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Modelling the local economic impacts of megatrends

Dr Kim Houghton
Adjunct Associate Professor
IGPA
University of Canberra

Prof Anthony Hogan
IGPA
University of Canberra

Abstract

Small regional economies are highly vulnerable to external shocks from 'megatrends' – major changes in markets, pricing, climate or policy. It has been difficult to map the impacts of these shocks at the local economy scale in ways in which communities can see themselves in the data and recognise their local supply chains, as the standard approaches of input-output models or regional CGE models discount local economic specialisations. This paper applies a supply chain elasticity approach based on firm-level performance data from firms in the target supply chains in the selected locality. Firm level data is then combined with regional economic data to enable modelling of the immediate and long term localised consequences of particular economic shocks. This hybrid approach ensures that local supply chain responses duly reflect adaptive capacities and histories of key firms, yielding modelling results which are generally perceived as more believable and more valuable by the communities concerned. Modelling shows that local labour market responses to external shocks can be non-linear. Responses are often highly elastic within quite wide limits, which usually mutes the immediate employment impact, while outside these limits a tipping point is crossed which triggers a sudden change. The results help explain why input-output and CGE models tend to overstate the impacts of some shocks and understate others. The results help communities and policymakers understand the local-level consequences of external shocks, facilitating future adjustment strategies.

Introduction

External shocks like environmental catastrophe (drought), policy changes (Murray Darling Basin Plan), international competition and fluctuations in market prices and the Australian dollar are all putting rural communities under pressure. A recent review of prospects for economic growth in Australia assessed the expected impact of megatrends on Australia as a whole, with major changes forecast in mining, agribusiness and tourism which will reshape the drivers of economic activity in regional Australia (Deloitte Access 2014).

Local level strategic planning is being encouraged by the MDB Plan and by the Regional Development Australia networks as a way of preparing for and adapting to these shocks. But communities have few tools available to them to consider future pathways other than consultative forums. These forums tend to see a narrow set of suggestions floated, many of which need outside resources to be delivered. There have been no tools available to communities to weigh up the impact on their populations and economies from different future scenarios.

Research Context

Concepts of 'localism' are currently in vogue in Australia and the United Kingdom. Localism is increasingly being promoted as a key social strategy which communities can use to address their needs to secure material sustenance; that is, they are required to secure their own socio-economic sustainability by taking an entrepreneurial approach to developing their local assets and resources (Hogan & Lockie 2013; Hogan et al 2012).

The extent to which communities might actually be able to determine their own future is strongly contested in theory and practice. In an era where governance is often determined by centralised bodies while localised authorities are left to some how manage processes of implementation amidst inherent contradictions, addressing issues of governance, engagement and exclusivity, and the boundary between leaders and the community are blurred as increasingly externalised drivers of change impact on communities. Eversole & Martin (2006) find that change drivers lie outside local control—creating a tension that is difficult to reconcile—and call for a more informed, whole-of-government policy strategy for the development of Australia's rural regions. Picking up on this theme, a series of recently published papers have highlighted how Australian Commonwealth Government policy, deployed as it has been amidst the globalisation of much agricultural production in rural and regional Australia over the past 40 years (Hogan and Young 2015), demonstrate the extent to which much of what is occurring to rural communities has come about as a result of megatrends. But Sorensen et al. (2007) argue that seeking to incorporate civil society into formal partnership and consultation processes is too government-centric a view. They argue that in fact non-government actors "frequently co-opt government into their development visions rather than the other way around and/or contest with each other for the ear of government. They can, and do, operate independently of government, but are still part of the governance system. Governance does not necessarily entail government …".

