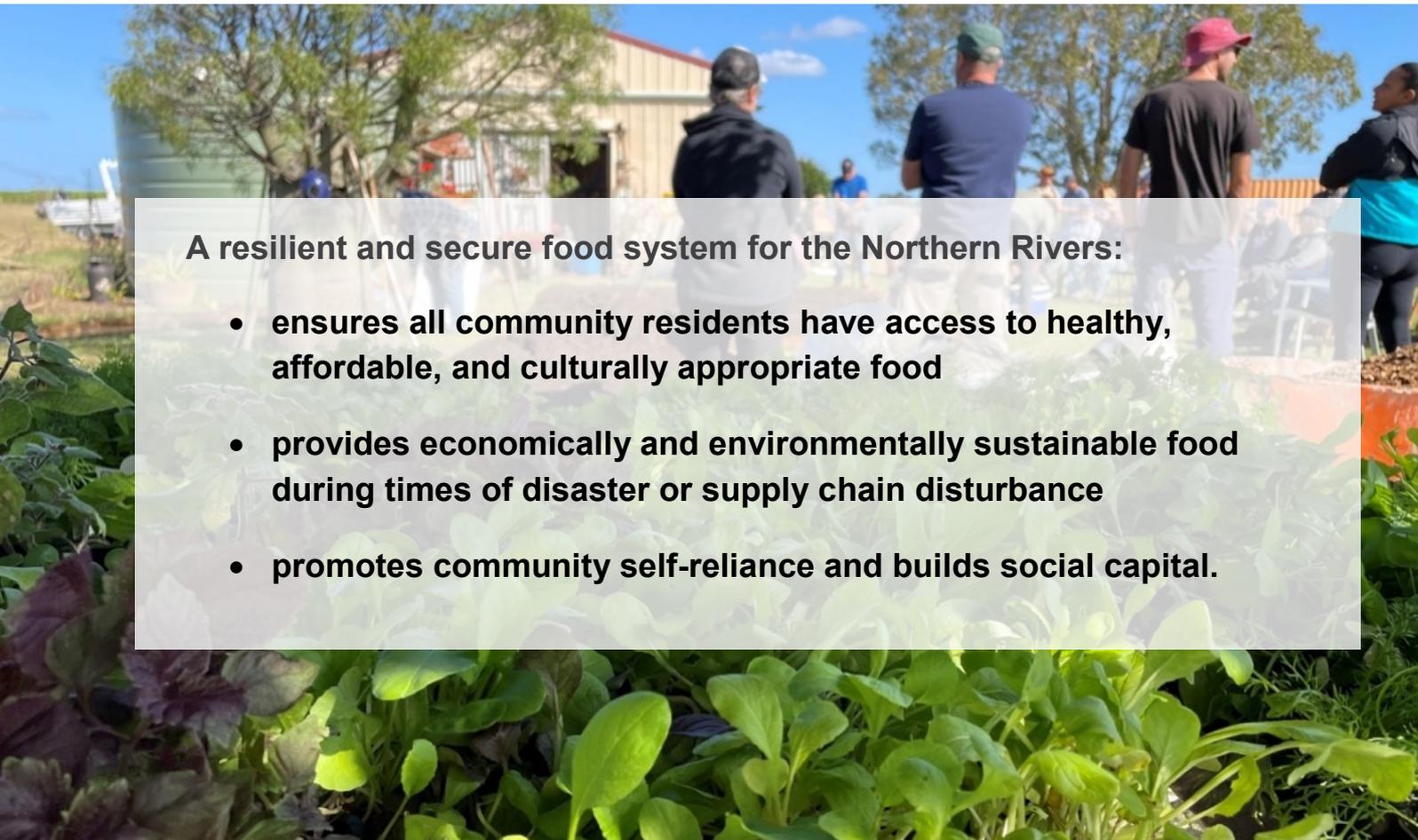
A resilient and secure food system for the Northern Rivers:

- **ensures all community residents have access to healthy, affordable, and culturally appropriate food**

- **provides economically and environmentally sustainable food during times of disaster or supply chain disturbance**

- **promotes community self-reliance and builds social capital.**

Analysis of the interviews identified several key findings that are listed below in alignment with 10 key recommendations.

Finding 1: In 'everyday state' the NRFS is poorly oriented to an intra-regional market and governance of the NRFS is not coordinated to address food security. In the 'disaster state', the speed of government response and lack of coordinated food contingency planning has led to food system challenges.

Recent disasters in the NR demonstrated limited capacity for food re-supply and food contingency planning and intermittent government support. While the NR produces an abundance of food, it lacks coordination between local production and access. Consumers struggle to access local and affordable food conveniently.

Recommendation 1: Develop NR regional food policies and planning

A more coordinated response to disaster food security is urgently needed, with greater support for local farmers and small food businesses to thrive and create diverse food supply options when disaster strikes.

Potential actions in the short term	and long term
✓ Formation of a NR Food Policy Council	✓ Develop a NR Regional Food Plan

Recommendation 2: Deliver rapid response across the food supply chain during disasters

Rapid supportive responses from governments to businesses and organisations supplying food in the region to recover and continue their role in providing food to the community more quickly.

Potential actions in the short term	and long term
✓ Identify rapid-response food emergency actions ✓ Train key NR food emergency responders	✓ Create NR Food Disaster Preparedness Strategy ✓ Establish NR regional food officer role

Finding 2: Local food connects people in the NR and builds social capital and resilience. In the 'disaster state' community-led food response was a key contributor to food security and government support was not timely.

Community connection and informal networks remain strong and a hidden contributor to food security.

Recommendation 3: Strengthen NR food system connections and collaborations

Strong social capital exists in the Northern Rivers, expanding on this resource presents a significant opportunity for enhancing resilience in the NR food system.

Potential actions in the short term	and long term
✓ Develop NRFS Map and Database	✓ Invest in food social capital building strategies ✓ Fund innovation in existing connections

Recommendation 4: Identify and support NR local food champions and community food efforts

There is an urgent need to recognise and value local champions already working to create a regionally-based food system.

Potential actions in the short term	and long term
✓ Establish Local Food Champion awards ✓ Conduct needs survey of community food	✓ Replicate and expand NR food champion activities

Finding 3: There is a clear demand for more food relief that is accessible and dignified to address food insecurity in the NR.

Food charities need fresh food, channels to receive it locally and support to expand their services to help flood-affected and marginalised communities in the NR.

Recommendation 5: Support NR food charities to expand services and provide fresh local food

Sustainable financial support is required for the NR emergency food and food relief sector to meet growing food insecurity and explore local fresh food options that are tailored to specific customer needs.

Potential actions in the short term	and long term
✓ Review equitable food relief best practices ✓ Conduct Food Security Survey ✓ Identify pilot linking local produce to food relief	✓ Deliver annual NR Food Security Survey/Index ✓ Expand food relief to production/distribution

Finding 4: NR food processors, suppliers and distributors struggle to find space for processing food and value-added products. Reliance on roads and freight trucks to transport food in and out of the region is a significant challenge and vulnerability.

While warehouse and cold storage space are flood damaged or unavailable and refrigerated transport is limited in the NR, the benefits of co-locating and incubating food businesses in NR are untapped.

Recommendation 6: Build NR food hubs and strengthen food transport networks for a regional circular food economy

The NR requires long-term and sustainable infrastructure solutions to enable regional food storage, aggregation and distribution systems to support local food industry growth and build food security capacity.

Potential actions in the short term	and long term
✓ Complete NR Regional Food Hub Study ✓ Discuss findings with transportation agencies	✓ Build network of NR regional food hubs ✓ Enable agri-food business regulatory environment ✓ Explore local food business models and incubation

Finding 5: There is conflict between a growing population, meeting housing demands and growing food in the NR.

There is a trend towards increasing approvals for planned urban development to increase housing supply over protection of agricultural land and strong coordination of state and local government is needed.

Recommendation 7: Protect arable land in the NR for food production

Further support for councils to protect land for growing food is needed, including supporting land-use planning and agricultural officer roles within councils and exploring innovative land use models.

Potential actions in the short term	and long term
✓ Review NR land use/agricultural policy ✓ Share findings with disaster/land use agencies ✓ Identify best practices in land-sharing/leasing	✓ Establish food/agricultural officers in each NR LGA ✓ Implement legislative/regulatory amendments to maximise agricultural land protection

Finding 6: Amplifying Indigenous voices in the food system and supporting emerging food sectors is important and necessary.

Indigenous-led enterprises require land and processing facilities as well as opportunities to expand knowledge through education and receive local government support. Protecting and valuing traditional knowledge of food sustainability and indigenous rights is a priority.

Recommendation 8: Support NR Indigenous and emerging agri-business sectors through innovation

Emerging food sectors and actors, increasing agri-tourism and exploring new agri-business models can provide diversity and stability during times of disruption. Indigenous-led enterprises and the emerging NR native foods sector require support to draw on traditional knowledge of country and food sustainability.

Potential actions in the short term	and long term
✓ Dialogue with traditional owners on native food ✓ Discuss emerging food sectors ✓ Conduct food industry incubator study	✓ Support Indigenous-led farms and education ✓ Fund NR agri-tourism and agri-business pilot projects ✓ Identify supportive legislative/regulatory frameworks

Finding 7: Information and data on the extent and resilience of the NRFS is limited.

Additional studies and information on the lessons from disasters on the NRFS and macroeconomic factors such as land use, cost of living, climate change, biodiversity, soil health and water are needed soon.

Recommendation 9: Develop a broader, deeper knowledge base about the NR food system

Expanding this study to be a more comprehensive assessment of food insecurity vulnerability and resilience capacity would allow a more targeted approach to building adaptive capacity in the NR food system.

Potential actions in the short term	and long term
✓ Expand this study's geography and scope ✓ Conduct NR foodshed analysis, food flow and food insecurity assessment ✓ Complete economic analysis of food economy	✓ Implement participatory consultative needs analysis ✓ Conduct monitoring and evaluation

Finding 8: Food security could be enhanced through increasing knowledge about the value of local food and increasing capacity to grow food.

A skills gap was highlighted by interviewees as a priority for supporting regional food. This included increasing expertise across the food value chain in local and regenerative food to improving availability of training in the NR education sector.

Recommendation 10: Increase knowledge and capacity for all to grow and value local and sustainable food

Training and education to support local food systems needs close attention across to increase awareness, build capacity and expand advanced and basic food growing skills to all food system actors.

Potential actions in the short term	and long term
✓ Review of local food education ✓ Complete consumer attitudes to food study ✓ Support community food programs/teaching	✓ Formal sustainable farming education and mentoring for young farmers

Contents

1. Introduction

1.1   Food security and a systems approach

Food security

This study was initiated to investigate food security in the Northern Rivers (NR). The Food and Agricultural Organization (FAO) defines **'food security'** according to four pillars, including sufficient *access*, *availability* and *utilisation* of food and the *stability* of these dimensions over time (2008). Recently, the UN High Level Panel of Experts on Food Security and Nutrition added to the four pillars dimensions of long-term food *sustainability* and people's *agency* to make choices about the food they eat (2020).

Despite the fact that Australia produces plentiful food, increasing numbers of Australians are struggling to access sufficient healthy food. **Food insecurity** is often misunderstood as simply not having enough food. The FAO presents the term as a 'food insecurity experience scale' of severity, ranging from low- concern about not having enough food, to moderate- difficulties acquiring enough food, to severe- hunger and going a day or more without any food (2013). In 2021, the Foodbank Australia hunger report revealed the number of people seeking food relief had nearly doubled from the previous year. 30% of people who struggled to meet their food needs were new to the situation, and 64% of food insecure Australians were employed (Foodbank, 2021). Foodbank's 2022 report revealed alarming statistics, that a third of Australian households had experienced moderate or severe food insecurity in the past 12 months and 1.3 million children in Australia are severely food insecure (Foodbank, 2022). Pandemic related loss of income, food price spikes and the emerging cost of living crises were cited as key factors impacting healthy food affordability. For children, food insecurity can have negative short- and long-term effects academically, socially, emotionally, physically and developmentally. Food insecurity is also disproportionately affecting socio-economically vulnerable groups, impacting their capacity to afford healthy food options (Reis, 2022; Cordell, 2022).

In Australia, we currently do not know the full extent of food insecurity as evidence and measurement are limited. In December 2022, the Australian Household Food Security Data Coalition released a Household Food Security Data Consensus Statement calling for "consistent, regular, comprehensive and culturally appropriate data collection on food insecurity to create timely solutions" (AHFSDC, 2022).

Food systems

The compounding food security challenges in the NR cannot be adequately addressed by linear cause and effect thinking. Food related activities along the supply chain have wide ranging and intersecting impacts on the environment, populations, and economies. A food systems approach is useful for analysing this complexity (Ericksen, 2008; Ingram, 2011). The Food and Agricultural Organization's food system definition has been used in the approach to this study:

> "**Food systems** encompass the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded" (FAO, 2018).

'**Food actors**' refer to the many people, organisations and institutions actively participating in food systems. This can include human actors (e.g. farmers, food employees, food researchers and consumers), institutions (e.g. governments, businesses, universities) and organisms (e.g. animals, plants, microorganisms). The interdependencies and interactions between these actors shape the system and changes in the system (National Academies of Sciences, Engineering and Medicine, 2015).

To ensure that food systems can endure and provide communities stable access to nutritious food, they need to be both **sustainable** and **resilient**. To explain this relationship, Tendall et al. (2015) refers to system resilience as the system's "capacity over time in the face of disturbance" that in turn enables system sustainability: the "capacity to preserve the system in the long run". By this understanding, a system will not endure, hence not be sustainable, if it is vulnerable to disturbances. On the other hand, without sustainability of inputs such as water, soil nutrients and pollinators, the system's capacity to withstand disturbances will be compromised.

Considering sustainability and **food equity** concurrently with resilience will support enduring, beneficial social-ecological outcomes. Important guiding principles for food equity include the human **'right to food'**- that all people should have physical and economic access to feed themselves adequate food (FAO, 2004), and the closely aligned concept of food sovereignty, that recognises people's right to choose the types of food they access (Parfitt, Rose, Green, Alden and Bleibly, 2013). Transforming current food systems to support sustainable, resilient and equitable food outcomes is recognised in many of the UN's SDGs along with calls to action by international experts:

> "The COVID-19 crisis has been a wake-up call to address the multiple complex challenges facing food systems, and it demands measures to improve food systems to make them not only more resilient to crises, but also more equitable and inclusive, empowering and respectful, regenerative, healthy and nutritious, as well as productive and prosperous for all." (HLPE, 2020)

Zurek et al. (2022) outlined three key concepts related to resilience known as the three Rs shown in Table 1.

Table 1. Food system resilience concepts from Zurek et al. (2022)

Food system resilience concepts	Description
Robustness	Robustness is based on the ability of the food system actors to adapt their activities to resist disruptions to desired outcomes **(i.e., maintenance of the status quo)**. Examples include using more heat-tolerant crops, storing water on-farm to buffer against drought, changing land management to ensure that there is sufficient natural habitat to support pollinators, and pest eating organisms, diversifying supply chains, building up soil quality and nutrient reserves, and strengthening strategic food reserves.
Recovery	Recovery is based on the ability of food system actors to adapt their activities to return to desired outcomes following disruption **(i.e., bounce back to the status quo)**. The ability to recover (i.e., their resilience capacities) is what helps people restore, protect, and maintain (or, in some case, improve) their levels of well-being in the face of shocks. An example is the ability of supermarkets to rapidly restock following unprecedented demand (i.e., panic buying) for pantry staples by having strengthened their resilience capacity with centralised distribution systems.
Reorientation	Reorientation involves **accepting alternative food system outcomes** before or after disruption and is based on the premise that changing societal expectations/demands of system outcomes can enhance food system resilience by making it inherently less vulnerable to shocks and stresses. But there will be trade-offs. Adapting activities so as to transform outcomes requires trade-offs to be negotiated among stakeholders, which can require considerable political and/or financial investment, and/or societal acceptance.

To better cope with food system disturbances and ensure food security in the face of increasingly severe climate-related disasters, Australia's food system experts have called for stronger action by governments to build resilience within Australia's food systems (Carey et al., 2022; Reis et al., 2020; Smith & Lawrence, 2018). Recent experiences of food insecurity have exposed vulnerabilities in Australia's long supply chains and overreliance on large supermarkets chains to supply our food (Carey et al., 2022). Australia's food retail markets are heavily dominated by a supermarket duopoly, which has suppressed the power of small, local food growers and retailers and their capacity to thrive, thus reducing the diversity within Australia's food supply chains (Dixon, 2016; Pulker, 2018). Given the high vulnerability to disaster and high level of socio-economic disadvantage in the NR, it is now critical that the NR develops greater **food system resilience**, both food contingency planning and long-term resilience strategies, to ensure future food security of the NR community.

1.2 Food security in the Northern Rivers in 2023

Natural disasters in the NR

Communities living in the Northern Rivers (NR) are familiar with natural disasters, particularly residents of Lismore where flooding has occurred regularly in parts of the town due its location on a river floodplain. However, the last five years have been marked by severe and compounding disasters the scale of which have not been seen before in the region. Flooding in 2017 caused widespread damage to housing, $40 million in damage to Lismore's CBD and long-term adverse mental health outcomes among flood-impacted residents (Nelson, 2017; Rolfe et al, 2020). The 2019 black summer bushfires burned through forests of the NR not previously thought to be susceptible to bushfire and destroyed many homes with an economic impact of $370.3 million (NRCF, 2022). In 2022, two major floods resulted in catastrophic impacts to the region, with the Wilsons River in Lismore peaking 2 metres above previous records on 28 February, followed by a second major flood a month later. Overlaying 2022 flood hardship, were the ongoing impacts of the COVID-19 pandemic and the emerging cost of living crisis that has also begun taking a significant toll on households. Even before the floods of 2022, the Lismore area was identified as the second most disaster-affected postcode in Australia (Gissing & Langbein, 2020). The cascading impacts disasters and crises have been extremely challenging for NR residents and businesses. A recent survey found 60% of NR residents felt they were not coping with the stress and trauma of flood recovery (Birch & Luke, 2022).

