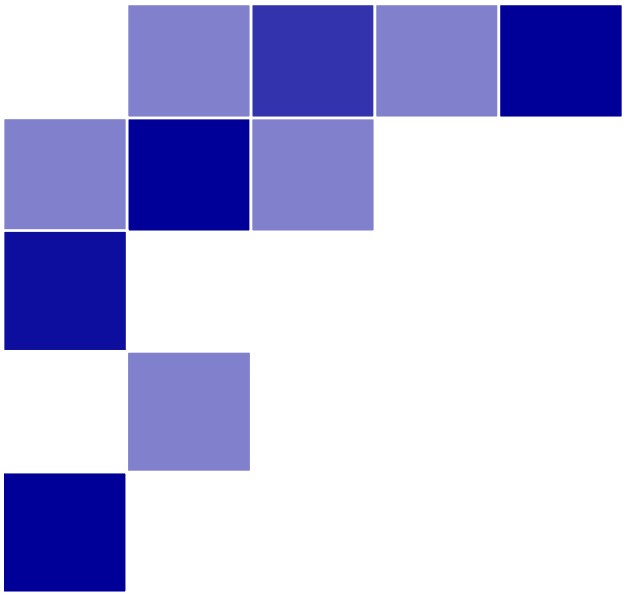
Review of the Singleton Horticulture Project's water entitlement provision costs, benefits and employment impacts.



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Research report prepared for
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Executive Summary

The Singleton Horticulture Project (henceforth 'Singleton') proposed south of Tennant Creek in the Northern Territory by Fortune Agribusiness has published a business case outline in publicly available form. The case outlines an ambition to develop 3,500 hectares of 'high value irrigated horticulture', primarily comprised of permanent crops (e.g. mandarins, grapes, avocados) with the remainder as annual horticulture (e.g. melons, onions and fodder). **To support the development, the Northern Territory Government has agreed to provide an entitlement to 40,000 megalitres of groundwater to be drawn annually for 30 years, free of charge.**

Whilst, the proponents have put forward a business case, it is short on publicly available detail. Additional rigour would be required to validate the claims in that business case that very large regional economic and employment benefits will result. This review challenges the business case and implicit assumptions that the project would provide net benefit to the NT by applying "reference case" analysis, (reference to similar past and ongoing projects) to realistically forecast potential performance of Singleton with respect to outcomes that count for the NT. The objectives are to:

1. Assesses the true economic costs of Singleton by considering the value of natural resources (namely water) that are currently not included in the business case for this project. This publicly owned asset has been allocated at no charge to Singleton.
2. Considers assumptions around employment and value generation for Singleton using data on agricultural employment and real-world business performance statistics from similar projects/cases.
3. Describe a range of other economic, social, environmental, and cultural impacts that may be substantial but are not considered within the Singleton business case.

Summary of findings

The key findings with respect to the Singleton business case are that:

1. The business case includes a large, unstated, subsidy in the form of a transfer of water owned by the NT public to Fortune Agribusiness, with a value of between $70 million to more than $300 million.

2. The economic benefit claims by Singleton seem overstated compared with reported industry performance in similar enterprises, especially when likely local and NT as opposed to outside of NT distribution of benefit is considered. The nature of this overstatement relative to best available real world reference data is summarised in the table below.

Economic benefit from Singleton.	**Claims made by Fortune Agribusiness and NT Government**	**Findings from our analysis.**
Value of the water entitlement.	Provided free of charge by the NT Government.	The entitlement is worth between $70 million and over $300 million.
Employment for local communities and Northern Territory residents.	110 permanent jobs and 1350 seasonal jobs, with opportunities for local employment.	A large proportion of NT agricultural jobs go to overseas workers and interstate fly-ins. Seasonal jobs are only available for short contracts over a few weeks or months. We estimate that only 26-36 full time equivalent jobs will likely be filled by residents of the Northern Territory, of which only 5-8 full-time equivalent jobs are expected to be from proximate Aboriginal communities in the Barkly region.
Economic activity through operating expenditures.	$110 million a year, much of this spent within the Northern Territory.	Operating costs appear to be inflated by between 10%-35%. The true expenditure figure is likely to be only between $70-$100 million per year, of which only $13-$28 million is expected to be spent in the Northern Territory.

The proposed project is also likely to generate large social and ecological costs that will result from substantial impacts on other users of the resources including groundwater-dependent ecosystems. Yet, social or environmental costs have not been accounted for in any publicly available Singleton business case reporting.

We conclude that the gift of water, valued at between $70 million and more than $300 million, from the NT public to a private enterprise headquartered outside of the NT is extraordinary. Especially given the lack of detail on the case for this transfer, and the potential for major social and environmental impacts associated with this water allocation. There is no evidence of a clear social benefit-cost analysis to justify a transfer of such value from the public to a private enterprise. Indeed, considering that as few as 26-36 full time equivalent jobs could be filled by Northern Territory residents and only $13-$26 million per year will be spent within the Northern Territory, if performance is similar to reference projects, the public value of this project appears to be highly questionable.

Also concerning is that, despite the NT Government's stated focus on development processes that are inclusive of Aboriginal people and communities, the Singleton project approval process has provided no substantive opportunity for Aboriginal communities with a clear stake in this project to participate in the water allocation decisions related to Singleton.