As a multidisciplinary issue, the changes facing rural and regional Australia have many facets. Communities associated with traditional industries in transition—mining, forestry and farming—are generally experiencing considerable population and service loss (Kenyon 2006). Kenyon points to long-term fundamental changes that are transforming rural Australia—demographic, economic, social, technological and attitudinal, issues echoed in many other countries (OECD 2006). Stimson (2011) provides a more recent overview of Australia's changing economic geography, in which marked regional differences in economic performance are evident, highlighting the changing nature of the socio-economic divides that have occurred, and speculating on what might lie ahead. An emerging field at the intersection of economics and geography is 'evolutionary economic geography', described by Tonts et al (2012) as evolutionary ideas in economic geography, where notions of path dependence, selection, adaptation, and resilience have gained considerable currency in recent years. In essence, it is concerned with accounting for the transformation of economic landscapes over various temporal and spatial scales and, in particular, the mechanisms underlying continuity and change (Boschma & Martin 2010). Transformation seems to require the right mix of economic endowments alongside suitable social capital; Cleary and Carson (2014) point to the importance of the presence of adaptive capacity for rural communities to thrive, and highlight that the ways in which this is enacted is critical to success, echoing both the studies of Flora and Flora (1993) and Woodhouse (2006).

From a more economic perspective, there is ongoing debate about the role and importance of diversification versus specialisation. One paper (Beer & Clower 2009) argues that regional cities in Australia have taken on new roles, and those that have witnessed an increase in the level of specialisation within their economy have, on average, grown more quickly than other cities. Trendle (2006), however, states that while regional economic theory suggests that greater diversity will make regional economies more stable, the evidence is far less convincing; stable or growing regional economies depend on many factors other than diversity. In an earlier paper, Trendle and Shorney

(2003) looked at diversification by population size and found that for regions with a labour force above 10,000 persons, less diversity was linked to higher unemployment, while for a labour force below 10,000 persons less diversity was linked to less unemployment. The European Union is focusing on specialisation rather than diversification, with its Smart Specialisation policy concept at the centre of its approach to driving innovation, helping regions focus on strengths and avoid spreading investment too thinly across multiple frontier technology fields (OECD 2013, EU 2014).

A typology for assessing the scale and level of change in regional Australia was proposed by Houghton and Fell (2012), which added a demographic change (rates of population growth or decline) dimension to the industry diversification/specialisation (rates of diversification of employment) dimension to offer a quadrant-based tool to help identify the recent history and trajectory of a community. The study noted that communities could have population growth with either increasing or decreasing employment diversity – signalling a community that was, for example, growing around a specialisation (as in a mining boom phase) or shrinking and diversifying (as traditional primary industries gave way to a role as a regional services hub).

In this multifaceted environment it would be useful to be able to model the impacts of shocks and transitions on communities. The two most commonly used economic modelling approaches are regional Input-Output (IO) modelling, and Computable General Equilibrium (CGE) modelling.

A regional IO approach is the most common way of building a predictive model of how a regional economy will react to external shocks. Unfortunately, while input-output models have been used effectively at the national scale, at the regional and local scale they cannot reflect enough of the local specialisations, strengths and weaknesses to be reliable. A regional-scale input-output approach known as Generating Regional Input-output Tables (GRIT) is in common use, and a study for the Cotton Catchment Communities CRC in 2008 (Powell and Chalmers 2008) noted a series of limitations (comments in **bold**):

1. A linearity assumption implies that any change has proportionate effects throughout the economy so that there are no substitutions among inputs and products. **Implication – fixed supply chains from paddock to export mean that the model cannot respond to adaptation and seasonal variation, for example by reducing need for labour through capital equipment.**

2. A set of homogeneity assumptions mean that all of the entities (eg farms) in the specified sectors are the same in terms of production technology, products produced, goods consumed, etc. **Implication – model eliminates adaptation amongst growers and between growers.**

3. There is no consideration of market effects in the input-output model and all results are based on real changes in production of goods and services. **Implication – models allows for no feedback between price signals (and more importantly for growers price expectations and forecasts) and cropping behaviour.**

Some major criticisms can be levelled at IO models (see for example Gretton 2013, Denniss 2012 and WA Treasury 2002). Notable criticisms are the exclusion of price reactions in IO models and the inherent assumption that the main 'factors of production' (land, labour and capital) are not constrained. This is particularly important in relation to water as an input, and farm level production functions taking account of the water input have been derived and aggregated as an input into regional IO modelling to overcome this constraint (CARE 2003). This is a useful addition to the modelling process, but the farm-level data gathering is time consuming and labour intensive.