NR Food system resilience

Recurrent disasters and crises are leading to both short and long-term food supply disturbances in Australia and, due to the high prevalence of disasters, have been felt acutely in the NR region. After the February 2022 floods, many food outlets and supermarkets across the NR were inundated with water and virtually all food businesses in Lismore, Coraki, Wardell, Evans Head and Woodburn were severely affected. Although most businesses in the NR were well aware of and prepared for floods, with elevating mezzanine levels for stock relocation, the height of the flood waters overwhelmed these preventative measures in many locations (George et al., 2022). With an estimated 2000 residents displaced due to the floods in the Lismore LGA (Lismore City Council, 2022), even accessing cooking equipment has been a significant issue for many. Residents and workers relied upon emergency food relief for many weeks post-floods.

Major supermarkets in Lismore remained closed for over four months- a significant period of time that required longer trips to neighbouring suburbs for food or continued reliance on food relief. Local food crops were devastated due to flood waters and food supplies from Brisbane were also severely impacted for weeks due to the Rocklea markets being inundated with water.

Food supply chains in the NR and across Australia, have been significantly impacted by COVID-19, disaster-related crop losses and international conflict (Godrich et al., 2022; Jambor et al., 2022). Disruptions due to staff shortages, panic buying and border closures have resulted in repeated food shortages in supermarkets and reduced food affordability due to price spikes (Carey et al., 2020; Jambor et al., 2022; Liveris, 2021). For example, pandemic border restrictions led to a sudden cessation of an international workforce to harvest industrial crops in Australia, resulting in crop wastage and losses worth over $45 million (Liveris, 2021). The frequency of acute food supply disturbances in the NR demonstrate a need for both short term food contingency planning and long-term action to address food supply options. Coverage of the impacts from the 2022 floods on the food value chain and social wellbeing was widespread across local and national media, shown in Figure 1. A full list of media articles is in **Appendix A**.

Figure 1. Media coverage of disaster impacts on the NRFS

There are a range of **vulnerabilities for the NRFS** that threaten the ability to maintain food security. A large proportion of food-producing land in the NR is in the floodplain - 72% of NR land area flooded in 2022 was agricultural food producing land (Lismore 18% and 0.4% in Byron) (RDA Northern Rivers, 2023). In addition, NR residents have higher risk of food-related health conditions such as obesity than NSW or Australia (NRCF, 2022). Weather-related disasters are projected to worsen in the NR by 2070 including maximum temperatures, rainfall and fire (NRCF, 2023). The median house price in the NR increased by 28% between 2020 and 2021 and less than 1% of listed rental properties are affordable to households on income support payments (NRCF, 2022) creating pressure on food budgets.

Food waste also remains a significant problem for Australia and the Northern Rivers and is often overlooked as the final point in the food supply chain. In 2020-2021, 17,000 tonnes of residential green waste were lost to landfill in the NR and over 12,000 tonnes of this was food waste (NE Waste, 2023). This presents an

opportunity to both avoid food waste occurring in the first instance, to rescue food being thrown away and to manage existing waste as a resource e.g. compost. NR organic waste collection and treatment, education and behaviour change programs and food rescue are occurring in segments of the community (NE Waste, 2023). The potential to further reduce the tonnes of food still being wasted in the NR needs further attention.

The importance of **social capital** for responding to disasters has been well established in scientific literature (Aldrich & Meyer, 2015, Carmen et al, 2022). Food is a valuable connector and common denominator that is inclusive and does not prescribe to any belief set or social dogma often present in other forms of social connection. It brings people together to support each other and connects vulnerable communities with service providers and support. Regional food systems therefore present an opportunity to build social capital in communities. Providing infrastructure to bring community and food system actors together (e.g. food co-operatives, food hubs or food policy councils), not only supports the local food industry, but is an important way to build resilience through connecting people.

1.3   Benefits of local food systems

Sustainability benefits

There are multiple benefits to be realised from a local food system, from reducing emissions and organic waste streams to building social capital, providing fresh healthy food locally to those who are food insecure and maximising environmental protection and liveability. Examples are illustrated in Figure 2.
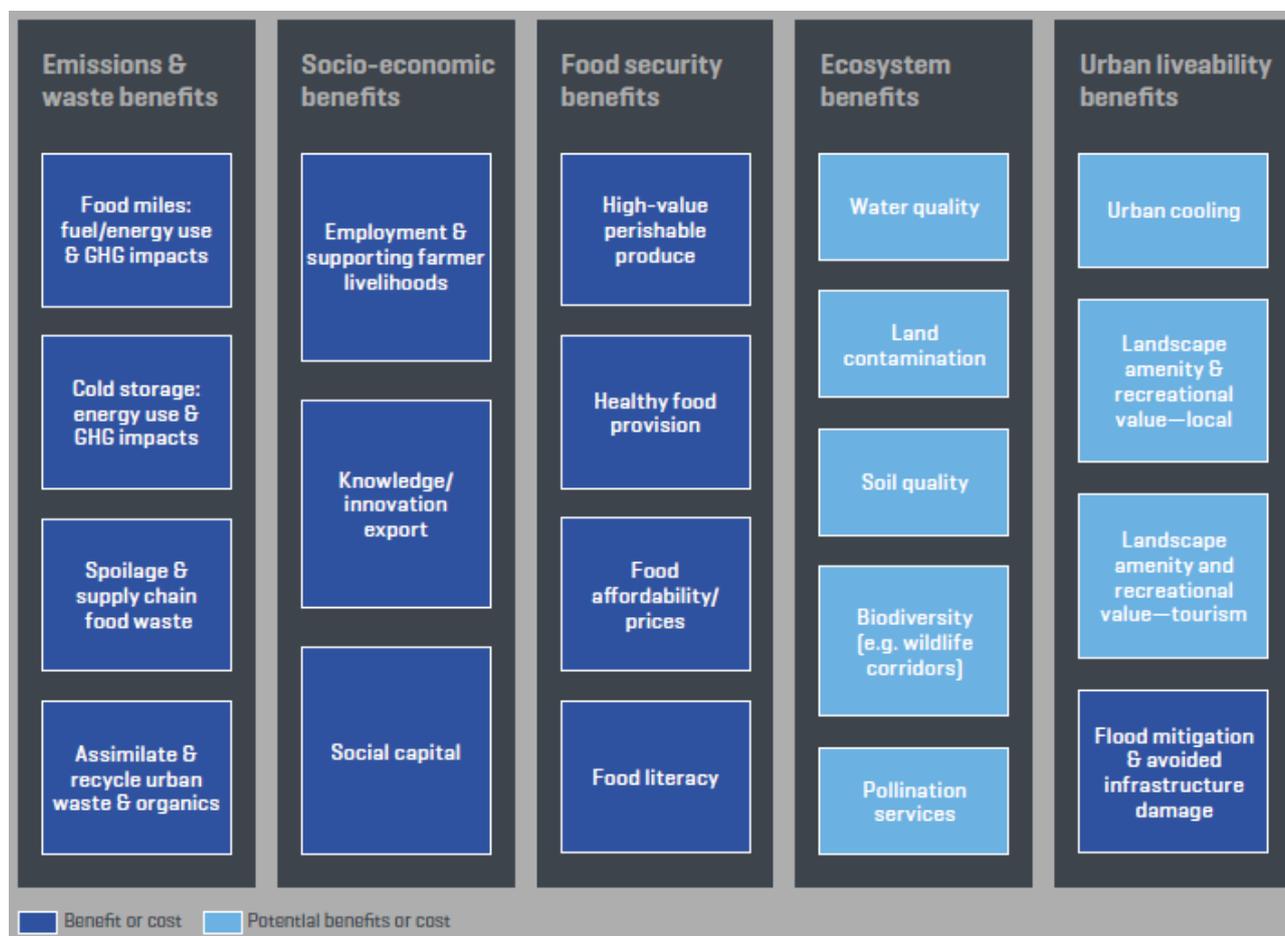
*Figure 2.* Sustainability benefits of local food systems (from Wynne et al. 2016)

Governance of food systems

Participatory governance mechanisms enhance adaptive response in food systems (Smith & Lawrence, 2018). **Food policy councils** have been a successful mechanism for achieving inclusive and participatory governance and demonstrate strong potential for building food system resilience (Calancie et al, 2018).

Underpinned by collaborative and participatory processes, councils can utilise strategic visioning process through key criteria such Awareness, Diversity, Integration, Self-Regulation, Adaptation and Inclusion (Harris & Spiegel, 2019) and be facilitated by experts in food governance, planning and strategy.

The need for overarching **strategic food plans** by governments was highlighted in the 2022 NSW Parliament Committee on Environment and Planning report on Food Production and Supply to address the multi-faceted challenges facing food systems. Developing regional food plans in areas such as the NR can utilise best practices to food systems in Australia and internationally (see **Appendix F**).

1.4   The project

The aim of this project is to develop an understanding of regional food networks in the NR and identify food security challenges and opportunities during recent disaster events, including recommendations for developing greater resilience within the regional food system. Table 2 outlines the research questions and objectives for the project.

Table 2. Project research questions and objectives

Research question	Research objectives
What regional food actors and networks exist in the NR?	• Identifying broadly the components of the NR food value chain • Identifying the key NR food system stakeholders and networks including food system governance
How are they responding to disaster related food security challenges?	• Investigating how NR food system stakeholders contribute to food security and resilience in the region and identify possible gaps and opportunities • Identifying what food is available locally to NR residents in the case of severe disruptions to the food system

What are the challenges and opportunities of the NR food system in light of recent disasters?	• Identify how recent disaster events have impacted NR food systems by uncovering:
	  – Challenges, opportunities and facilitators to food security
	  – Specific strategies and recommendations that could increase resilience
	• Envision what a resilient and regenerative food system would look like in the NR

1.5   Project constraints and assumptions

This project is a foundational project and presents a high-level scoping study for food security and resilience in the NR. This report is the first phase of investigations and analysis and provides recommendations for the next phase. The methods and approaches utilise high level qualitative analysis and are guided by university ethics procedures.

The project experienced a number of delays from its commencement in February 2022. This included the unprecedented floods of February and March which devastated the NR. The availability of interviewees for the interview phase was also a constraint, as many were still recovering from the disaster. While larger supermarkets in the region are also a major point of access for food in the region, they did not respond to our requests for an interview. Local restaurant and food service operators were interested but time constraints in their busy workplaces post-flood impacted their capacity to participate in an interview, therefore the restaurant sector remained under-represented. There were other community-led food actors such as community gardens in Lismore and Byron Shire that were flood affected and also not represented.

Each food system actor brings different perspectives based on their experience in the food system, their role across one or more food system elements and their ability to respond to shocks and stresses in the food system. Some actors were representing their own individual businesses and others speaking on behalf of

their organisation or employer. Some questions may be answered differently by actors who were not involved in the study. In addition, there are varying capacities both economic, environmental and social of each actor which need to be considered in a cooperative way.

The project does not present a full detailed picture of the NR food system value chains and does not encompass all food system actors, or the relationships between them. It also does not address the seven Local Government Areas (LGAs) in the NR and interviews were with actors in Byron Shire and Lismore City Council LGAs as a first phase, with a few actors who represent the NR more broadly.

2. Methodology

A mixed-methods approach was used to investigate food security and resilience in the NR that included high level analysis of academic and grey literature, identification of food system actors and qualitative data collection through semi-structured interviews.

2.1 Literature review

The literature review aimed to develop an overview of previous food system and food security-related projects, research and policy in the NR. While it was beyond the scope of this study to conduct a critical analysis of all literature reviewed, the review aimed to highlight what work has been conducted in relation to the NR food system, identify any significant challenges faced and identify what gaps exist in current work and knowledge related to the NRFS.

A review of academic and grey literature, along with government documentation, was conducted to provide a synopsis of Northern Rivers-based research and interventions related to food security to date. Academic literature was retrieved through the databases Web of Science and Scopus and Google Scholar. Grey literature was identified through Google search engine and government documentation retrieved through government websites and personal communication with local government officials. The literature retrieval followed an iterative process that applied search strings within databases and search engines, reference lists and in-text referrals. Literature and documents from the past 15 years were included in the review and there were no restrictions put on the types of literature included in the review. Example search terms included 'Northern Rivers' OR 'North Coast' AND 'New South Wales' combined with terms including 'food security', 'food system', 'food' AND 'resilience OR sustainability'. A literature list is in the References section and **Appendix B**.

2.2 Scope

The NR is a highly fertile region in northern New South Wales that borders the state of Queensland. The subtropical climate with high rainfall and mild winters, along with rich volcanic soils, make the NR an important food producing region in Australia. Key agricultural industries in the NR include beef (27% of Gross

Value of Production), fruit and nuts (20%) comprising macadamias, avocados, blueberries, and bananas, sugarcane (16.5%) and dairy (11.8%) (NSW DPI, 2020). The LGA breakdown is illustrated in Figure 3.
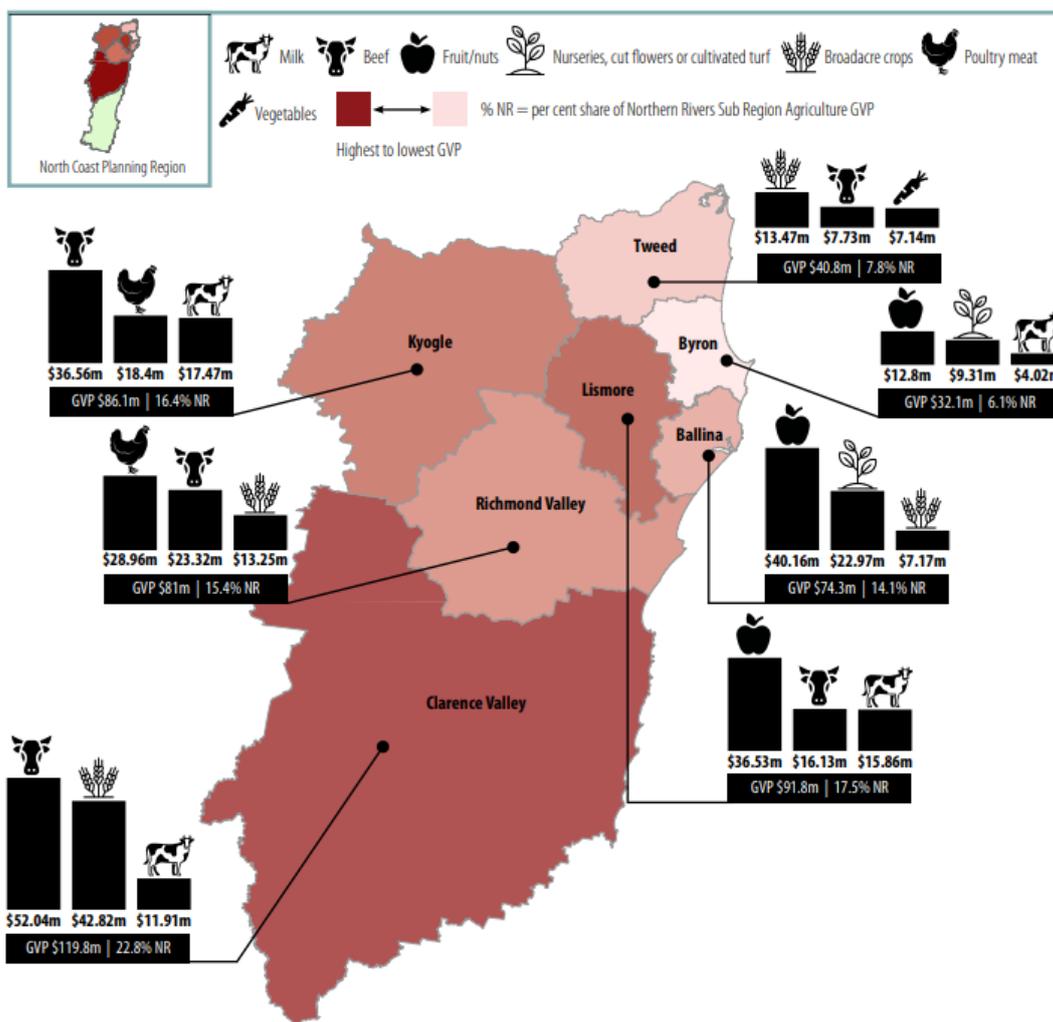

Figure 3. Northern Rivers agricultural Gross Value of Production (GVP) by LGA (Source: NSW DPI (2020))

In 2016, the NR had a resident population of 290,264 (RDA, 2016). Like many rural and regional areas of Australia, communities in the NR experience higher rates of socio-economic vulnerability compared to state averages and lack of affordability of housing in the region that has been further amplified by the vast damage to housing from the 2022 floods. The NR suburbs most impacted by flooding also experience higher levels of socio-economic disadvantage (Rolfe et al, 2020).

While the literature analysis included the entire NR region, the stakeholder identification and interviews focused on two LGAs within the NR region: Byron Shire and Lismore City.

Lismore City Council area is a diverse community, situated in Bundjalung country, home to over 40,000 people. Lismore covers an area of 801 square kilometres and contains 60% urban and 40% rural population. Agriculture (macadamia, avocado, coffee, beef, dairy, tea tree and sugar) dominates the rural landscape. The local government area faces challenges such as land-use conflicts (residential and lifestyle), disconnected sectors, water insecurity and rising costs of production and land prices.