CGE modelling starts with similar economic flows data to IO models but allows capital and labour to move and allows for demand and supply to respond to changes in prices. CGE modelling is designed to model the impacts of an external shock to an economy (a shock like a tax change or resource price change) to see what the economy looks like once the shock has been absorbed and the economy is again in equilibrium.

While superior to input-output modelling in being less prone to overstating impacts, weaknesses in model design and modelling methodologies bring other constraints. The inability of CGE modelling to take account of substitution between material and capital inputs to production (Gretton 2013) is a particular weakness when the models are applied to estimate changes in firm behaviour from external shocks like a new tax or a reduced water allocation. These types of shocks may well have a big impact on the material and capital inputs used by a firm, and excluding this adaptation from the analysis weakens the robustness of the results.

Elasticity assumptions are crucial in driving CGE modelling outputs. They are not computable *from* the model but are important inputs into it. This means that CGE models are weak when applied to regions rather than nations, as it adds considerable complexity to account for regional specialisations, like higher land or labour productivity, or different elasticities of supply amongst firms in a region compared with firms elsewhere.

Similarly, applying CGE modelling to a regional scale requires apportioning core variables such as industry value added and household consumption using whatever local 'bottom'up' data is available – Census employment and household composition data (Wittwer 2010). But in using these data to apportion national data to a region, any local specialisations are eliminated.

Finally, CGE modelling is all about equilibrium, comparing the state of the economy at one equilibrium (before a shock) and then another (after the shock). This means that CGE modelling has to take an economy-wide view of the shock, mapping both 'winners' and 'losers' at the new equilibrium point, but not mapping how either made the transition, or how the transition is actually effected, or where in an economy (below the national level) the impacts will be dispersed.

The alternative to scaling down a national economic model is to build up a local economic model of key supply chains. While this approach is likely to be weak in its ability to track the flow-on effects and links between *all* the different parts of the economy (the strength of IO and CGE modelling) it gives a much more accurate picture of the scale of activities along a local supply chain, and the responses to increased or decreased activity (a weakness of IO and CGE modelling).

Study Communities

The supply chain elasticity approach set out here is based on one agricultural supply chain in each community. The approach is based on the collection of data from local growers, handlers and value-adders on their scale of operations (including employment), the factors that determine this, and the main upstream and downstream links in the supply chain. Supply chain elasticity modelling is then used as the basis for estimating the impact on local economies of changes in farm production. The estimated impacts are based on the historical experiences of businesses over the last decade, a period which in Australia covers both low-production drought years and some high production years.

The scenarios investigated here relate to water availability in two Murray Darling basin communities in Australia.

St George is the principle township of the Balonne Shire, located in Queensland on the New South Wales border some 500 kilometres from the east coast of Australia. St George was founded in around 1850 as the district centre of what was then mainly a wheat-sheep area. The importance on wheat-sheep farming continued until the mid-twentieth century, when the community began a transition towards irrigation production, mainly cotton, following strong private and public investment in irrigation infrastructure in the Shire during the 1950's and 1960's. Cotton plantings and harvest values were highly variable during the decade to 2010.

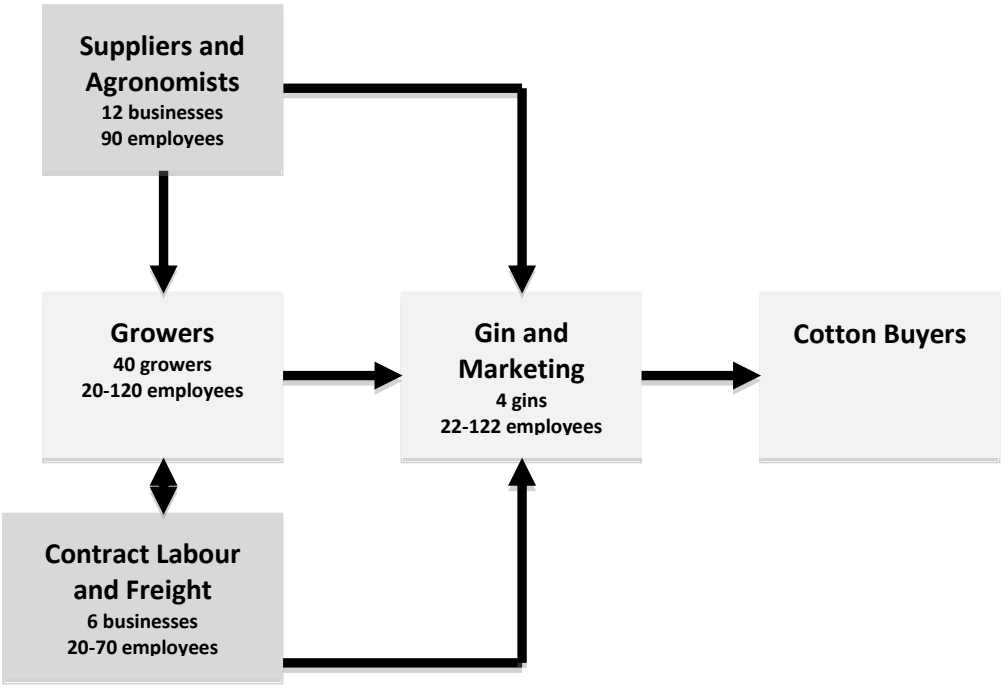
Gunnedah is the main town in the Shire of Gunnedah in North West NSW. The Shire has a population of around 12,000 people and is part of the Namoi Catchment. Gunnedah was one of the first towns in the Namoi Valley and was established in the 1850s. The Liverpool Plains, of which Gunnedah is a part, are an extensive pastoral and cropping district. In addition to its productive agricultural industry, coal mining around the Gunnedah district began in the 1880s and has had a turbulent history of many boom and bust periods since then. Agriculture has remained the major industry around Gunnedah, with 80% of the Shire area devoted to farming. Gunnedah's primary exports are cotton, coal, beef, lamb and pork, cereal and oilseed grains.

In both communities, despite the difference in direct reliance on primary production, availability of water (especially water for irrigation) underpins future scenarios imagined by these communities. The perception is that additional water will bring boom times, and that water restrictions will cause significant economic and social hardship. But it is difficult for communities to assess the extent to which these scenarios will play out – ie just how much will the local economy boom in good seasons, and what is the scale of the economic impact of reduced agricultural activity?

Methodology

In each community cotton is the most significant crop in terms of the Value of Agricultural Production (VAP) and so the analysis focused on the cotton supply chain. The methodology presented here has been designed to balance effort and cost with robustness of results. Effort and cost are minimised through selection for interview of businesses representing key stages in dominant local supply chains. Robustness is maximised by benchmarking the information obtained from these against aggregated economic activity data from other sources.

Figure 1: Gunnedah cotton supply chain



For each community, ten primary producers and ten downstream businesses were interviewed, with the focus of the interviews being how firm activity levels (including throughput, turnover and employment) varied with peaks and troughs in their business cycle. The downstream businesses included

- Contractors and freight
- Processor/packers
- Manufacturers
- Rural supplies/rural services businesses

The interviews (Attachment 1) were tailored for either farm on downstream businesses and covered scale of operations (production/throughput, staff, turnover), trends in these, importance of cotton to the business, importance of and sensitivity to water availability, and changes in technology and business practice through the drought.

Figure 1 gives an example of the scale of the supply chain in Gunnedah. The information gathered enables modelling of the elasticities of these supply chains (particularly turnover and employment) in response to peak and trough activity levels. The approach is similar to firm level panel data, but it less prescriptive and is more suited to smaller enterprises that don't have access to detailed historical internal performance and activity data. The approach is firmly grounded in the local circumstances of each study site, as the primary data relates specifically to the firms operating at those sites. Turnover and employment are the two key measures of a firm's direct impact on a local economy – how much of its material and service inputs it sources locally, and the scale of the wages and contracting payments to local workers.