Byron Shire boasts a relaxed lifestyle and active tourism sector, also located in Bundjalung country and with a population of over 36,000. The shire covers an area of approximately 550 square kilometres approximately 95% of which is rural (Byron Shire Council, 2017) with 72% living in urban areas and 28% rurally (Byron Shire Council, 2017). Key agricultural sectors include coffee, avocados, sugar cane, seafood/fishing, dairying, macadamias, stone fruit, blueberries and bananas. Retail and home-based businesses are large employers in the Shire which faces challenges of population growth, high tourist numbers, urban sprawl, increasing cost of land and demand for additional infrastructure and services (Byron Shire Council, 2017).

2.3 Stakeholder identification

The stakeholder identification aimed to begin the process of identifying actors in the NRFS. The creation of a comprehensive map including all actors within the NRFS was beyond the scope of this project, as was the process of interactions between each of the components of the food system. The identification process aimed to create a foundation of key stakeholders and representation of a wide range of food system actors across the spectrum of food system activities in the NR. A simple list was developed, and each actor was categorised according to the following eight food system elements adapted from RUAF/FAO City-region toolkit (FAO, RUAF & WLU, 2018) as illustrated in Figure 4.
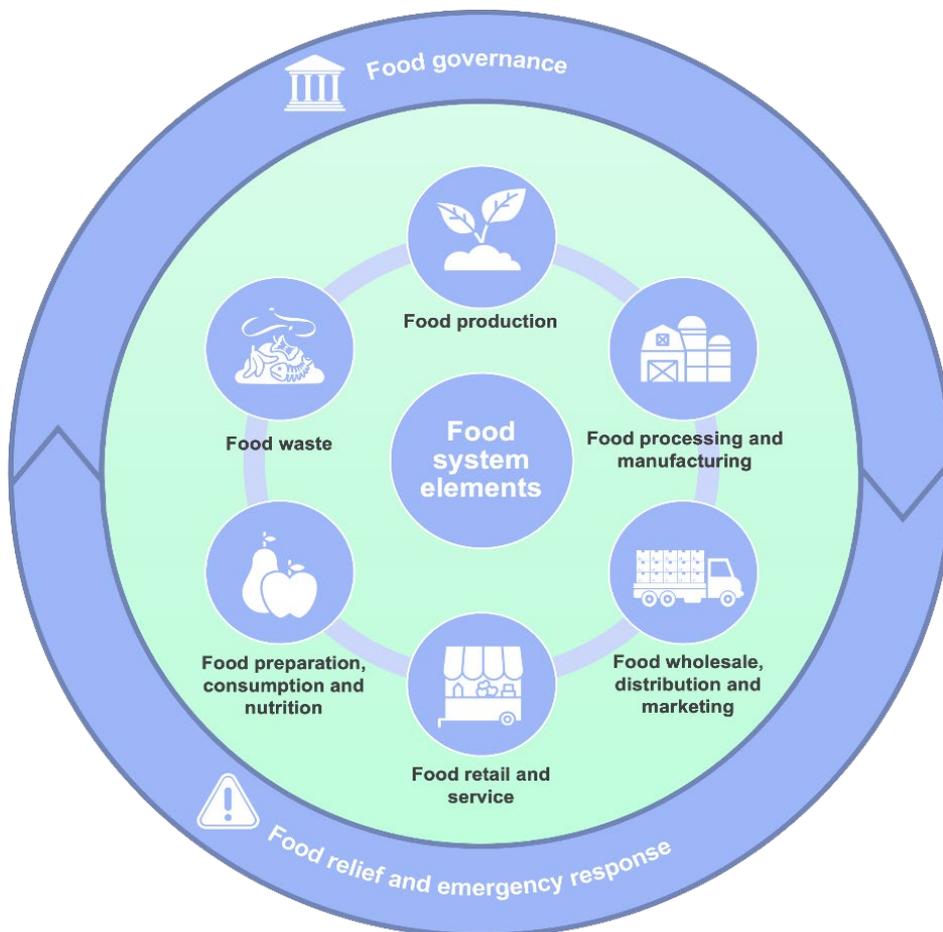
Figure 4. Preliminary food system elements

The actors were also categorised according to their ***organisation types*** adapted from RUAF/FAO City-region toolkit (FAO, 2023) as illustrated in Table 3.

Table 3. Food system actor organisation types

Industry	Community Organisations	Public Sector
Regionally-based individuals/ businesses	Regionally-based groups	Regional officers
Industry associations	NGOs	Regional gov departments
Industry peak bodies	Festivals	Local gov departments
		Public institutions

The identification categories were also used to inform the selection of interviewees.

2.4 Interviews

The stakeholder identification process continued to be informed through the interview phase, as interviewees were asked to identify other people and organisations in the NRFS they interact with on a regular basis. The goal was to interview 25 stakeholders using a purposive, snowballing strategy to include NRFS actors working across a wide range of food system activities. The interview selection process utilised a number of criteria. Core criteria were that the interviewee must be active and well-established within the NRFS and have a focus on local food supply and access. Desirable criteria were involvement in multiple aspects of the regional food system, have experience in food disaster response and offer a diverse perspective. More detail on the criteria used are in **Appendix C**.

An interview instrument was developed with key questions across four sections:

1. Role in the NRFS

2. Socio-environmental sustainability initiatives

3. Food security impacts due to:

   – 2019 bushfires

   – COVID-19

   – 2022 floods

   – Any other disruptions

4. Recommendations/vision for a more resilient NRFS

The full list of questions can be found in **Appendix C**. Not all questions were asked, depending on their relevance to the interviewee's situation, organisation type and role in the FS. Interviews were approximately 60 minutes in duration (at times shorter or longer depending on the interviewees availability) and were conducted in person or online using a video call. Interviews were recorded and transcribed for analysis.

2.5 Thematic analysis

Transcripts from the 22 interviews were analysed using a qualitative thematic analysis. The data was organised across the four sections of interview questions. Data was then analysed to identify key themes under the four pillars of food security, sourced from Harris and Spiegel (2019), as outlined in Table 4.

Table 4. Food security pillars from Harris and Spiegel (2019)

Food system pillar	Description
Availability	The physical availability of food "addresses the 'supply side' of food security and is determined by the level of food production, stock levels, and net trade." (FAO, 2008) The availability pillar includes domestic production and imports, and traditionally also includes sources of food aid (FAO, 2006).
Accessibility	An adequate supply of food (i.e., availability) does not guarantee that all people, at all times, can access it. Thus, the accessibility pillar considers the economic, social, and physical access to food and includes considerations like the financial status of households and means of physical access like reliable transportation, safe roads, and accommodating work schedules.
Utilisation	The utilisation pillar captures the nutrition component of food security. While available and accessible food is necessary for food security, the ability to utilise food to support human health is also critical. "Food preparation, diversity of the diet and intra-household distribution of food" and "good biological utilisation of food consumed" contribute to sufficient caloric and nutrient intake by individuals (FAO, 2006). Thus, the utilisation pillar includes the nutritional status of individuals with a focus on diet diversity and access to food storage and meal preparation (FAO, 2006).
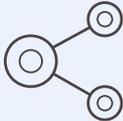
Stability	This pillar considers not only the stability of the other three pillars over time but also the stability of the local, regional, or global food system over time. For example, an individual's nutritional status may be jeopardised if their access to adequate food is inconsistent due to extreme weather events, political instability, an increase in food prices, or unemployment (FAO, 2006). However, to achieve food security, households and individuals should not, at any time, be at risk of losing access to food due to sudden shocks, such as economic or climatic crises, or cyclical events, such as seasonal food insecurity (FAO, 2006). The stability dimension forces governments and organisations to address vulnerabilities in the food system to avoid these outcomes, as well as their short- and long-term effects.

The themes which then emerged gave a temporal element to the food system experience of the actors, particularly given that the interview content often focused on the lived experiences of the food actors prior to and following the disasters. This enabled organisation of the findings into three "states" of the NRFS in the resilience journey (before, during and after the recent disasters) as illustrated in

Figure 5:

Figure 5. Food system "states" in the NR

3. Findings

3.1 Literature analysis

Academic literature

Very few academic papers relevant to the NR food system have been published. However, one highly relevant case study by Singh-Peterson & Lawrence (2015) was identified that investigated post-disaster food security impacts on small and large food retailers in rural and urban areas of the NR after the 2011 floods. This study found the 2011 floods impacted both local and non-local food supplies. Some local food supply was reduced due to the impact of heavy rain on crops. Non-local food supply was impacted due to the flooding of Brisbane's Rocklea market and supermarket distribution centres and road closures. Not all local producers were impacted, however, and local food producers were able to continue providing fresh food to existing customers at reasonable prices when supermarkets were still struggling with road access for truck deliveries and for 2 – 3 weeks after the flood required additional transport as supplies needed to come from distribution centres in Sydney and Melbourne. Local retailers that sourced fresh food from Rocklea markets were able to work collaboratively to pay for a truck delivery from southern markets, however, this came at an extra cost for consumers. Proximity to major transport routes was a key enabling factor for small and large retailers in accessing food. A previous study by Singh-Peterson, Shoebridge and Lawrence (2013) indicated that the cost of food in the NR post 2011 flood increased to a greater extent in smaller independent supermarkets and there was a strong correlation between remoteness of retailers and increased food prices.

Grey literature

Grey literature reports from the last 15 years revealed that although there have been periods of intensive work aimed at developing the NR food system, the overall approach has been inconsistent and lacking cohesion. There have been two significant region-wide food system projects based in the NR that were aimed at enhancing food security, sustainability and resilience- the NR Food Links project and the Sustain NR Food project. The NR Food Links project (2009 – 2011) was a large, collaborative project involving seven local councils in the NR and Rous Water and funded largely through the NSW Environment Trust to the sum of approximately $2 million. The project involved the production of baseline data on local food trade, producing marketing and education campaigns aimed at retailers and consumers, a distribution project to support intra-regional trade and local food system projects in the seven participating council areas. Very little publicly available information or resources remain from the project. While the NR Food Links project achieved positive outcomes for local farmers markets, community gardens and promoting local food, evidence of continued collaboration between councils on food systems is lacking, apart from the brief work by the NR Sustain Food working group (outlined below). Considerable challenges faced in implementing the programmes were highlighted in evaluative summaries of projects (Richardson, n.d.; Wright, n.d.) including the following key points:

- Lack of comprehensive baseline data on actual and potential local food supply capacity

- Underestimation of the managerial and administrative costs and time requirements to coordinate the many projects involved

- Personal and professional conflicts regarding future project directions and how best to address food security were an issue and likely due to unclear communication in the pre-planning and consultation phase

- Partner organisations in the distribution project were working under high pressure to meet contract requirements leading to tensions between participating organisations.

Ongoing work from the NR Food Links projects included the formation of the Sustain Food working group and Sustain Food website that ran from 2012 – 2015, however, other than a brief resurgence in 2017 - 2018, has ceased operation. The Sustain Food working group included a diverse set of stakeholders from the NR regional food system and three local councils (Tweed, Byron Bay and Clarence Valley), who established a set of key priorities and desirable outcomes for the NR food system in their 2012 Roadmap (Sustain Northern Rivers). This document demonstrated the beginnings of a sustainable and resilient food system

plan for the region, however, did not progress into a strategic document, and there is no evidence of evaluation or monitoring of recommended actions. Analysis of websites provides evidence of current collaborative food system action in the NR, including the independent food industry body Northern Rivers Food, that has been operational since 2011 in supporting local food businesses and regional food networks. Organisations aimed at agricultural sustainability and regeneration have been led through Southern Cross University based in the NR, including the Farming Together (a joint project with the Australian Government) and the Regenerative Agricultural Alliance. While these organisations are national in their scope, their work includes projects based in the NR, such as the 'Northern Rivers Net Zero' project.

Regional Development Australia- Northern Rivers (RDA-NR) has led the development of several projects and research reports related to food security and resilience in the NR:

- Source Identification Project (2011): in collaboration with NR Food Links, RDA-NR led the development of baseline data and programme implementation to encourage retailers to source local product and help consumers identify local products:

    ○ baseline data- surveying 180 producers and retailers to create a snapshot of local food production and sales in the region. Consumers surveys were also conducted across 5 local IGA supermarkets and how much local food consumers are buying and from where behaviour local food research project

    ○ a marketing and education programme to develop local food identification through providing retailers with case management and tool kits

- Securing Food Futures (2013): produced a kit of local food system development resources for local councils, drawing upon local food system developments across Australia to provide a guide for food system planning and specific actions to support local food.

- Northern Rivers Regional Food Survey (2019): Reports on a survey investigating potential growth in local food businesses and interest by local manufacturers in utilising industry manufacturing hubs or precincts to share infrastructure and resources

- Roots to Routes report (Doust et al, 2019) in collaboration with Southern Cross University: a freight and supply chain strategy for the NR

- Several region-wide strategic plans have been developed that relate to aspects of the NR food system. The Department of Primary Industries has released various reports related to disaster preparation and resilience within agricultural and livestock industries in the NR, including the Flood Ready Dairying Strategic Plan for the North Coast Region of NSW (Stillman, Stow & Whitehead, 2014) and Flood Ready Cane Farming Strategic Plan for the North Coast Region of NSW (Squire, Stillman & Whitehead, 2014). North East Waste is a regional organisation (funded by the NSW Environment Protection Authority) that is involved in food waste prevention projects across the seven LGAs of the NR and has previously worked on local food rescue and relief programmes. North East Waste have developed a region-wide strategic plan for sustainable waste management (2017). The NSW Office of Environment and Heritage commissioned a North Coast Enabling Region Adaptation Study in 2019 which identified a range of transition pathways for the food and agriculture sector to adapt to climate change impacts in the North Coast region, as illustrated in Figure 6. The NSW government released their North Coast Regional Plan in 2022, that outlines policy for agricultural productivity, land use planning and sustainable resource management.

Food and Agriculture

Definition: diverse system incorporating food, fibre, energy, fisheries and forestry production and processing

SYSTEM DRIVERS

System driver arrows (left):
- Cost of production
- Social norms and consumer preferences
- Land use conflict and land prices
- Environmental regulation and red tape
- Bio security issues and threats
- Population growth and turnover
- Climate change and extreme events
- Market unsupportive of environmental innovation
- Conservative producer base

2018

BUSINESS-AS-USUAL

Rising costs and lack of support for flood plain agriculture

Diverse climate varies across the region leading to regionally diverse production systems e.g. dairy and local climate, large number of individual enterprises: fisheries industries targeting specific species

Some sectors disconnected from extension networks (fish co-ops operate as social hubs)

State legislation limits water security and capture for horticulture, disincentive to keep run-off from farm to fisheries

Changing pasture composition (e.g., C3/C4 legumes) effects forage quality

Unregulated rivers with limited water sharing plans leading to over extraction in some locations, un-metered use, no regulation to address over extraction

Residential development encroaching on agricultural areas

Supermarket chains limit prices received for produce (e.g., dairy)

Emerging biosecurity issues (pests, diseases) with increased costs on farmers

Environmental & social issues with some horticultural systems

Emerging "cottage" industry sector (speciality items, cheese, gin, organic veggies)

Macadamias on the flood plain causing tension around existing land use & raising property prices impacts neighbours

Land use and community conflict (blueberries) as sectors are shifting within the region

Livestock heat stress is an increasing problem

Fisheries have been through a reform process

Industry demographics influenced by uncertainty, lifestyle & changing regulation

Green transformation arrows (middle):
- Develop a strategic focus for the region that promotes diversity of produce
- Adaptation supported by NSW government programs for North Coast agriculture
- Implement improved consultation processes around land use planning into long-term sustainable productivity
- Educate community to understand the relationship between primary production and the viability of the regional economy
- Find low-cost innovative ways to promote resource sustainability and efficiency (water, fertilizer, drainage, soil, vegetation and energy)
- Capture data to support social licence to operate, engage industries in reporting improvement in environmental performance, animal welfare, BMP, CoP and equivalent.
- Provide infrastructure to support existing and future industries of all scales (e.g. food hubs to cottages) and explore co-operative model

2050

TRANSFORMED SYSTEM

Renewables integrated in the food system

Clear responsibility for agricultural regulation state and federal involvement

Local research and development for North Coast system

Long term strategic local planning for agriculture is coordinated

Community values agriculture and recognises value of Indigenous knowledge

Ground water extraction is within sustainable limits

Production systems are climate adapted

Family farming retained in the region

Social license to operate embraces local values and is actively promoted to recreational fishers

Innovative governance of North Coast water is science-based with urban demand managed to reduce pressure on off-river supplies.

Improved road infrastructure east-west

North Coast agriculture speaks with a combined regional voice and includes regional socio-economic impact

Agri-tourism (particularly horticulture) valued as intrinsic to regional tourism promotion

Finance industry recognises and supports the agriculture sector to value and enhance natural capital

Commercial fishers participate in informal best practice training for sustainability

Co-ops promote local produce accessed through local markets

Cooperative vertical integration ensures local retention of employment and profits

Local energy generation has reduced the cost of electricity for the agri-food sector

**Food system balances environment and production values**

Figure 6. North Coast Enabling Regional Adaptation Study (2019) - change model for food and agriculture

Student research reports (Griffith University) and a brief policy analysis document based in the NR were also identified in the grey literature. McKinnis and Wilkinson (2021) investigated the motivations and perceptions of consumers shopping at two local farmers markets in the NR through 44 online surveys and 94 semi-structured interviews. An overarching theme in their findings was the importance of markets for social connection and support that were particularly beneficial during COVID-19 lockdowns. Attendance at farmers markets was not negatively impacted during COVID-19. Trust in and support for local farmers were also key themes identified. Another student research report by Moore and Why (2018) compared the cost of purchasing food at farmers markets with similar products at supermarkets. The findings indicated that fresh fruit and vegetables and nuts were cheaper at farmers markets, while supermarkets were cheaper for meat and dairy. An analysis of food related policy by local councils of the NR (Guise, 2018) found evidence of policy related to farmers markets and agricultural land protection in 3 – 4 out of the 7 LGAs, however, healthy eating and community garden/streetscape policy was less common and no councils had a dedicated food officer.