The supply chain elasticity model puts boundaries on upper and lower activity levels and on employment and turnover levels based on external limits like water availability or commodity prices. The model is designed for predicting responses to changes in these external limits rather than predicting crop yields (the latter is a different science).

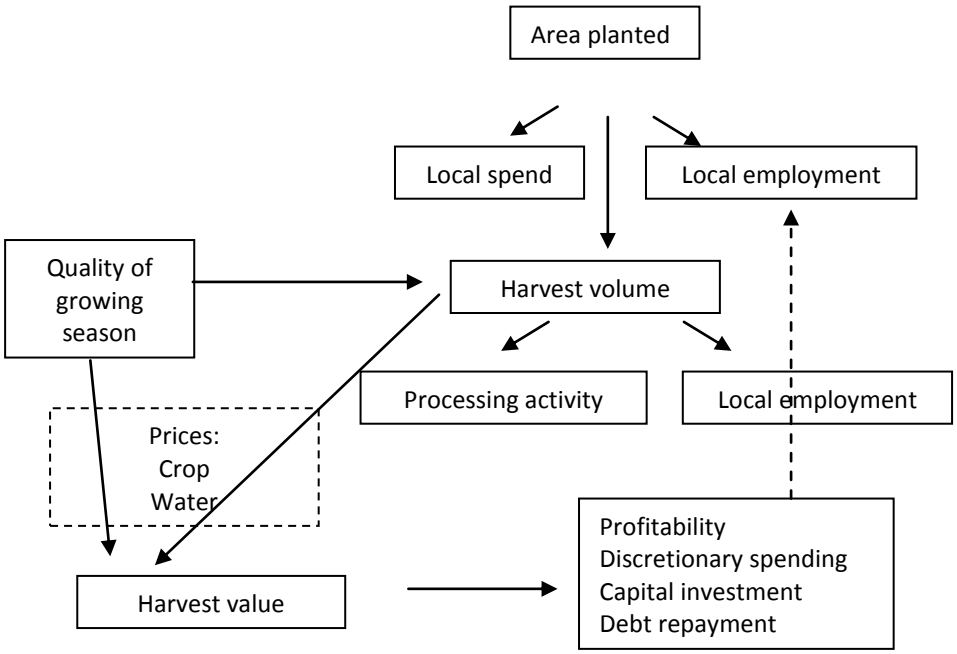
The flow along the supply chain in each area is based on assumptions that:

1. Area planted determines local spend and local employment

2. Quantity of harvest determines ginning/processing activity levels and employment
3. Value of harvest determines debt repayment, capital investment and discretionary spending in the community
4. Harvest value is offset by water availability and cost influences on aggregate operating costs, and therefore profitability.

These links and feedbacks are shown in the Figure 2 below.

Figure 2: Agricultural supply chain links, dependencies and feedbacks



Modelling the flow-on effects through the local economy

As Figure 2 indicates, there are at least three critical points along the supply chain that have major impacts on rural services and non-farming business operations, and these will need to be identified for any area being researched. For example:

- In the two cotton communities one of the most critical drivers is the grower planting decision (how much to plant) and the decision rules that drive it, as it is this decision that has the greatest immediate flow-on effect into the local economies.
- Most agricultural regions are seeing the gradual consolidation of processing and value-adding capacity into a smaller number of larger capacity facilities. With widely varying production levels it is clear that some value-adders and processors continuously review their viability. And while in the wider context the loss of such a facility will mean more business for a neighbouring region, the local flow-on effect from less employment could be important.
- The other major determinant of the impact of farming on a local economy is the nature and extent of the local 'farm business infrastructure' like rural supplies, contractors, aerial services, transport etc which determines local value-adding. Wide variations in planting/production levels have placed pressure on the long-term viability of some of these businesses. While growers would source their products/services from elsewhere if their local suppliers closed, the loss of local jobs in any of these fields would have further negative impact on the local economy.