Key findings and discussion

Key findings from the literature review include:

Many information gaps exist for the NRFS and lack of baseline data have led to significant challenges in a previous NRFS project. There is a clear lack of academic literature related to food security and resilience in the NR and challenges faced in the Food Links distribution project stemmed from lack of understanding about the actual local food production capacity.

The limited research available indicates there is potential for enhancing food resilience in the NR through local food supply options, but scaling up of local food supply is needed. Academic literature revealed that local food producers and retailers were quick to adapt to disaster food supply impacts and able to continue food supply, however, local supply will need to be upscaled to provide a more significant contribution to food security.

Recent strategic planning that addresses food in the NR has been relatively siloed within either agriculture or transport. There is a need for strategic planning that approaches food from a systems perspective, that incorporates the range of actors and activities across the food supply chain, and holistically considers food resilience, equity, health and sustainability.

Both academic and grey literature in this review have identified the vulnerability of the NR to extreme weather events and the critical need to build resilience within the NRFS to ensure future food security. Evidence from Singh-Peterson & Lawrence (2015) and the Food Links project (Richardson, n.d.) indicate that local food producers and retailers often demonstrate greater adaptive capacity than large supermarket retailers in the face of disaster events, however, local food supply capacity has not been of sufficient scale to support a more significant contribution to food security. Similar findings have been observed in previous Australian research on alternative food networks (Dixon & Richards, 2016) and suggests that scaling up of local food production is required alongside efforts to increase regional distribution of those foods.

Collaborative efforts to address food system sustainability and resilience in the NR have been occurring over the past 15 years, particularly the Food Links and Sustain Food projects, however, less collaborative work has happened in the last 5 years. Past projects have faced several challenges in implementation and little legacy remains of an ongoing, region-wide approach to food system development that brings the many actors of this system together. While there is evidence of strategic planning for agricultural land use, supply chain logistics and disaster preparation for farmers, these have been relatively siloed approaches and a dedicated food officer role within regional councils does not exist (Guise, 2018). Recommendations from this review include the development of holistic, strategic planning for the NR food system, that takes an inclusive, systems approach. Given the staggered and often piecemeal approach to food system development in the NR, a more consistent, long-term approach to building resilience and sustainability is needed. To provide more targeted, effective and economically efficient action, more research is needed to establish baseline information about the NR food system, and ongoing monitoring and evaluation of initiatives is needed to track progress and inform future decision-making.

3.2 Food system stakeholders

A total of 76 food system actors (50 in Byron Shire and 26 in Lismore City) were initially identified at the outset of the project. This was using a set of desirable criteria which focused on food system actors representing multiple aspects of the food system and with a focus on supplying local food. Availability of interviewees was a key factor and often up to 3 contact attempts were made to secure an interview. **Appendix D** illustrates interviewee's role in the food system elements, the match to the core and desirable criteria and their location.

The prioritisation process resulted in a total of 22 interviews with actors from the NR food system. Interviewees included 11 stakeholders from the Lismore LGA, 7 from the Byron Bay LGA and 4 that worked across various LGAs in the NR region as illustrated in Figure 7.
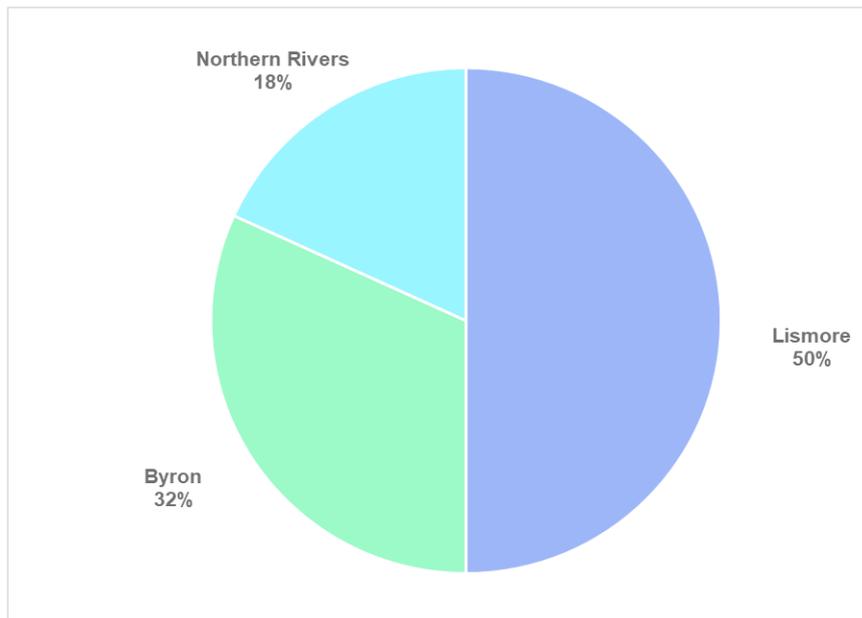
Figure 7. Location of interviewees

Interviewees represented a wide range of food system activities, as demonstrated in Figure 8. The spread of representation was reasonably even, with slightly higher numbers representing the food retail sector and slightly fewer representing food governance.
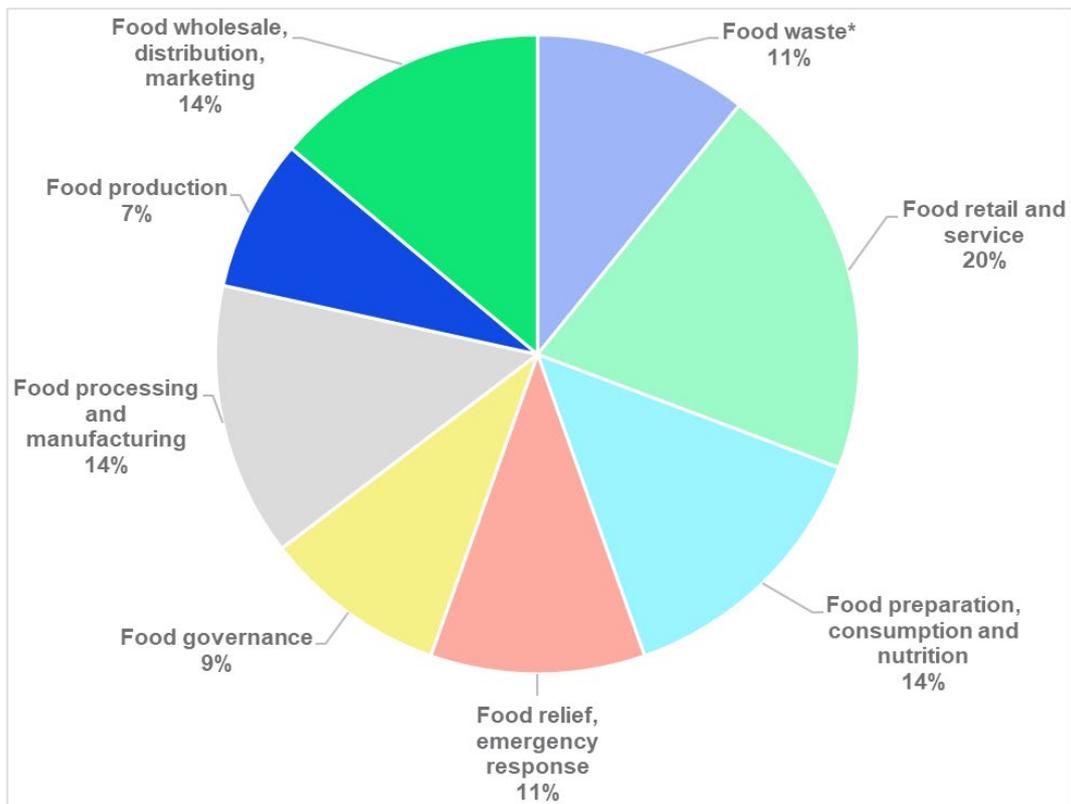
the role of representatives from the food waste sector was generally not food waste-specific, but addressed food waste as part of a broader role (i.e. conducting food rescue within the role of food relief coordination)

Figure 8. Food system elements represented by the interviewees

The occupation or position title of interviewees are listed in Table 5, which indicated the highest proportion of interviewees were business owners, followed by farmers.

Table 5. Occupation or position title of interviewees

Interviewee occupation or position title	Total number (and %) of interviewees
Farmer	5 (23%)
Business owner	7 (32%)
Manager/executive director	4 (18%)
Service coordinator	4 (18%)
Local/state government officer	2 (9%)
Representative or officer of a non-government organisation	2 (9%)

The type of organisation interviewees represented was over half (62%) from the food industry (producers, businesses, and industry bodies), approximately a third (29%) from community organisations (not-for-profits and individuals) and a small number (9%) from government as illustrated in Figure 9.
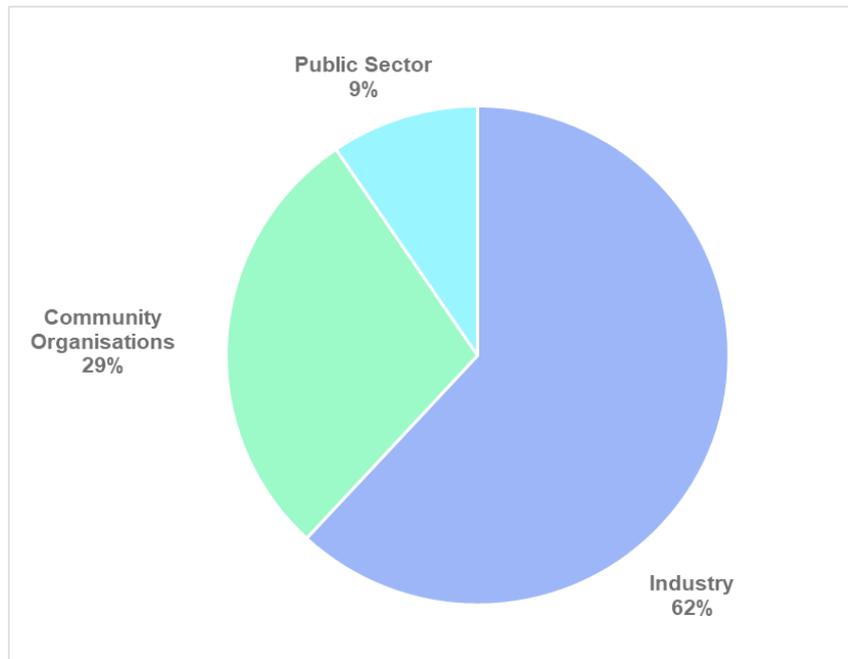
Figure 9. Interviewee organisation type

Sections 0-3.6 document the key results from the thematic analysis of the 22 interviews conducted. The analysis is structured under the three states of the NRFS in the resilience journey. The analysis draws themes from a combination of:

- Interview instrument categories (role/contribution to the FS, impacts and opportunities from disasters and vision/strategies for resilience)

- Four pillars of food security (Harris & Spiegel, 2019)

Gaps, vision and strategies for food security and resilience in the Northern Rivers by interviewees

3.3 Everyday Practice state

This section presents interviewees' responses in relation to the role that food system actors in the NR are contributing to everyday food security, referring to how the four food security pillars outlined in Table 4 were being addressed prior to or after acute disaster/crisis periods. Key points on how interviewees are addressing everyday food security are presented in Table 6 and a synopsis of findings are presented below.

Availability

As indicated in Figure 5, 15% of interviewees were involved in the production of manufacturing of food. The two fruit and vegetable producers and bread manufacturers interviewed provided almost entirely for locally-based markets, the dairy, muesli and bushfoods producers provided to regional and national artisanal distributors and the rice cooperative provided an important contribution to the national supply of rice (7,000 tonnes), including through national supermarket chains.

Accessibility

The largest proportion of interviewees were involved in food retail or food service and included a diverse range of operations providing access to food. Food retailers included a small, independent supermarket, grocers, food outlets, online shopping platforms, as well as farmers markets. Two interviewees were coordinating one or more community food pantries operating in the region, providing affordable access to food for community members in need. Both interviewees indicated increasing numbers of community members using their services.

In terms of providing access to locally grown foods, independent grocers and supermarkets were sourcing 40 - 50% locally produced foods and while they were committed to supporting local producers, the seasonality of local food and the need for precise and specific ordering required sourcing a significant proportion of foods from Brisbane's Rocklea markets. Farmers markets were focused on providing as close to 100% local as possible, and a local bakery shop was providing locally manufactured products using some local dairy and fresh produce and non-local flour.

> **Box 1. STORIES OF RESILIENCE: Producer builds everyday farming and retail practices to survive disruption**
>
> Adopting sustainable growing practices, a food producer and retailer managed to recover better from the chain of natural disasters and be less affected by them through creative initiatives.
>
> > *"We're an ecologically sound company to begin with, as there is no pests and diseases, so no pesticides are used at all."*
>
> They kept their business socially, economically and environmentally sustainable through ecotourism, research collaborations, using organic fertilisers, waste management by recycling and composting, networking with other businesses and growers and regenerating rainforests. Although not affected by the floods being located above the floodplain, they adopted several initiatives in the time of COVID and lockdown to increase their adaptive capacities and in turn enhance their resilience towards shocks and stresses. They installed a self-locking cabinet and window for local customers to purchase products at their farm gate.
>
> > *"We took some of the issues in mind, for instance, where we could have an open window to serve coffees onto the deck if anyone wanted to have that safe distance and not come in the shop."*
>
> They took the COVID period to invest in their online store and renovated their main office to improve space for customers when restrictions were lifted and they returned to the physical store. A good example of shifting threats as an opportunity.
>
> > *"We were grateful to see that, and we really had to then invest in that online store and how to maximise its potential."*

Utilisation

Community food pantries and community services centres have been making important contributions to food utilisation in the region through food rescue arrangements with supermarkets, SecondBite or OzHarvest, or (to a lesser extent) taking excess produce from farmers. Community services centres are also preparing rescue food into healthy meals for distribution to the community- an important service for community members with limited cooking skills or facilities. Local grocers, community food pantry and dairy farmers are sending excess/unsold product to farms for animal feed. Interviewees described a strong commitment to providing healthy food to the community, including local farmers, market coordinators, local distributors and online retailers.

Stability

An important way that local food producers and manufacturers are ensuring a stable business model to continue supplying food into the future is through utilising diverse market channels. For example, selling through local farmers markets and local shops as well as seeking regional or national markets through distributors. Nearly all food producers or manufacturers utilised both retail and wholesale market streams. Networks within the local food industry were also pivotal for expanding local businesses (within the region and to larger national markets) and for developing sustainable practices, and these networks were facilitated by a local food industry networking group. Two organic food producers interviewed have taken an active role in research and development into soil health and working with land and water committees to improve the sustainability of food production in the region (see Box 1 for example). Several farmers were also turning farm waste into compost and developing other fertilisers to feed new crops, thus creating a more closed nutrient systems and reducing reliance on imported inputs. Representatives from state and local levels of governance identified both policy and programmes aimed at preserving productive farmland and indicated that 85% of land in the Lismore LGA has rural RU-1 zoning for primary production.

Table 6. NRFS actors' current contributions to food security

Food system pillars	Availability	Access	Utilisation	Stability
Food production, food processing & manufacturing	• Farming or harvesting fruits and vegetables, rice, coffee, nuts native bushfoods and milk for local markets • Manufacturing bread & bakery goods, dairy products, ready-made meals, muesli & preserved products for local markets • Cheese & other product manufacturers supplying artisanal products (e.g. muesli) are supplying national markets • Dryland rice producers make important contribution to national supply of rice (7,000t) • Local rice milling and bread baking facilities • Planning for local cheese-making and rice packaging facilities	• Farmers are starting farmers markets in the region to support access to locally grown food • Some farmers are selling most of their product through farmers markets, others are selling through local, regional and national market channels	• Farmers giving excess product to community food pantries, sharing with fellow farmers at markets or sending to pig farms as feed	• Research and development into soil, water and land health to improve the sustainability of food production in the region
Food wholesale, distribution & marketing	• Local distributors support local farmers and manufacturers through selling products in local shops and restaurants		• Promoting the distribution of healthy foods	• Many local producers and manufacturers utilised diverse market channels
Food retail, restaurants & food service	• Farmers market encouraging seed swapping and running food growing workshops with local schools	• Farmers markets were supporting access to 100% locally produced foods	• Community food pantries' food rescue arrangements with supermarkets	• Building networks with local food businesses and supporting them to

Food system pillars	Availability	Access	Utilisation	Stability
		• Smaller, independent grocers and online retailers are stocking 40 - 50% locally produced foods • Community food pantries offering low cost groceries mostly from Foodbank or supermarket food rescue • Local distributors are supporting local		grow. Long-term relationships with suppliers or others in local network support business stability
Food consumption, nutrition and food waste			• Community organisations are sharing cooking skills • Online platform with recipes • Food rescue programs utilising food that would otherwise be wasted	
Government and other governing agencies				• Land use policy and programmes to protect productive farmland at state and local levels of government • Food industry networking body fostering industry connections to support local businesses

3.4   Disaster state

This section presents the interviewees responses when asked to identify the key challenges and barriers that occurred during disasters. Specifically, the focus was on a) 2022 floods b) the COVID pandemic and c) other disruptions. They were also asked to share opportunities or facilitators that arose during these times, summarised in Table 7.

2022 floods

Challenges

Challenges and barriers faced by the interviewees during the floods included impacts on business or farm management. Flooding initially caused a blockage in NR road networks and prevented access to farms which caused a shortage of staff and subsequent difficulties. The persistent wet weather and mud (which lasted for at least six months) inhibited access to farms and properties.

> *"It was a long time before people could get back onto their properties to either assess their damage, or start to repair things like fencing and things like that." - State government representative*

Boggy roads limited movement of tractors and machinery between farms, compacted soil and prevented planting. Inundation resulted in some annual crops being lost entirely.

> *"...for example, soybean crops we had 100% wiped out which is massive."- State government representative*

Some interviewees mentioned a lack of support to maintain staff income while their business was non-operational due to the cost of damages and losses. Post-flood land management issues included weed management, sediment deposit, loss of riverbanks, contamination and landslips that required repair.

Produce and sales were affected as a result crops, plant or stock loss. Some local suppliers were more affected (e.g. 75% rice loss, cucumber, avocado) and some less. Stock and orders at the warehouse of the freighted logistics chain were also lost. One interviewee mentioned the loss of markets for by-products (e.g. rice) as the buyers begin sourcing elsewhere. Combined climate conditions such as flooding periods, cool springs and dry summers highly impacted farms' productivity. Loss of work for follow-on contractors and access to trade services were limited.

> *"(Farmers) have done it before and will do it again and they're quite resilient in that manner, but this one (2022 flood) I have certainly seen a lot more people impacted just by the extent of it." – State government representative*

This resulted in a significant drop in farmers market income and sales (e.g. half a million loss in revenue for a rice grower, or a 50% drop for a retailer). As described by an interviewee:

> *"(We are) not making any money at the moment, just working to maintain customers" – Food business*

Utilities and infrastructure impacts included power loss on farms in Lismore between a week and up to two months. Fuel access for running a generator in these times was also challenging. In the Byron Shire, drinking water was also at times unavailable as water treatment plants were affected. Cuts to network and internet access affected communications, card payments, and cash-only purchases and cash shortages led to security risks.

Farmers markets were closed during the flood due to saturated ground at the showgrounds and stalls were damaged. People experienced a loss of support as markets are usually a place for people to connect and socialize, which they needed more during the flooding stress. Even post floods, persistent rain made market conditions and environment unpleasant for store holders and customers. Access, parking availability and even stray animals were challenges. Box 2 presents how farmers markets in the region adapted to these challenges during the disasters.

> **Box 2. STORIES OF RESILIENCE: Northern Rivers farmers markets managers as key champions for food security during disasters**
>
> In Byron and Lismore Shires, farmers markets are a key channel for local food. During the unprecedented 2022 floods, the showgrounds where the markets are located experienced significant inundation and were unavailable to the markets.
>
> > *"It took several days for the water to recede, enough that I was able to get access to the Showgrounds and I organised to meet up with the Secretary and the President of the Showgrounds to inspect, it was their first time to get down there too. There was sludge everywhere. There was a dead donkey, a dead cow, lots of dead, other small creatures" - Farmers market manager*
>
> Despite this significant hurdle, it was through the determination of the farmers market managers that the markets were some of the first fresh food supplies to return to operations post-flood (in one instance, within 4 weeks of the flood event). One manager liaised with a large number of alternative channels for farmers produce and provided rapid solutions including pivoting supply to local green and organic grocers, facilitating online produce boxes via the market's website, managing a rapid pickup service for customers and coordinating farm-gate pickups of produce all whilst finding new space to operate.
>
> > *"Because supermarket shelves were completely empty, we had all this produce... I was literally on the phone to the Council just looking at a map saying "where can we go that is not flooded?" What was a real awakener, was there was nowhere in the LGA that was flood-proof." - Farmers market manager*
>
> Similarly, during the COVID pandemic, farmers market managers were integral as community champions and key advocates to continue providing local fresh food to the community.
>
> > *"We had strong conversations with the Council, we had strong conversations with the World Health Organization, insisting that we were an essential service, that we were far safer than the supermarkets…and that we were the local food security. I made it very clear that our farmers wouldn't probably survive if they cut off their lifeline of being able to provide their food." - Farmers market manager*

Local and regional transport access routes were closed or damaged during the flood which led to food scarcity. Stallholders could not get to market due to road closures, broken rivers and causeways etc. This in turn affected distribution and delivery drivers were in short supply.

Road repairs were slow and deliveries from heavier vehicles was not possible due to limited access and road damage. This damaged produce and processed products i.e. bruising, losing seal on product, spilling etc. Damage to vehicles also occurred such as wheels, tyres and associated value depreciation.

Frozen storage facilities were damaged and cold/refrigerated transport was flooded and with already expensive freight, transport to Sydney markets was cut off. Products were lost and production parcels from remote areas were delayed.

> *"I had a box from Broken Hill, took nine weeks or something to get to me here" - Food retail business*

Interviewees mentioned equipment and furniture flooded and water also damaged the business sites:

> *"We've gone through a lot of storm and tempest previously, but it was those short periods when it rained extremely heavily were quite damaging to infrastructure" - Producer*

Some interviewees stated that they took the risk of not having insurance as they could not afford it. It was not realistic to purchase but they factored in the risk as such disasters and shocks were not very frequent. Unfortunately, those who could not afford insurance had to close businesses and sell property. Others who had secured their business with insurance found performance or damage coverage was limited e.g. lost machinery not covered for growers in floodplains. Some interviewees are still negotiating with insurance

companies even a year later, but no decisions have been made on claims, and meeting requirements are onerous as physical damage needs to be claimed before loss of profit.

Most of the interviewees have pointed out underwhelming government support; which was slow and taken away far too soon. Few plans and responses towards disaster management were in place and there seemed to be no person or authority responsible or available.

> *"(There was) basically nobody in command and only self-appointed people making decisions (which) caused unrest in the community" – Neighbourhood centre*

Lack of clarity and information regarding supporting plans e.g. grants, was also mentioned. One interviewee could have claimed more if they knew the type of support available. Some found government support and financial grants unhelpful as reimbursements for money already spent, rather than as grants for recovery.

> *"(Grant support) wouldn't have been as helpful for business with little cash reserve." - Food retail business*

An interviewee actively supporting her community in Lismore by preparing food during and after the floods criticized the government for not providing any support in terms of funding and budget. Box 3 provides more detail of this resident's story.

> *"They seemed to be non-existent" – Resident*

Some mentioned institutional barriers regarding facilities and infrastructure needed for recovery. One local council was also identified as unhelpful with the relocation of a farmers market after the flood.

Council and state government interviewees also shared their side of the story. They highlighted lack of supplies and resources to alleviate the situation, fix things and provide relief. It was challenging to identify those with highest needs or most affected. Loss of communication compounded supply shortages and cut off usual networks. Despite this, many people registered for flood support, over 100 people per day were accessing help and food relief agencies were ordering four pallets per week from FoodBank. Government employees also faced challenging conversations e.g. farmers that did not qualify for grants and would not accept this news. Government staff were also impacted due to floods e.g. their own homes and the Local Land Services office also inundated, however they continued working.

Food safety regulations limiting food preparation/catering in the time of crisis were described as a barrier by food charities. A food pantry was unable to cover costs and relied on donations and a volunteer workforce. A lack of food preparation facilities and recovery plans to support those who lost houses and properties and therefore access to kitchens was a key issue. Many residents still live in tents or houses that are not functional.

> *"They didn't have the mental or physical capacity to cook anyway. People were saying that they were living on snack foods or things like that because they just didn't have the energy to deal with it"*
> *– Resident*

Many challenges were observed in the supply chain such as access to products and ingredients (up to 10 days at different scales for factories, businesses and citizens). Some travelled extra kilometres for groceries and daily maintenance. There was a significant shortage of fresh food products in local shops and stores.

> *"It was too hard to get things here, as everyone was shopping between the two small supermarkets in Goonellabah, so a lot of things weren't available" – Resident*

Lack of ingredients resulted in skyrocketing food prices, especially fruit and vegetables whose farms flooded. Limited storage and distribution compounded this issue. Great uncertainty was spoken about and a lot of distress in the local NR supply services. It was also difficult for businesses to plan ahead as they had already been hit by a sudden shock.

> *"You've got stock sitting in the shed waiting to leave and then it goes underwater and you lose all your products, so you have to start all over again" – Food business*

There was a chaotic rush to buy food and once businesses reopened and they were unable to restock fast enough to meet demand. Deliveries were delayed but orders were coming in many more times than usual.

Box 3. STORIES OF RESILIENCE: Community-led food security and the role of volunteering

As early as the previous 2017 floods, a resident had volunteered to cook meals for flood-affected residents. When the significantly larger floods occurred in February 2022, the resident began preparing meals from a home kitchen for hospital staff. Other displaced families who had specific meal requirements, such as children on the autism spectrum, then requested meals.

> *"For their kids I was doing nuggets and chips and things that were familiar because they needed some kind of security. Then any excess that I had, I advertised on Facebook, and it just got bigger and bigger. In late March… (another resident) ... came on board. She initially came here and helped me out, but then we expanded into her kitchen as well. At our peak, we were doing about 1400 meals a week." - Resident*

Initially food was purchased from supermarkets in a neighbouring LGA using own funds, financial donations from individuals and charities and food donations from local businesses. Key to the provision of meals to those without kitchen facilities and those focused on disaster recovery activities was community connections, volunteers and a key benefit was much needed social connection.

> *"I ended up getting a couple who became my delivery team through the rest of the process. They were checking in on people as well, to see how they were coping. A lot of people have said that our meals and check-ins got them through what they were dealing with. Knowing that they had a meal ready when they'd finished cleaning at the end of the day, and it was one less thing that they had to be concerned about, was what kept them going." - Resident*

The demand for food continued well beyond the disaster event.

> *"Most days I could have given meals out twice over as there was just so much need. To start with, there were charities like Salvation Army, but they all seemed to disappear really quickly. We did it for 10 months, and it is still needed." - Resident*

Opportunities

Some found the government financial support helpful to pay staff or for lost stock. Flood grants were beneficial to help farms recover. The government also assisted some producers to grow their next crop. As a result of repeated and frequent disasters, Emergency Recovery support service and Case Workers are now available in the NR to address disaster management. This has led to potential revisions on one Council's 2020 local strategic planning document.

> *"Everything changed with the February/March floods in terms of how we think about Lismore's future" - Council staff member*

As a community response, people tried to help volunteer with cleaning and sharing equipment and relationships became much stronger as the community came together

> *"I've made some amazing friendships throughout this journey"- Resident*

Social media created a good platform for communicating, searching for market and local food availability and accessing volunteers.

> *"It was more a case of community coming together, rather than it come from anywhere else" - Resident*

A food retail business mentioned staff being supportive of both the store and the community and help for traumatised customers. A shopping centre in Lismore lowered rent for affected pop-up shops downstairs.

Interviewees identified the following workshops or services offered to assist citizens and businesses:

1. Mental health and services support through the food pantry for trauma from the flood experience.

> *"We meet people who are having the worst day of their life often...if you have to turn up to a food bank to put food in your belly for a day, you're having a bad day." - Food pantry staff*

2. Regenerative/organic farming workshops and seminars for existing and new farmers via small consultancy business and community groups.

"I think the opportunity also to demonstrate the effects of soil management on resilience to the extremes of weather became apparent. Seeing is believing for a lot of farmers so that was an opportunity where we could highlight those issues and also help them understand how they can use these techniques in their own farming systems." - Producer

3. Weekly newsletter instead of a monthly by an industry association or sending messages out on social media and to the subscriber base.

Interviewees noted the floods brought an opportunity to raise awareness on sustainable food production. People started to care more about health, cultural and nutritional aspects of food they were buying and consuming. Fresh food and farmers markets provided people with their first fresh food when external supplies and supermarket shelves were empty. Availability of farmers' produce was attributed to sustainable farming methods and more localised supplies. People were more adaptable and flexible with food needs.

Large shopping centres and supermarkets reliant on external and nonlocal supplies were unable to meet demand which opened opportunity for small and local businesses to be the first choice.

COVID-19 pandemic

Challenges

There was a significant drop in local sales and farm visits due to the lockdown and restrictions. Many growers became hopeless as they lost wholesale markets and business experienced significant loss.

"If farmers have to find other ways to earn an income, they stop growing and then we lose our food security." – Food pantry

Businesses/retail interviewees expressed significant reduction in turnover and loss of profit, and in 2023 some have not returned to the pre-COVID status. The situation forced many to downscale businesses and lose customers. Nearly all wholesale businesses changed to retailers due to closure of shops, cafes, and restaurants. Sales reached their lowest point leading to huge financial losses. Many NR businesses lost export markets due to border closures as well as staff resulting in a high reliance on foreigners, tourist, and backpackers as a casual workforce.

Supplier sourcing was limited significantly especially from outside the region. Businesses were required to become more agile with some supplies and are still struggling. Some growers mentioned difficulties in accessing chemicals, farm inputs, containers and other plastics.

The stress caused by the pandemic resulted in an unstable food demand pattern. One interviewee mentioned a rise of 400% in demand, which dropped by the same amount once the gap was addressed. Some purchased extra stock to prevent issues in supply or transport. The pandemic also put additional strain on the workforce with staff working long hours and facing increased stress given the 'temporary' shortage.

Staffing and logistics coordination became challenging as elderly (more at risk) unvaccinated staff were unable to work. Travel restrictions and border control cut off those traveling from Queensland. Businesses affected by this loss did not receive adequate government support.

Transport was costly in the short term and delays in packaging, time lags and grocery deliveries were a problem.

"I even had people messaging me that had come down with COVID over the time that were stuck at home and if I could provide them some meals in the week."– Resident

Customers' and visitors' behaviour against pandemic protocols or restrictions were a challenge e.g. some market customers refused to wear masks or had objections to directives posing a health risk to stallholders.

"The average age of farmers is over 57, and we are older than that so there are a lot of the stallholders are at higher risk of COVID so that was some stress for some of those operators" - Producer

Enforcing COVID rules was challenging for some interviewees. As people were using the market for purchasing goods and as a social space meant additional staff were required e.g., at gate check-in points. There were also some challenges arising from anti-vaccine protesters.

Interviewees expressed different government-related challenges and barriers from a range of perspectives. Farmers markets had restrictions against opening despite considering it a safer open-air option than supermarkets which was difficult, as were government-enforced quarantine and mandatory shutdowns.

> *"I feel like our government in that respect has failed as well, as they just don't seem to grasp the severity of how people are affected. With products being limited, families like my own (dealing with autism) would have to go back multiple times a week." – Resident*

Interviewees expressed difficulties in navigating information from multiple sources, including misinformation, leading to confusion and a lack of reliable guidelines. Fear, uncertainty, and doubt were prevalent, exacerbated by social media's negative impact with aggressive comments and fear-driven discussions. Farmers markets faced challenges such as reduced food donations due to concerns about food insecurity. Emotional support and connection created psychological impacts during the pandemic.

Opportunities

The pandemic changed some reactive businesses to adopt proactive models including :

1. Establishing or expanding online sales or stores

> *"We probably would never have done (online retail) or done so many products if it wasn't for COVID" - Food retailer*

2. Creating multiple marketing and sales channels such as a COVID safe self-locking cabinet and window for local customers, reintroducing milk and cheese deliveries, food box/home delivery services.

3. Expanding from wholesale into a retail product line.

4. Renovating office space for an improved visitors and customers experience in the future.

5. Filling gaps created by competitors who were forced to leave business under pressure.

> *"As bad as it was for some people, it was positive for us" – Food processor*

Some interviewees found government's financial support with wages very helpful. Post-COVID business mentoring support through a government-subsidised organisation in Byron (no longer operating) was helpful

for structuring a business plan, marketing strategy and future direction. An industry association hosted an event to help businesses managing product pricing for ingredients and equipment.

The pandemic raised awareness among people about what they eat. People were willing to buy safe and clean food and were looking for certified organic produce to help support more than pre-COVID.

The farmers markets re-opened quickly compared to other sales channels which was helpful. People liked to shop outdoors for healthy and fresh produce and to socialise (although regulated). New customers started attending the market due to supermarket supply chain problems and closure of restaurants, resulting in increased sales by 15 - 20% for the first period of COVID.

Other disasters

Challenges

Some interviewees noted the Ukraine war affected supply of equipment and price increases, e.g. fuel, ingredients such as flour, etc. The cost of diesel and inputs increased by almost 40% from COVID and the Ukraine war caused challenges in shipping and logistics.

The 2019 bushfires were mentioned as having significant effects on the food service. An interviewee highlighted that the food service sector was worst hit earlier e.g. cafes affected by bushfire smoke preventing customer attendance. One interviewee mentioned that due to forest damage, honey supply (quantity and price) was a challenge for manufacturing.

The millennium drought in 2004 significantly reduced water resources and crops. One grower stopped its import and changed produce to diverse crops more suitable for the local market.

Compounding impacts of continuous shocks and disasters highly affected the resilience of the NRFS. This has bankrupted and failed some food businesses and producers.

> *"Post bushfires and then when the first flood hit, there's a lot of people that have been dual affected. So, we have had quite a few people from this region that were affected by bushfires and now have actually been affected by the floods... quite a few people that lost their home in Rappville, waited lots of time and then had just partially rebuilt and then they were affected by the floods, again."*
> *– Neighbourhood centre employee*

> *"It wasn't that long ago since people recovered from the 2017 floods and then, you know, they've lost that infrastructure again." – State government representative*

The specialised microclimates in the NR limit some production and diversity, making the region more vulnerable to food insecurity. Poor product quality, difficulties in local/interstate sourcing are also a problem.

> *"Disasters have affected the financial stability of our business pre and post-disaster" - Food retailer*

Also highlighted were the impacts on everyone's mental health.