The peaks and troughs data gathered from the businesses in the local supply chain(s) enables modelling of the impact of changes in activity levels on direct employment and flow-on employment and business activity. This local data was supplemented by data on trends in overall levels of planting and harvesting for the study communities from industry and ABS agricultural census publications.

Three scenarios were modelled:

- 'Best case' with historically high levels of planting, cropping or water availability
- A 'medium case' with intermediate levels of planting or activity
- 'Worst case' with historically low levels of planting, harvesting or water availability.

Activity ratios from historical performance data drive the high, medium and low scenarios:

- Planting area (best case, typical case and worst case)
- Local spend per hectare (best, typical, worst) and total spend
- Harvest volume (best, typical, worst),
- Employment (full time and casual, best, typical, worst)
- Profitability per ha (best, typical, worst)

Results

The results are presented in the following two tables. The value in the modelling, and the contribution it makes to understanding community wealth and wealth being, lies in the ability to estimate the flow-on impact on local spending and supply chain employment across the three scenarios (best case, typical case and worst case).

In the example shown in the two tables, the modelling showed that for the two cotton communities on-farm employment is likely to vary by a factor of 4 between the worst case and best case scenarios. Flow-on employment would vary in range of 2-fold to 5-fold.

Scenario modelling table 1

	Hectares planted		Est farm emplt (no. of people)		Est Post harvest business employment (no. of people)		Est Rural services employment (no. of people)	
	St George	Upper Namoi	St George	Upper Namoi	St George	Upper Namoi	St George	Upper Namoi
High planting	26,000	30,000	141	162	113	138	192	333
Medium planting	14,000	12,000	76	65	90	110	117	226
Low planting	4,000	6,000	28	42	68	83	42	118

Scenario modelling table 2

	Est of local expenses (excl water)		Est costs per ha		Est profitability per ha		Est discretionary spend	
	St George	Upper Namoi	St George	Upper Namoi	St George	Upper Namoi	St George	Upper Namoi
High planting	$65,000,000	$75,000,000	$3,620	$3,620	$1,400	$1,400	$36,400,000	$42,000,000
Medium planting	$35,000,000	$30,000,000	$3,620	$3,620	$1,100	$1,100	$15,400,000	$13,200,000
Low planting	$12,000,000	$18,000,000	$4,550	$4,550	$700	$700	$2,800,000	$4,200,000

For St George, it is likely that the total on-farm and immediate flow-on employment would vary by a very significant 307 employees between the best scenario (445 people) and the worst (138 people). These projections take account of the changed employment response for the best, typical and worst scenarios, and amounts to some 14% of the Balonne Shire workforce in 2006. For Gunnedah, the variance would be 390, between the best scenario (633 people) and the worst scenario (243 people). This is a smaller proportion (8%) of the larger Gunnedah workforce. The higher water and labour costs anticipated from the worst case have also been factored in, leading to 10 to 12-fold differences in the amount of discretionary spend from growers into the community.

These results help the community understand the scale of impact on the local economy, and give boundaries on scale of adaptation necessary should any regulatory or structural change dictate which scenario is more likely – in addition to climatic variations. Interpretation of the results and integration with the other aspects covered in this book are covered in the next section of this chapter.

Conclusion

It is evident from this analysis that in modelling local economic activity in these two study areas, the main players in the supply chains are experienced in handling variability in agricultural activity levels, and that there is not a simple, linear relationship between planting, harvest and local flow-on spending. In particular, it is not accurate to predict flow-on spending by growers, or employment levels on farms or processing businesses, as a fixed proportion of areas under crop across a wide range of cropping areas. There is a tipping point for grower and business adaptation between 25% and 50% reductions in water availability, with practices for both groups changing significantly across this boundary.