> *"It's just the constant kind of pressure that's really impacting people's mental health as well." – State government representative*

There were other challenges and barriers mentioned by the interviewees affected food resilience in the NR:

1. The global financial crisis, increased cost of living, housing crisis affected people's ability to afford food, even working families needed food relief. People are finding rental increases and utility costs difficult to afford, in turn affecting the food industry. Employees (baristas, factory workers, farmers, farm pickers) are often unable to afford high rent costs in the NR or petrol costs to commute from outside of the region. The global financial crisis also caused the loss of European markets which never recovered again.

2. Some critiqued the state government as having passive responses. Growers suggested the Federal Department of Agriculture is not supporting farmers effectively. Council fees and bureaucracy for food businesses and state government grants are not tailored to meet needs. Farmers markets stated Council sometimes appears to take complaints of local businesses more seriously than sustaining the market itself. Issues with Council obstacles against farmers markets or restrictions on farm gate sales were also noted.

3. Urban development was mentioned as one of the biggest threats to the food industry in the NR by many interviewees. Urban development is encroaching on significant farmlands, and costs of farms are not justified compared to the land's monetary value. Alstonville Plateau, for instance, has a third village under construction on agricultural land. Byron Shire is also losing land to multiple occupancy approvals.

It was noted Council's challenges of subdivision for residential land uses are referred to the state government where they are overruled. Land use conflicts also occur e.g. agricultural odours (manure).

> *"If we don't have local farms, we don't have local food, which feeds into our...food tourism economy. Our restaurants are based on local food and our food experiences are based around farm and food"*
> *– Industry body*

Opportunities

Shocks and stresses on the NR food industry have highlighted the value of local small-scale production not reliant on imported but rather regular local labour. This contributes directly to the resilience and security of the food system in the region. Businesses showed adaptive capacities after the chain of disasters, helping recover better and changing business model to focus on value-added products. One food production business noted receiving a $150,000 Regional Food Processing in Australia government grant in 2007 for a commercial kitchen which enabled business expansion through export to Europe.

Table 7. Key thematic analysis findings in Disaster state

Themes/Disaster	Floods		COVID-19		Other (e.g. bushfires, global trends)	
	Impacts/challenges	**Opportunities/ responses**	**Impacts/ challenges**	**Opportunities/ responses**	**Impacts/ challenges**	**Opportunities/ responses**
Food production- Farmers/growers	• Loss of crops/ plants/stock • Compacted soil and boggy roads preventing machinery movements on farm • Growing seeds and produce • Contamination of farms • Post flood land management	• Promoting sustainable, organic and regenerative farming methods through event and workshops	• Loss of wholesale markets • Drop in local sales and farm visits • Difficulty accessing farm supplies		• Poor quality of produce	
Fresh food/farmers markets	• Closure of the farmers markets during the flood • Drop in farmers market income and static sales • Blocked access to showground • Unpleasant condition of farmer markets	• Collaborations and initiatives between growers, farmers and suppliers	• Restrictions to opening the market	• Re-opened quickly as being an outdoor market • New customers attending market because of the supply chain problems • Increased trades	• Restrictions on farm gate sales	
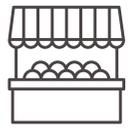
| Themes/Disaster	Floods		COVID-19		Other (e.g. bushfires, global trends)	
	Impacts/challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses
Businesses/retail/ sales	• Loss of markets for by-products • Uncertainties to plan ahead	• Increased trades for some local retailers • Opportunities for smaller stores and businesses	• Turnover drop and lost profit, financial losses • Downscaling businesses • Lost export markets since COVID	• Online shops growth • Increased adaptability through multiple marketing channels • Creative initiatives • Some businesses filling gaps created by competitors who were forced to left their business • Changing from proactive to reactive	• Global financial crisis caused the loss of European markets • Financial stability of the businesses • Food service sectors heavily impacted	• Quick adaptation
Supply chain	• Lost access to products/ ingredients • Increased price of some supplies vulnerable to weather impacts		• Closure of shops/cafes/rest aurants • Difficulty getting supplies at times • Limited supplier sourcing limited • Problems with foreign supplements	• Laid bare stark issues around the supply chain	• Ukraine war affected supply of equipment • Bushfire impacted supplies availability and price • Drought heavily affected the	

Themes/Disaster	Floods		COVID-19		Other (e.g. bushfires, global trends)	
	Impacts/challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses
					supply of the products	
Demand	• Chaotic rush to buy food • Difficult to restock in a timely way		• Unstable demand patterns • Difficult to keep up with demand		• Difficulties in local and interstate sourcing	
Staffing and management	• Staff/farmers access to farm due to the persistent wet weather and mud • Loss of work for follow-on contractors	• Having prior training in emergency management	• Risks of business failure due to lack of the staff • Travel restrictions border control for staff access • Loss of the workforce/labour		• Increased cost of living and housing crisis affecting the workforce	
Utilities, infrastructure and equipment	• Loss of power • Loss of network and internet access • Loss of water treatment plants and drinking water • Equipment and furniture flooded • Loss of frozen storage facility	• Repairing damaged equipment				

Themes/Disaster	Floods		COVID-19		Other (e.g. bushfires, global trends)	
	Impacts/challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses
Transport/access and logistics	• Closed local and regional access routes • Long road repairing process • Damage to products traversing damaged roads • Storage and distribution problems	• Byron highway was a good logistic infrastructure to get through the floods (Lismore was blocked due to lack of such highway access)	• Costly transport for a short time • Delays in packaging and time lags • Grocery deliveries issues increased		• Increased cost of diesel and inputs	
Insurance	• Not affordable and justified for every business • Limited cover of damages • Unresponsive plans and reimbursements instead of grants and financial supports • Slow performance	• Claims paid for some losses				
Government / council	• Slow and underwhelming response • No clear or pre-existing plans in	• Government's financial support with wages and lost stock	• Measure inconsiderate of different needs for different groups of people	• Post-COVID Business mentoring support	• Passive government responses and actions • Council not supporting	• Local council supportive of the farmers market staying open during various different disasters

Themes/Disaster	Floods		COVID-19		Other (e.g. bushfires, global trends)	
	Impacts/challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses
	terms of disaster management • Lack of clarity and information in terms of support • Lack of supplies and resources to respond • Staff impacted • Challenges with identifying grants eligibilities	• Established Emergency Recovery support service • Assistance to grow the next crop		• Government's financial support with wages • Events for businesses	farmers effectively • Land use changes and encroaching urban development on good farmlands	
Food relief/charity		• Mental health and services support	• Less food donations			• Donations from different business owners to public
People and communities		• Volunteering and community help • Social media and platforms for communicating and sharing equipment	• Objections to directives and restrictions • Anti-vaccine protesters • People in need of emotional support and contact		• Increased cost of living and housing crisis impacting people's ability to afford food	

Themes/Disaster	Floods		COVID-19		Other (e.g. bushfires, global trends)	
	Impacts/challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses	Impacts/ challenges	Opportunities/ responses
		• Relationships became stronger • Importance of networking and connections • Being more adaptable & flexible				
Raising awareness		• Regenerative/ organic farming workshops and seminars • People caring more about food systems	• Misinformation, uncertainty, fear, and doubt	• Increased attention to safe, clean and nutritious food		

3.5　Recovery state
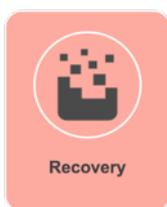
The state of recovery refers to the post-disaster phase of the NRFS. Interviewees highlighted a number of activities that occurred in the recovery to the floods in particular.

Interviewees were asked questions relating to the

- Activities which helped them recovery quickly from disruption
- Gaps in the NRFS so as to be more food secure
- Suggested strategies and vision for a more self-reliant and secure NRFS.

Key themes from their responses have been identified around the four pillars of food security: availability, accessibility, utilisation and stability.

Availability

The net trade imbalance and lack of locally-supplied food in the region was a key gap. The shock of the floods and COVID-19 highlighted further the NRFS reliance on export of food produced in the region and import of food from outside the region, which still remains a key gap following the disasters. Competition with larger producers inhibits small scale producers to supply local markets and to even participate in the export market was identified as challenging with respect to obtaining licences. The wholesale or supermarket supply system continues to utilise upstream warehouses who buy direct from the farm and then distribute to their stores, with limited criteria or priority for local food. Buying from local producers remains inconvenient and requires additional time and effort. Food relief relies heavily on imported food and supermarkets compared to fresh food grown locally. Most farming inputs and food retailer supplies (e.g. baking flour) were not able to be sourced locally prior to the floods, which became worse after the floods. Suppliers find sourcing local food is nuanced as consumers want local but also a variety of non-seasonal produce.

> *"You can only grow what you're actually currently selling and you can't have stuff sitting there waiting for a buyer that ends up being a loss to you and you shouldn't have bothered producing it."*
> *– Producer*

Collaborations between growers/farmers and suppliers led to some forming a collective to gather produce from different small farms to sell and another where excess produce of local farmers would be brought together for market. Farmers markets also created produce boxes to distribute fresh food and dropped off in Lismore to ensure produce did not go to waste. Farmers could also drop produce to a point in town.

> *"(This) was very important during this time when petrol was scarce and supermarket shelves were often empty." – Farmers Market manager*

Despite the region being a key grower of some foods (e.g. macadamias), sourcing organic food remains a challenge for suppliers. Many interviewees commented on the reliance on freight and fuel to supply food to the area. There is also pressure on producers to meet market standards that are biased towards cosmetically perfect produce of specific size.

> *"We are required to have specialty or first grade product for wholesalers but producers have diversity of produce and grades... but meeting these standards conflicts with seasonal produce and increases the amount of prophylactic chemical use and nitrogen fertiliser use to try and achieve those grades."*
> *– Producer*

Residential development and the price of land is a key threat to food production and bridging the gap between agriculture and other land uses is a challenge. Trends highlighted by interviewees included the conflict between the environment, resources and income, the purchase of land for lifestyle reasons, an ageing farming demographic, a lack of skilled and willing younger generation farmers to afford agricultural land and state significant farmland being approved for residential development. A state government representative highlighted the need for additional staffing and funding for Council strategic planning divisions.

Themes that emerged from the interviews included seasonality of produce being a constraint for sourcing, lack of diversity of crops, climatic conditions limiting growth of crops (e.g. grains) and location of crops in the

right place (e.g. pecans within, and avocados above, the floodplain). However, some interviewees felt the NR was an "untapped food bowl" and "major food producing hub".

> *"Different regions are suited for different things and we're not always planting the right things in the right place." – Producer*

Lack of support for emerging food sectors was a common theme. Interviewees noted a dominance of support for macadamias and blueberries and lack of support for fruit, rice, coffee and native foods sectors. The lack of local government support to provide information for start-up (food) companies in the region and the length of time it takes for new food businesses to achieve approval and meet Council requirements were also noted. Partnerships for new food industries are slow to develop. In addition, the community is sometimes in opposition (NIMBYism) to new food infrastructure e.g. the Bangalow Food Hub was not approved due to objections around traffic and noise close to residential properties. The lack of training and education on agriculture was another key gap in the FS and interviewees noted a trend of reduced funding for agriculture education at the local TAFE.

Accessibility

Some suppliers (more often local suppliers) offered 7- or 14-day payment terms.

> *"This helped when orders could not get through or were delayed and to not be out of pocket during that time when cash flow was reduced" – Online food retailer and distributor*

Interviewees commented on the increasing cost of retail food and the high built-in costs of food production. Trends included housing insecurity, insecure tenancy and the cost of land as key gaps for food production. A food relief organisation commented that fresh healthy food is becoming more expensive than fast food. There is demand for local organic food but pricing is an obstacle for suppliers who find interstate wholesalers more affordable.

> *"Thank God the food wasn't priced like it is now. At least the prices were better last year than they are this year because I couldn't have done it to the same extent. The budget would have needed to be a lot bigger." – Resident who cooked and supplied meals during the floods*

Key themes from the interviews included an overreliance on supermarkets for food relief organisations and low-income householders who see supermarkets as the only option for purchasing food, a lack of support from consumers for local food at farmers markets, limited convenient access to local food for consumers, limited farmers markets for accessing food at different times and a lack of regional produce supply to farmers markets.

> *"We need markets that when people go with their basket, they don't just get three things and then have to go to Coles anyway." – Farmers market owner*

Consumer awareness and education on local food was identified as a gap and while there is some demand for local food, greater awareness about the benefits of buying local food and the impacts of the corporate food economy was highlighted to increase the support from consumers for local food.

Opportunities to improve education and skills on sustainable farming practices such as organic or regenerative agriculture and soil management exist. A theme emerged around the reduction in funding for education at TAFE and agencies such as the DPI and Local Land Services focusing more on biosecurity or solely on livestock (veterinary support) than horticulture. A key gap in food technologist skills was highlighted as well as skills in native food horticulture and training for young farmers in sustainable agriculture methods.

> *"We basically don't teach agriculture on the Northern Rivers to farmers anymore. It's been moved mainly to online. They changed the structure of courses from a short course with flexible timing and small fee to enrolling in a whole certificate." – Producer*

A food pantry representative mentioned there was an intergenerational reliance on welfare and ongoing need for food relief. Charitable organisations providing food relief are currently reliant on grants which is not a self-sustaining model. Local food is currently contributing minimally to food relief which is highly reliant on importing food through FoodBank or food rescue such as SecondBite. Physical accessibility and infrastructure of food relief venues was also an issue e.g. a community food pantry requires a volunteer

forklift driver to move loads of food into the building and has no disability access for patrons. Access to refrigerated transport is also a key barrier for providing fresh food to food relief agencies. One interviewee who had cooked and provided meals during the flood found many people did not know how or where to access food relief services.

Utilisation

An interviewee commented on the lack of food relief tailored to different needs. They shared that food relief often has the same type of food available to everyone and is not being adapted for different users, such as larger families and families with children who have developmental disabilities and prefer specific kinds of food (e.g. frozen items). Often these specific foods were not available during the disasters from food charities or supermarkets.

> *"I've still got people reaching out to me now (2023) because of the lack of (food charity) services in our area" - Resident who cooked meals during the floods.*

Stability

Interviewees shared the importance of networking and connections e.g., businesses with better networks recovered quickly. Reasons for this included a Federal MP lobbying the electricity companies to restore electricity quickly, access to storage for additional supply and stock pre-flood, saving time and money by repairing damaged equipment or facilities rather than disposing and purchasing new.

Prior training in emergency management through employers and past experience was very helpful. Knowing who to work with, policies (internal), roles, local committees, procedures, scenario training and biosecurity impacts during an emergency.

Farming methods that assisted with optimal recovery included good soil management, forward planning for sudden shocks, minimising erosion, not relying on a lot of inputs to the farm and the use of a biodiverse mix so some crops grow back quickly.

> *"We generally plan for flood and drought and hope for a normal season." – Producer*

Support for farmers to be more disaster resilient was a key gap. Some examples included the cost of insurance for producers and reliance on inputs from outside the region (e.g. fertilisers) and the difficulty for producers to match production from crops to the marketplace due to the delays in the supply chain and growing food. A neighbourhood centre commented on the lack of a coordinated response between community and emergency response agencies to respond to the food emergency.

Improved emergency response for food systems during disasters was indeed also a gap. A neighbourhood centre representative commented that there was no change in the disaster response since the 2017 flood and there was a need for a more coordinated emergency response. They felt the government's emergency response was slow and caused distrust from the community, making it more difficult to partner with the government for new emergency planning approaches.

Box 4. STORIES OF RESILIENCE- a food business's rapid recovery flooding

A proactive food business in the Lismore CBD demonstrated how **financial, technical and social resourcefulness** enabled rapid response to the 2022 flood. These resources provided the business agency to respond with flexibility and nimbleness and allowed their business to continue thriving and **supply food to the community** at a time when few other food supply options were available. Although the business owner had not been able to insure his premises, this had been factored into his business model and financial resources and infrastructure had been put in place (at their cost) to prepare for flood events. Despite applying for grants to assist in flood preparation for the business, these were unsuccessful.

> *"We applied for many grants to become more flood resilient prior to the flood, but were rejected. All the work we did to build the second level floor was out of pocket, including closing the business for 2 months to do renovations" – Food business*

Importantly, this business had been established in Lismore for more than three decades and had a wealth of local knowledge and strong social networks. Having readily-accessible social and financial resources, and not having to wait for government support to arrive or insurance repair work, his business was able to contract tradespeople and restore the premises and equipment relatively quickly.

While financial government support was eventually helpful for paying his staff and funding repairs, these supports came too slowly and personal financial reserves were required to act quickly and avoid serious impacts to the business. Government support schemes were generally structured to compensate expenses paid, which also required initial personal funds to cover repairs- a significant issue for businesses without pre-existing capital.

Another key enabler for this business was their 'can do' mentality, to get in and **fix their equipment** where possible rather than throwing it out. This also avoided wasted items and was a stark contrast to some much larger, insured businesses in the city, that took a strict approach to throwing out any flood affected equipment.

> *"Being able to fix equipment was critical for our business to get up and running again and prevent large amounts of unnecessary waste" – Food business*

3.6   Summary of key findings

In 'everyday practice', the NRFS is poorly oriented to an intra-regional market and governance of the NRFS is not coordinated to address food security. While a local food culture exists and farmers markets and food outlets source locally, the region continues to rely on distant urban export markets to sell NR-grown food and large supermarkets to supply food from outside the NR to feed the population. Competition and market expectations for food quality are challenges for farmers. Diversity and suitability of NR food as well as equitable economic opportunity present barriers to thriving regional markets. While the NR produces an abundance of food, it lacks coordination between local production and access. Consumers struggle to access local and affordable food conveniently. Food system stakeholders are craving leadership, direction and strategy for the future of food and are willing to explore new governance models.