It is important to understand the nature of these tipping points and improve understanding of the impacts of changes on agricultural production, so that communities have access to more robust and more intuitively believable modelling. Earlier simplifications which base modelling on fixed relationships like “employment per megalitre of water used” have had little traction in communities. The interviews, local histories and modelling done for this project have shown that there is not a simple relationship between inputs such as water and labour, and that to base further research on such an erroneous assertion is to invite community criticism.

While some level of variation is expected as ‘the norm’, the scale of the downstream consequences is significant. The best/worst scenarios showed an 8% impact on total employment in Gunnedah and 14% in St George. The modelling also showed that a 5-fold increase in area planted (or of water

available) could lead to a 10 to 12-fold increase in discretionary spending in these regional economies – a very significant 'topping up of the economic tank'.

In assessing different scenarios for these communities, the modelling helps understand the total contribution to the local economies of the supply chains that have been analysed. The worst case in St George would mean that to stave off significant numbers of workers and their families leaving the district due to ongoing low levels of water availability for irrigation, the community would need to find 135 jobs in other businesses and industries. On the upside, good seasons and high levels of water availability will provide a foundation for 163 more jobs and a doubling of spending in the local economy

When the modelling is applied to more than one supply chain, it can be used to compare the net impact on local employment and spending of changes in each. So, for example, when adaptability in tourism businesses is included, expansion or contraction in visitor numbers or visitor spend can be modelled to estimate the impact on local employment and local spending, in the same way the changes in farm scale activity have been modelled in the examples above. The impacts of a 'farming led' or 'tourism led' future can then be compared, with the contributions from each supply chain better understood.

The approach described here is built around local intelligence on the flows within the local communities and economies, and how these have adapted to external changes over the last decade or so. The approach generates believable scenarios for local futures, and enables communities to weigh up the impacts on their future of each megatrend that will be exerting influence over their local farm and non-farm businesses. To these ends, this approach makes new tools available for community leaders and policy makers to utilise when considering the possible impacts of policy strategy at the local level. Given that these insights can now be generated, space will need to be created for such analyses within the policy development process. Most specifically, it is now possible to properly demonstrate the economic and social impacts of policy strategy at the local level. As many of these changes originate outside of existing communities, these tools and the information they provide, will place new responsibilities on centralised policy makers because any dis-welfares arising from policy can be documented, raising the question of the extent to which policy makers are responsible for the social and economic costs borne by the few for the benefit of the many.

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Attachment Supply chain business interview template (grower)

A. ABOUT YOUR BUSINESS

1. What is your position in the business? (please circle one)

Single Owner/Manager Co-Owner/Partner Employee Other .....

2. How long have you been farming in the area? (please ☑ tick one)

a☐ Less than 1 year c☐ 5 to less than 15 years e☐ 25 or more years
b☐ 1 to less than 5 years d☐ 15 to less than 25 years

3. What is the total area of your farm?.....ha

What area of this is irrigated?.....ha

How much water did you use in the 2010/2011 season?……Ml

4. Where appropriate, for the last season, please indicate the total area farmed, yield per hectare and price received per tonne for the below:

Cotton

Total area farmed?.....ha

Average yield per hectare?.....t

Average yield of cotton per Ml? ……t

What price did you receive per tonne?.....

Other Crops

How much land did you have under other crops this season?.....ha

What were those crops?.....

Other Activities

Did you carry out any other land-uses on your farm this season?

……

5. What water entitlements do you currently control as part of your farm business, and what is the volume attached to each?

High Security permanent entitlement within an irrigation district	☐ _____ ML
Low Security permanent entitlement within an irrigation district	☐ _____ ML
General Security permanent entitlement within an irrigation district	☐ _____ ML
High Security license as a private diverter	☐ _____ ML
Low Security license as a private diverter	☐ _____ ML
General Security license as a private diverter	☐ _____ ML
Groundwater permanent entitlement	☐ _____ ML
Other licence type (e.g. drainage diversion license)	☐ _____ ML

6. How many people, including yourself, other owners, family members, other operators, etc, work on your farm? (please write number of workers)

Full time _____ Casual _____ Others _____

Part time Contractors (FTE) Don't know

7. Is labour availability an issue for your farm? If so, why?

.....