Compounding disasters and disruptions have highlighted significant weaknesses in the NRFS but also opportunities. The NRFS has been and will continue to be significantly impacted by droughts, bushfires, floods, pandemics and global conflict. Recent NR disasters demonstrated limited capacity for food re-supply and contingency planning, food price increases, loss of farmer livelihoods, failing infrastructure, lack of insurance, disaster preparedness and intermittent government support. Opportunities arose via online sales, stronger distribution channels, new collaborations and local food economy.

Local food in the NR is building social capital and food system resilience. Community connection and informal networks remain strong and a hidden contributor to food security (see **Appendix E** for examples). Producers and retailers rely on diverse distribution and supply channels. Disaster pop up food outlets create mutual support. Food relief connects service providers with the vulnerable. Food recovery events facilitate dialogue across all walks of life. Providing infrastructure to bring community and food system actors together (e.g. food co-operatives, food hubs or food policy councils), not only supports the local food industry, but is an important way to build resilience through connecting people.

In the 'disaster state' community-led food response was a key contributor to food security and government support was not timely. Farmers market managers, individual residents, food charities, farmer networks and neighbourhood centres were the most effective food responders during the disasters. While government support was often helpful when it arrived, delayed and uncoordinated government agency support also led to confusion, uncertainty and food insecurity.

There is a clear demand for more food relief that is accessible and dignified to address food insecurity in the NR. Food charities need fresh food, channels to receive it locally and support to expand their services to help flood-affected and marginalised communities in the NR.

There is conflict between a growing population, meeting housing demands and growing food in the NR. There is a trend towards increasing approvals for planned urban development to increase housing supply over protection of agricultural land and strong coordination of state and local government will be needed to address this issue.

Amplifying Indigenous voices in the food system is important and necessary. Indigenous-led enterprises require land and processing facilities as well as opportunities to expand knowledge through education and receive local government support. Protecting and valuing traditional knowledge of food sustainability and indigenous rights is a priority.

Reliance on roads and freight trucks to transport food in and out of the region is a significant challenge and vulnerability. Border closures, flooded freight lines and landslide damage from disasters and disruptions resulted in loss of food and livelihoods. The NRFS is reliant on fuel, agricultural and retail supplies external to the region, but transport companies are closing and refrigerated transport is limited.

NR food processors, suppliers and distributors struggle to find space for processing food and value-added products. Warehouse space and cold storage is either flood-damaged or unavailable. Food hubs and central distribution facilities for storing and distributing food need fast-tracked government approval and financial support, along with action to enhance community support for local food. The benefits of co-locating and incubating food businesses in NR are untapped.

Information and data on the extent and resilience of the NRFS is limited. Significant knowledge gaps about the NR food system exist, that have impacted the efficacy of past endeavours to develop a more

resilient NR food system. Additional studies on the lessons from disasters and macroeconomic factors on the NRFS such as land use, cost of living, climate change, biodiversity, soil health and water are needed soon.

Food security could be enhanced through increasing knowledge about the value of local food and increasing capacity to grow food. A skills gap was highlighted by interviewees as a priority for supporting regional food. This included increasing expertise across the food value chain in local and regenerative food to improving availability of training in the NR education sector.

There are hopeful stories of resilience in the NRFS that tell the lived experiences of industry adaptability and community-led resilience in the FS, as documented in Box 1, 2 and 3 in the previous sections.

4. Recommendations

The following 10 recommendations were developed through triangulating interview findings, interviewee suggestions, findings from the NR literature review and broader recommendations from academic literature.

1. Develop NR regional food policies and planning
2. Deliver rapid response across the NR food supply chain during disasters
3. Strengthen NR food system connections and collaborations
4. Identify and support NR local food champions and community food efforts
5. Support NR food charities to expand services and provide fresh local food
6. Build NR food hubs and strengthen food transport networks for a regional circular food economy
7. Protect arable land in the NR for food production
8. Support Indigenous and emerging agri-business sectors in the NR
9. Develop a broader, deeper knowledge base about the NR food system
10. Increase knowledge and capacity for all to grow and value local and sustainable food

Recommendation 1: Develop NR regional food policies and planning

A more coordinated response to disaster food security is needed, along with greater support for local farmers and small food businesses to thrive and create diverse food supply options when disaster strikes.

Interviewees' suggestions:

- introduce new governance models for food
- establish a coordinating body for emergency planning and response in the food industry
- coordinate local food organizations using the appropriate model
- amplify voices and share ideas to localize the food system
- implement a regional approach to food planning across LGAs
- discuss sustainable population size
- discuss sufficient food production to support processing and secondary industries
- advocate for federal government recognition of the right to food
- empower community-led governance of food systems
- focus on protecting primary production areas to avoid fragmentation

Key literature review findings:

Recent strategic planning that addresses food in the NR has been relatively siloed within either agriculture or transport.

Potential Actions:

Short term:

- Formation of a NR Food Policy Council, through a community-led participatory visioning approach consisting of diverse and inclusive representation of all FS stakeholders across the NR

Long term:

- Develop a NR Regional Food Plan that
    - addresses all elements of the NRFS
    - is informed by lessons learned from disasters and disruptions
    - refers to existing strategic planning processes in the region
    - documents a clear vision and objectives
    - suggests clear achievable and measurable strategies for policy and planning in the NR

Recommendation 2: Deliver rapid response across the NR food supply chain during disasters

Rapid supportive responses from governments to businesses and organisations supplying food in the region are needed to recover more quickly and continue their role in providing food to the community.

Interviewees' suggestions:

- connect vulnerable and isolated community members with services and anonymous support
- provide support to flood-resilient businesses in the CBD
- establish disaster-resilient infrastructure for food production, including power backups, improved water storage and management, and assistance with road access
- implement water security strategies, such as improved water licensing and creating specific infrastructure for horticulture
- deliver timely information to producers and food retailers during disasters
- improve flood warning systems and address power outage issues for better preparedness
- develop flood-resistant infrastructure for food retailers
- offer support and education for equipment repair during flood events
- provide a safe location and assistance for moving equipment during floods

Potential Actions:

Short term:

- Establish rapid-response emergency preparedness actions for food
- Train key food emergency responders across the NR e.g. CCR network by Plan C in **Appendix E**

Long term:

- Develop NR Food Disaster Preparedness Strategy across emergency agencies in the FS
- Develop regional food officer role to coordinate disaster food security and implement NR Food Plan

Recommendation 3: Strengthen NR food system connections and collaborations

"The food system is made up of interconnected actors, and it's difficult to act on one part of it without taking all impacts into account" – Community organisation

Enhancing and enabling local networks and collaborations should be a core feature of future resilience building strategies.

Interviewees' suggestions:

- create networks and platforms for farmers, Indigenous people and farmers markets to meet regularly
- facilitate connections between researchers and the government on local food

Potential Actions:

Short term:

- Develop NRFS Map and Database which includes:
    - food system actors
    - key activities already in place
    - key pressures on stakeholders across the food system elements
    - key connections and collaborations that exist between and across stakeholders

Long term:

- Invest in social capital building strategies and frameworks e.g. Australian Red Cross (2012)
- Fund innovation in existing connections through digital tools and collaboration models

Recommendation 4: Identify and support NR local food champions and community food efforts

There is an urgent need to recognise and value local champions already working to create a regionally-based food system in the NR (see **Appendix E** for a non-exhaustive list of existing activities).

Interviewees' suggestions:

- local government encouraging a culture that supports farmers markets i.e. food inspectors with positive information and hands on approaches to helping farmers do the right thing
- Increase backyard and community food gardening, food swapping/sharing and community cook-ups

Potential Actions:

Short term:

- Establish Local Food Champion awards or recognition mechanism
- Conduct needs survey of community gardens, farmers markets, urban farms and food co-operatives
- Identify tools and funding required to support local food champions to continue their work

Long term:

- Policies, funding and procedures to replicate and expand food champion activities across the NR

Recommendation 5: Support NR food charities to expand services and provide fresh local food

"People walk in our doors for food, it brings people in and allows other social interaction and support. We can then find out what is going on for them and how to help out in other ways" – Food pantry

There is a need for sustainable financial support to the NR emergency food and food relief sector to meet growing food insecurity and explore local fresh food options that are tailored to specific customer needs.

Interviewees' suggestions:

- diversify, dignify and localise food relief
- fund food pantries ongoing costs and growth
- increase cost recovery supermarkets and better access to vouchers
- source local food for food relief organisations
- expand food pantry options to include fresh food or food vouchers for fresh food
- personalise food charity packages for families with different needs
- removing the stigma of who accesses food relief and link food to social support

Potential Actions:

Short term:

- Review best practices for equitable and dignified food relief with resilient food system outcomes
- Conduct Food Security Survey with food relief programs from recipients, food charities and food rescue agencies (e.g. City of Casey and UTS Food Insecurity Mapping examples in in **Appendix F)**
- Identify pilot projects linking producers/farmers markets to food relief using digital tools

Long term:

- Implement an annual Food Security Survey/Index for the NR
- Expand food relief activities to production/distribution e.g., Canada Community Food Centres **Appendix F**).

Recommendation 6: Build NR food hubs and strengthen food transport networks for a regional circular food economy

"A local food hub that we collect food and buy would allow people to come and buy and wasn't allocated to say 3 hours of a week at a market." - – Producer

There is an urgent need for long-term and sustainable infrastructure solutions to enable regional food storage, aggregation and distribution systems to be local, circular and resilient.

Interviewees' suggestions:

- Establish an NR food hub for local product distribution that includes options for cold storage facilities
- Reinstate refrigerated freight services to major markets in Brisbane, Melbourne and Sydney
- Increase access points and centralize farmer food collection for relief efforts
- Utilise public spaces for food production and farmers markets
- Direct strategic planning and investment in agriculture infrastructure e.g., roads, processing facilities
- Minimise food waste while promoting food recovery and relief
- Develop online platforms for market connectivity and food box delivery
- Distribute homegrown food to marginalized communities via community organisations
- Facilitate neighbourhood networks for food swapping and community gardens
- Improve federal regulations to support the NR food industry workforce and food start-ups
- Provide grants and incentives for emerging agri-business e.g. native foods and farm gate to retail

Key literature review findings:

The limited research available indicates there is potential for enhancing food resilience in the NR through local food supply options, but scaling up of local food supply is needed.

Potential Actions:

Short term:

- Complete NR Regional Food Hub Study to identify and develop
  - existing studies/activities e.g., Richmond Valley Regional Job Precinct, Bangalow Food Hub
  - business case for food hubs that support a circular local food economy
  - emergency cold storage and refrigerated transportation for incoming food aid and local food
- Discuss findings with transportation agencies and align with e.g. Roots to Routes RDA-SCU study

Long term:

- Build network of food hubs in the NR that catalyse and enhance regional food systems
- Create an enabling regulatory environment and incentivise agri-food business development
- Explore local food economy business models, entrepreneurship and incubation (e.g. ecovillages)

Recommendation 7: Protect arable land in the NR for food production

State and federal government must support local council decision-making on land use for food production and exploration of land use models for community food production.

Interviewees' suggestions:

- Expand agricultural support officer positions at all NR local councils to assist farmers
- State government support for local government decisions on land protection
- Prioritize fertile land with water availability for agriculture
- Local government policies supporting local and affordable food production and manufacturing

- Long-term protection of agricultural land and food industries from urban encroachment
- Preserve larger industries alongside small scale farming e.g., vegetables and niche agriculture
- Promote acceptance of higher density living
- Explore intensification of production, such as greenhouses
- Explore land leasing and sharing models, especially for young farmers (e.g. FOOPL in **Appendix F**)

Potential Actions:

Short term:

- Review NR land use/agricultural policy using resilient food system criteria e.g. Cordell et al., 2022
- Liaise with disaster and land use agencies to discuss findings e.g. NRRC, NRJO, DPI, LLS, Councils
- Identify and document best practices in leasing, land-sharing and public land food production

Long term:

- Establish food/agricultural officers in each NR LGA, working with land use planning officers
- Implement state and local legislative/regulatory amendments to maximise agricultural land protection

Recommendation 8: Support Indigenous and emerging agri-business sectors through innovation

""Different regions are suited for different things and we're not always planting the right things in the right place"
- Industry body

Indigenous-led enterprises and the emerging NR native foods sector require support and increasing agri-tourism and exploring new agri-business models of emerging sectors can provide diversity and stability during times of disruption.

Interviewees' suggestions:

- support for all food industries, including large and emerging sectors by state agencies implement industry-led solutions based on their expertise
- support blue ecology (ocean) organizations and improve seafood provenance information
- promote Indigenous-led food enterprises through pilot case studies and guidelines for replication
- encourage agritourism growth through supporting legislation for farmer supplementary income
- establish a NR business incubator for new food actors
- support younger generations in small-scale food production e.g. microgreens
- embrace circular economy principles
- establish a CBD shop sourcing produce from farmers markets
- identify land for expanding native food production

Potential actions:

Short term:

- Dialogue with traditional owners on expanding Indigenous food activities in the NR
- Discuss emerging food sectors with community and government to identify best approach to support
- Complete a food industry incubator study to help start up local food growers and processors

Long term:

- Establish traditional food farms, supplies and food education for Indigenous people
- Fund NR food emerging sector agri-tourism and agri-business pilot projects
- Identify legislative/regulatory frameworks for supporting NR agri-food business development

Recommendation 9: Develop a broader, deeper knowledge base about the NR food system

Comprehensive research into the NRFS is needed to identify key issues and to inform a more targeted, efficient approach to future NRFS action and upscale the local food system capacity.

Key literature review findings:

Many information gaps exist for the NRFS and lack of baseline data have led to significant challenges in a previous NRFS project.

Potential actions:

Short term:

- Expand this study to include
    - wider community feedback
    - climate impacts and governance (e.g. economics and policy)
    - data for remaining five LGAs: Ballina, Clarence Valley, Kyogle, Richmond Valley and Tweed.
- Develop baseline data to inform a targeted approach to food system action. Key priorities include:
    - a NR foodshed analysis (food demand and supply)
    - intraregional food flow assessment
    - food insecurity vulnerability and adaptive capacity assessment (food insecurity hotspots)
- Complete economic analysis of a NRFS local food economy

Long term:

- Implement participatory consultative needs analysis of NRFS to inform strategic planning

- Conduct monitoring and evaluation of initiatives to track progress and inform future decision-making

Recommendation 10: Increase knowledge and capacity for all to grow and value local and sustainable food

There is a need to improve availability of training in the NR education sector to address awareness and skills gaps in the food value chain, local and regenerative food production and basic food growing in backyards and community gardens.

"Consumer sovereignty means that what you spend your dollar on actually reaffirms that production and that supply chain, and they can spend their dollar in a way that reaffirms a more resilient and food secure production and supply chain".
– Producer

Interviewees' suggestions:

• Educate farmers on sustainable and regenerative agriculture methods in a non-academic way

• Facilitate guidance for purchasing farms e.g. 'tree change education' for real-estate agents

• Provide sustainable farming advice and education for new farmers

• Encourage experienced farmers to communicate their values and challenges to the public

• Promote the concepts of paddock to plate and food sovereignty

• Facilitate knowledge sharing between older and younger farmers through mentoring programs

- Incorporate land use planning and development into school education

- Create Council and farming group collaborations on production and business management projects

- Increase awareness of food security challenges, local growers, markets, and biodiversity

- Promote consumer sovereignty and educate consumers on sustainable food choices

- Reinstate TAFE courses and workshops to grow skills in native food horticulture

- Educate consumers about food origins, preparation/storage/preservation and plant-based diets

Potential Actions:

<u>Short term:</u>

- Review of local food education in the NR across vocational, schools, tertiary and private institutions
- Study into consumer attitudes and beliefs about local and regional food
- Support local food programmes and projects aimed at teaching food growing skills to communities

<u>Long term:</u>

- Support new and young farmers food production skills and regenerative farming knowledge through:
    - formal education/training for young farmers
    - fostering peer-to-peer support
    - developing industry and community support and ensuring secure
    - affordable access to farmland

This NR food security scoping study has identified a definition for the future of the NRFS as follows:

A resilient and secure food system for the Northern Rivers
- ensures all community residents have access to healthy, affordable and culturally appropriate food;
- provides economically and environmentally sustainable food during times of disaster or supply chain disturbance;
- promotes community self-reliance and builds social capital.

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Appendix A – Media articles relating to food during NR disasters

Northern NSW farmers face total crop losses after widespread flooding

https://www.abc.net.au/news/2022-03-03/northern-nsw-crop-flood-damage/100875454

Northern Rivers running out of food, medicine, fuel as flood claims four victims

https://www.smh.com.au/politics/nsw/northern-rivers-running-out-of-food-medicine-fuel-as-flood-claims-four-victims-20220302-p5a14x.html

The Queensland and NSW floods further exposed our food insecurity – could self-sufficiency be the answer?

https://www.theguardian.com/australia-news/2022/mar/08/the-queensland-and-nsw-floods-further-exposed-our-food-insecurity-could-self-sufficiency-be-the-answer

Shops running out of food in flood-affected areas as flooding blocks Pacific Highway

https://www.abc.net.au/news/2022-03-02/shoppers-strip-shelves-bare-as-floods-strand-truckies-in-nsw/100874048/

Norco co-operative's dairy farms and Lismore ice-cream factory smashed by floods
www.abc.net.au/news/rural/2022-03-04/norco-cooperative-dairy-farms-lismore-factory-flood-damage/100882506

Brisbane Markets goes under water while macadamia and pecan growers flooded in Qld & NSW
https://www.northqueenslandregister.com.au/story/7640352/flooding-continues-as-hort-braces-for-impact-assessment/?src=rss

Flooded farmers pull together market in Lismore to feed hungry locals fresh produce

https://www.abc.net.au/news/rural/2022-03-07/flooded-farmers-pull-together-to-feed-lismore-community/100887576

The never-ending fallout of the Northern Rivers floods: 'People are just worn down'

https://www.theguardian.com/australia-news/2023/feb/20/the-never-ending-fallout-of-the-lismore-floods-people-are-just-worn-down

Locals take charge of NSW floods helicopter food and rescue efforts amid frustration with ADF

https://www.theguardian.com/australia-news/2022/mar/07/locals-take-charge-of-helicopter-food-and-rescue-operations-in-nsw-floods-amid-frustration-over-adf-efforts

Chefs lead volunteers to feed NSW flood victims in absence of government food relief

https://www.theguardian.com/australia-news/2022/mar/08/chefs-lead-volunteers-to-feed-nsw-flood-victims-in-absence-of-government-food-relief

Appendix B – Bibliography of reports and articles on the NR food system

Northern Rivers Foodlinks Project, 7 NR Councils and Rous Water (2009)

NSW Community Food Initiatives Report, NSW Environmental Trust (2015)

North Coast Enabling Region Adaptation Study, NSW Office of Environment and Heritage (2019)

'Shop Smart, Shop Local Comparing the Cost and Origin of Food at Farmers Markets, Supermarkets and Independent Greengrocers in the Lismore Local Government Area', Moore & Why Griffith University, NSW LHD and Red Cross (2018)

'Northern NSW farmers' markets foster connection and trust in the COVID era- a consumer perspective.' Griffith University. McKinnis, A., Wilkinson, S. (2021)

Farming Together/Farm Cooperatives and Collaboration Program, Southern Cross University and Federal Government (2016-2020)

Regenerative Agriculture Alliance (current), Southern Cross University

'Insights into community vulnerability and resilience following natural disasters: perspectives with food retailers in Northern NSW', Australia, Singh-Peterson, L., & Lawrence, G. (2015)

'Food pricing, extreme weather and the rural/urban divide: a case study of Northern NSW', Australia, Singh-Peterson, L., Shoebridge, A., & Lawrence, G. (2013)

Organic Food in the North Coast Region of NSW An Industry Snapshot Prepared for North Coast Local Land Services by EcoLogical Australia (2015)

From Roots to Routes: A ground up approach to freight and supply chain planning for the Northern Rivers NSW, Northern Rivers Joint Organisation (2019)

Increasing Food Security in Lismore: Home and Community Food Production in the Lismore Local Government Area, Jo Sharp for Lismore Urban Agriculture (2016)

Appendix C – Interviewee criteria and interview instrument

Interviewee selection criteria

Criteria	Rationale	Examples of evidence to be considered
Core Criteria *(interviewee meets each of these criteria)*		
1. Key representative of the NR region's food system	Is an active and well-established participant within the NRFS, or can represent the views of those working within this system. May address any of the following aspects of the food system: production, manufacturing, transport/distribution, wholesale or retail, consumption/nutrition and waste management.	Business owners or managers, organisation directors or leaders and public servants
2. Substantial focus on local food supply and access	Organisation/business/role has a substantial focus on supply or access of food produced in the NR region	Strong presence within food access points in the region such as retail shops or restaurants, emphasis on local food in publicly available information
Desirable Criteria *(interviewee meets one or more of these criteria)*		
3. Involvement in multiple aspects regional food system	Including persons who have experience in more than one aspect of the food system (including aspects mentioned above) to provide a broader view of the food system interactions and relationships	Farmers who also work as distributors or chefs, retailers who also produce or manufacture food.
4. Experience in contingency planning or disaster response in food system operations	Experience in responding to the food security needs of a community in a post-disaster situation	NGO management, community organisations, public servants, emergency responders
5. Diversity	Represents a view or experience that offers a diverse perspective or broad range of knowledge on the topic area. May represent diversity related to type of operation, cultural practices, location or gender. Includes diversity of food system element (producers, manufacturers, retailer, consumers) and diversity of food types grown or produced to include the major food groups.	People from cultural groups, organisers working with minority or gender specific groups, people from diverse locations in Byron and Lismore Shire

Interview instrument

Establishing role in the NRFS

Prompts are indicated in the bullet points and some may be more appropriate than others depending upon what aspect of the food system the interviewee works in.

1. Can you tell me about your organisation and your role within this organisation? (RO #1)
   Interviewer's notes:
      1. About: Name, Home office, other locations
      2. Org type: Private, government, For profit, not for profit
      3. Food System Actor Type(s): Producer, distributor, processor, etc…

4. Products / services provided: food type / processing type / etc
5. Final food in their outputs
6. Locally owned?

2. Can you explain to me your organisation's role in supplying food to people within this region?
   a. What areas to do service (distribute to or relevant service)?
   b. Who are your customers? Demographic - age/income/etc
   c. How much food do you produce/distribute/process (handle?) In financial terms and in quantity?
   d. How much of your business is aimed at the local/regional market?
   e. Of your key inputs (e.g. produce / compost / ingredients / etc…) how much of them are produced locally?
   f. How much of your work includes developing regional food supply?

3. Who within the NR regional food system do you do business or collaborate with on a regular basis?
   a. Please cover private, public or community sectors?
   b. Where do you source/sell local food and other inputs you need?
   c. How many market channels/options are available?
   d. What transport do you need?
   e. What do you do with your waste?
   f. Is there anything else you rely on for your business to be functional?

Socio-environmental sustainability and resilience

4. How does your organisation/business consider environmental and social sustainability within its operations?
   a. What are some examples?
   b. Consider if this is a big answer and how they will take this?
   c. E.g. Farmers/Producers - What style of farming do you do? Regenerative? Organic? Fertiliser?

Food security impacts due to disaster

Go through Fires / COVID / Floods separately

5. How has your organisation/business been impacted by recent disasters such as the 2022 floods, the 2019 Bushfires and COVID-19?
   a. During the flood, how was your capacity to supply food to the region affected?
   b. During the flood, how was your capacity to source food from within the region affected? and from sources external to the region?

   c. During recent disasters, what were the most reliable channels for you to sell/source food? Was there any change to normal?
   d. During the fire was it the same or how was it different?
   e. How did COVID-19 affect your capacity to source and supply food for the region?
   f. Is your business stable? E.g. financially stable or are there other factors that could cause your business to close down? How stable was it during the disasters (Flood/Fire/COVID-19)?

6. During the recent disaster, what were the significant obstacles/barriers for your work / business / organisation?
   a. External impacts on your business other than the direct impacts of disaster already outlined above
   b. E.g. Were there logistical issues, supply chain issues, policies, regulations?
   c. Did any connections/collaborations fail?
   d. How do you get new customers / advertise?

7. What was supportive/helpful for your organisation/business during recent disasters?

     a. Were there any mechanisms in place to support you when issues impact your capacity to supply/sell food? I.e. internal / community / government support or policy

     b. What help could you have used to better deliver during the disasters (Flood/fire/COVID-19)?

     c. What connections/collaborations with others working in the food system were important for you to continue your work?

     d. What support did the important connections bring?

8. During recent disasters, were there any opportunities (potential or actual) arising for your business/organisation?

     a. How was your business/organisation able to adapt/innovate to continue functioning?

Recommendations/envisioning a more resilient RFS in the NR

Preframe: Set up and define what food security is

9. What gaps are there in the NR food system for the NR to be food secure i.e. have enough food to thrive or at least have adequate food to be comfortable?

     a. If there were to be a bigger disaster e.g. no food deliveries from outside the NR for a month or more, what would happen?

10. If you had a magical wand and could upgrade the food supply in the NR what would you do to make us more self-reliant? (What would a fully food secure NR food system look like?)

     a. What needs to be added / removed / changed?

     b. What actors (growers/processors/distributors/retailers…) need to be added?

     c. Interviewers Note: make distinction between local actors and non-local

11. How can the government help support greater food security in this region, particularly how could local food options be enhanced?

     a. What would support you/your organisation specifically?

     b. How can the state or federal government help?

     c. How could the council help?

     d. What legalities / legislation needs to change?

     e. Do you find the government enabling or an obstacle?

     f. How can it become more enabling? (and present less obstacles?)

     g. What is your perspective on the regulatory environment? Conducive / obstacles

     h. How can this be improved?

12. What could organisations like yours do to help improve the food system?

13. What could people and the community do to help improve the food system?

14. Would some type of NR food system coordination group be of value?

     a. Would you be interested in participating in that?

15. Anything else?

Ending the Interview

1. Thank you
2. Next steps
3. Are you willing to review and give feedback on our draft report?
4. Who else do you think we should interview?

Appendix D – Summary of interviewee characteristics

#	Food production	Food processing and manufacturing	Food wholesale, distribution and marketing	Food retail and service	Food preparation, consumption and nutrition	Food waste	Food relief, emergency response	Food governance	NR food system representative	Focus on local food	Involved in multiple	Experience in disaster food	Diversity in food system representation	Lismore LGA	Byron LGA	Northern Rivers
	FOOD SYSTEM ELEMENT								**CORE CRITERIA**		**DESIRABLE CRITERIA**			**LOCATION**		
1	✓	✓	✓	✓		✓			✓	✓	✓			✓		
2			✓			✓			✓	✓	✓			✓		
3	✓	✓	✓						✓	✓	✓			✓		
4				✓	✓				✓			✓		✓		
5				✓	✓		✓	✓	✓		✓			✓		
6			✓	✓		✓			✓	✓	✓		✓	✓		
7				✓					✓	✓	✓		✓	✓		
8					✓		✓	✓	✓			✓		✓		
9		✓	✓	✓					✓					✓		
10								✓	✓		✓			✓		
11			✓	✓					✓	✓	✓			✓		
12	✓	✓					✓		✓	✓					✓	
13	✓	✓							✓	✓		✓			✓	
14			✓	✓	✓				✓	✓					✓	
15		✓		✓					✓	✓					✓	
16	✓	✓							✓						✓	
17				✓		✓	✓								✓	
18				✓		✓	✓								✓	
19		✓				✓		✓	✓							✓
20							✓			✓	✓		✓			✓
21		✓					✓	✓		✓	✓	✓				✓
22				✓					✓	✓						✓
Total	5	9	10	15	11	7	7	6	20	17	15	6	7	11	7	4

Appendix E – Local food solutions in practice in the Northern Rivers

Everyday Practice State	
Community Gardens There are approximately 19 community gardens operating across the Northern Rivers Region which span all local government areas. Byron Shire has 2 community gardens, Ballina 2, Clarence Valley 3, Lismore 2, Tweed Shire has 6, Richmond Valley 3 and Kyogle 1. This represents a significant community food sector in the Northern Rivers as spaces for growing food, connecting community with food and advocating for, and education about, local food systems.	
	Wardell CORE food activities Promoting horticultural activities for trauma recovery, social enterprise, community resilience and ecosystem restoration. They focus on providing a rich landscape for personal development and sustainability through initiatives including crop swap events, Home Harvest gardening program, Backyard Gardening Basics workshop, and etc.
Plan C Byron Shire Resilience and Regeneration Roadshow – workshop on food security Aiming to build the resilience and regenerative capacities of Northern Rivers communities in the face of future disasters and crises through mapping actors, partnerships, informing and educating residents, community connections, research and evaluation, and influencing decision-makers. Plan C also contributes to improving food and water security by training its network of Northern Rivers Community Carers and Responders (CCR) on this.	

Produce swaps

Federal Exchange: a platform to share excess home grown produce to improve local food security, strengthen community connection, support and inspire gardening, encourage new varieties of produce, support sustainable living reduce food waste and reduce dependence on food commerce.

Crop Swap Northern Rivers NSW: aims to build a community for people to come together, reduce food waste and help each other eat better by providing a platform for neighbours to meet and swap excess produce.

Kyogle Produce swap: A place for Kyogle locals to swap, sell or giveaway their home grown produce with others.

Clunes Co-op Crop Swap: A platform for residents to bond with their community, advertise their local businesses and also buy, sell, swap or give away.

Clarence Valley Food Inc

Through collaboration, networking, events, leadership and education their priority is to connect consumers back to their food source and provide a platform for discussion to showcase and grow their local produce sector, cafes, growers, products and manufacturers.

Lismore Urban Agriculture

Although no longer active, a community-led organisation operating until 2018, Lismore Urban Agriculture aimed to inspire a culture of growing food in the backyards and provided produce swaps, advocacy and education through initiatives like Stop the Rot, Urban Orchards, Garden Blitzes and events and festivals.

Regenerative Agriculture Alliance

A collaboration of Australia's leading researchers and practitioners in regenerative agriculture, whose aim is to improve the holistic health and wellbeing of Australian landscapes, farmers and communities through regenerative agricultural research, education and practice.

TAFE Wollongbar

Certificate III/CV in Production Horticulture (Bushfoods) for Aboriginal people: Teaches how to establish, control and grow a variety of native food crops to enter the Bushfoods Industry through a full-time course with a customised Certificate.

Northern Rivers Food Harvest Food Trail

The Harvest Food Trail offers a chance to meet with the farmers, producers, growers, distillers and chefs to celebrate all the Northern Rivers food & beverage industry has to offer to know the story behind the food…understanding where the food was grown, the regenerative methods the farmer used to produce it, the people behind the brands and their unique stories.

Young Farmers Connect

A national not-for-profit organisation committed to cultivating networks, resources and community for young farmers state and nation-wide through providing educational platforms and community connections that encourage young agrarians to farm for the future, supporting the use of regenerative, holistic & sustainable agricultural practices.

North East Waste food waste

North East Waste is regional waste agency as part of the NSW EPA Waste Less, Recycle More initiative funded from the waste levy. They work on a number of food waste programs to avoid, reduce and manage food waste in the Northern Rivers.

Disaster State

Koori Kitchen

Koori Kitchen Lismore was set up to provide meals to people affected by devastating floods in Lismore and surrounding communities earlier this year. The Kitchen quickly morphed into a huge hub offering not just food but also essential necessities as well as mental and social support.

Trees not Bombs café

The Trees not Bombs tent has become one of the only places in Lismore where community members can come to, sit down, hang out and get something to eat and drink, for free after the floods.

Five Loaves Kitchen

Five Loaves is a Local Lismore charity. This charity was founded by Darcy Goodwin, offering free food to those who need it most.

Recovery State

Resilient Lismore Community Cook Ups

Resilient Lismore is hosting a series of free and fun events for local communities, with food generously provided accompanied by some entertainment to provide a place for people to connect with their community.
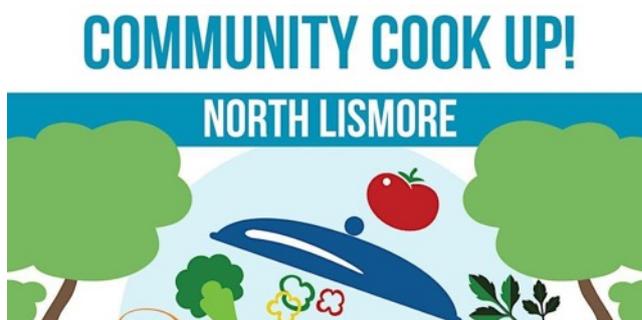
Good Pantry

They aim to help the people that are really struggling to provide a flood relief, which offers free memberships for people to shop lowered price items.

Appendix F – Best practices in regional food systems projects and research

UTS Institute for Sustainable Futures

- Sydney Foodsheds mapping http://www.sydneyfoodfutures.net/
- Progress in the Spatial Modelling of Food Insecurity in Australia: A Foodbank Australia White Paper https://www.uts.edu.au/sites/default/files/2021-12/Foodbank_white_paper%20final.pdf

Sustain: the Australian Food Network

- City of Casey Food Security Framework https://conversations.casey.vic.gov.au/food-security
- Cardinia Food Movement https://www.cardiniafoodmovement.org/
- Melbourne Food Hub https://sustain.org.au/projects/melbourne-food-hub/
- Food Systems Directory https://sustain.org.au/directory/
- Oakhill Food Justice Farm https://sustain.org.au/projects/oakhill-community-food-justice-farm/

Open Food Network Australia

- https://openfoodnetwork.org.au/

Right to Food Coalition Australia

- https://righttofood.org.au/

Australian Food Sovereignty Alliance (AFSA)

- People's Food Plan https://afsa.org.au/category/peoples-food-plan/#:~:text=The%20Peoples'%20Food%20Plan%20%E2%80%94%20conceived,society%20%E2%80%94%20was%20Australia's%20first%20crowdsourced
- Farming on Other People's Land (FOOPL) Project https://afsa.org.au/our-work/farming-on-other-peoples-land/#:~:text=FOOPL%20activities%20support%20and%20encourage,tools%20for%20successful%20farm%20enterprises.

Griffith University QLD

- Logan Food Mapping https://regionalinnovationdatalab.shinyapps.io/Logan_Food_Mapping/
- Cairns Towards Local Food Resilience https://www.griffith.edu.au/__data/assets/pdf_file/0029/1334297/CRI-Towards-local-food-resilience-research-report.pdf
- Partnering with Queensland Government's Office of the Inspector-General Emergency Management (IGEM) https://www.griffith.edu.au/cities-research-institute/research/digital-earth-and-resilient-infrastructure/food-contingency

Canberra Region Food Collaborative

- https://www.agrifood-hub.com/

South Coast NSW

- Food & Fibre South Coast https://foodfibregsc.com.au/about-us/

Baw Baw Food Hub

- https://bawbawfoodhub.org.au/

Bega Circular Valley, Local Food and Logistics Program

- https://begacircularvalley.com.au/projects/local-food-and-logistics-program/

Canada

- Community Food Centres https://cfccanada.ca/en/Home

PLAN C

OUR PLAN IS THE COMMUNITY