8. Please provide an estimate of your best farm operating surplus in the last 5 years (please ☑ tick one)

a☐	Less than $50,000	d☐	$150,000-$249,999	g☐	$750,000-$999,999
b☐	$50,000 - $99,999	e☐	$250,000-$499,999	h☐	Over $1 million
c☐	$100,000-$149,999	f☐	$500,000-$749,000		
NS	Not sure	NP	Not provided		

9. Do you have any sources of off-farm income?

.....

10. Who are your main contractors, suppliers and customers for your cotton business?

.....

11. What were your yields of cotton and price received per tonne in each of the last five years?

2010	2009	2008	2007	2006

B. MANAGING CHANGE

12. We are interested in the changes you have made to your farm operation during the last five years, and your plans for the next five years. Have you done (or are you planning to do) any of the following:

	Last 5 years			Next 5 years		
	No	Yes	Considered	No	Yes	Considered
Increased your irrigated area	☐	☐	☐	☐	☐	☐
Decreased your irrigated area	☐	☐	☐	☐	☐	☐
Changed your irrigated production (e.g. the mix of crops, varieties grown etc)	☐	☐	☐	☐	☐	☐
Purchased any farm land	☐	☐	☐	☐	☐	☐
Sold any farm land	☐	☐	☐	☐	☐	☐
Improved the efficiency of your irrigation infrastructure	☐	☐	☐	☐	☐	☐

13. How did you change your business practices or business structure to manage the recent drought period? (e.g. decreased staff, increased non-irrigated production, more off-farm income etc.)

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14. Which has the biggest impact on your farm bottom-line: cotton price or cotton production? How do you manage fluctuating prices and production in your farm business?

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15. Are you planning for reduced water availability over the next 5 years? Yes / No

16. How would you rate your ability to adapt to future reduced water availability?

1	2	3	4	5
No more room to move	Only risky or costly options left	A few options left, but less significant outcomes	Will continue recent adaptations	Many other options available

17. If water availability was reduced by 10, 25 or 50% next year, would you take any of the following actions? (please tick)

	Reduction of water availability			
Action	**10%**	**25%**	**50%**	**Not relevant**
Increase borrowings	☐	☐	☐	☐
Sell business assets	☐	☐	☐	☐
Sell private assets	☐	☐	☐	☐
Seek other business income	☐	☐	☐	☐
Seek other/more employment: for self	☐	☐	☐	☐
: for spouse	☐	☐	☐	☐
Reduce on-farm labour requirements	☐	☐	☐	☐
Control costs by other means eg.....	☐	☐	☐	☐
Decrease plantings	☐	☐	☐	☐
Change crop mix	☐	☐	☐	☐
Sell water entitlements	☐	☐	☐	☐
Leave farming	☐	☐	☐	☐
Leave community	☐	☐	☐	☐

Comments

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18. Conversely, if water availability was increased by 10, 25 or 50% next year, would you take any of the following actions? (please tick)

	Increase in water availability			
Action	**10%**	**25%**	**50%**	**Not relevant**
Increase borrowings for expansion	☐	☐	☐	☐
Repay debt	☐	☐	☐	☐
Buy business assets	☐	☐	☐	☐
Buy private assets	☐	☐	☐	☐
Seek other business income	☐	☐	☐	☐
Less other employment: for self	☐	☐	☐	☐
: for spouse	☐	☐	☐	☐
Increase on-farm labour	☐	☐	☐	☐
Increase plantings	☐	☐	☐	☐
Change crop mix	☐	☐	☐	☐
Sell water entitlements	☐	☐	☐	☐
Buy water entitlements	☐	☐	☐	☐
Leave farming	☐	☐	☐	☐
Leave community	☐	☐	☐	☐

Comments

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19. What do you see as the future of the St George farming district? Is it a viable community? Why or why not? Do you see yourself or your family farming here in 10 or more years?

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