Recommendations

This review raises serious concerns about the process of approving water entitlements in the NT. A lack of publicly available information demonstrating thorough and creditable assessment of project benefits and costs suggests that the Northern Territory Government (NTG) is unlikely to have robustly assessed the high social and economic costs involved in the Singleton water entitlement or the return on the large gift of publicly owned water. In the absence of publicly available assessment demonstrating otherwise, we can only conclude that the NT Government appears to have decided to gift a public asset worth between $70 and more than $300 million for a project likely to create very limited NT employment and likely adverse impacts on the social and economic wellbeing of Aboriginal traditional owners, residents of neighbouring remote communities and the environment.

The main recommendation arising is that the NT Government should reform the processes of water entitlement application review, evaluation and charging. A revised process backed by legislation and regulatory frameworks should:

a) Require Commonwealth and State water infrastructure and dam investments and private proponent proposals for water allocations such as the Singleton water allocation to include an independent and peer-reviewed social benefit cost analysis process;

c) Strengthen processes and policy that support Aboriginal participation in water entitlement applications in order to make resource allocation decisions that are consistent with Aboriginal cultural practices, cultural values protection, and employment and development objectives; and

d) Introduce an appropriate charging regime for transfer of public water assets to private interests.

About this report

The Central Land Council (CLC) is a Commonwealth corporate entity established under the *Aboriginal Land Rights (Northern Territory) Act 1976* (ALRA). It is also a native title representative body under the *Native Title Act 1993*. It is led by a representative body of 90 Aboriginal people elected from communities in the southern half of the Northern Territory, which covers almost 777,000 square kilometres and has as Aboriginal population of more than 24,000.

The CLC has statutory responsibilities to ascertain, represent, and protect the rights and interests of Aboriginal people living in the CLC region. It also has specific statutory functions with respect to Aboriginal land. One of the CLC's central roles is to protect the interests of Aboriginal people with an interest in Aboriginal land, by assisting constituents to make land claims, negotiate agreements with third parties, protect sacred sites and use land and other financial resources for the benefit of their communities. Many Indigenous communities and outstations are located on Aboriginal land owned under the ALRA, and thus the CLC had a direct interest in, and responsibility for, the administration of land in those communities and outstations.

In addition to these functions, the CLC administers a range of programs for the benefit of constituents in relation to environmental management, community development, governance, cultural heritage, and customary practices. The CLC also plays a strong role in advocating for the interests of our constituents, the majority of which reside in remote communities.

The CLC, on behalf of local traditional owners and native title groups, requested a team of economists led by University of South Australia Business School Professor Jeff Connor to review the economic case put forward by Fortune Agribusiness in their Singleton Water Licence application for a 3500 hectare irrigation development south of Tennant Creek in the NT.

1. Introduction

The Singleton Horticulture Project proposed by Fortune Agribusiness on Singleton pastoral station south of Tennant Creek in the Northern Territory has published a business case in publicly available form. The case outlines an ambition to develop 3,500 hectares of 'high value irrigated horticulture', primarily comprised of permanent crops (e.g. mandarins, grapes, avocados) with the remainder as annual horticulture (e.g. melons, onions and fodder). **To support the development, the Northern Territory Government has agreed to provide an entitlement to 40,000 megalitres of groundwater to be drawn annually for 30 years, free of charge.**

The proponent's business case, whilst short on publicly available detail, claims that very large regional economic and employment benefits will result. Good governance would require transparent review of costs, and benefits from the perspective of the NT public including accounting for large implicit subsidy and high costs from groundwater level decline.

Taking a public good benefit cost perspective the analysis considers the costs and benefits likely to accrue to the people of the Northern Territory who will implicitly subsidise the project. This review applies a "reference class analysis" approach where performance of documented similar projects is used to estimate performance, cost and benefit assumptions.[1] The approach is particularly important in evaluation of large irrigation and water resource projects because it can correct for the enduring optimism bias around performance and costs typical in large project evaluations.[2]

[1] Ansar, A., Flyvbjerg, B., Budzier, A., Lunn, D., 2014. Should we build more large dams? The actual costs of hydropower megaproject development. Energy policy 69, 43-56. Flyvbjerg, B., Bester, D.W., 2021. The cost-benefit fallacy: Why cost-benefit analysis is broken and how to fix it. Journal of Benefit-Cost Analysis 12, 395-419.

[2] Higginbottom, T.P., Adhikari, R., Dimova, R., Redicker, S., Foster, T., 2021. Performance of large-scale irrigation projects in sub-Saharan Africa. Nature Sustainability 4, 501-508. Petheram, C., McMahon, T., 2019. Dams, dam costs and damnable cost overruns. Journal of Hydrology X 3, 100026.

Objectives

The objective of this review was to test assumptions about benefits and costs in the Singleton business case published by Fortune Agribusiness (henceforth 'the Singleton Project Report') against published data on comparable projects and contexts with a view to:

i. Consider the validity of business case assumptions and the case for possible adjustments to more accurately reflect experience with projects facing similar circumstances to Singleton.
ii. Consider implicit assumptions about subsidy, true economic costs and values at risk for the NT from the Singleton proposal that are not stated in the Singleton business case.
iii. Provide a recalibration of the skeletal business case detail made publicly available for Singleton including evaluation of distribution of benefits and costs within and outside of the NT using data on actual outcomes from a range of cases that are comparable in at least one dimension to Singleton.

Three key aspects of the business case from the NT public perspective examined analysis were:

1. The value of natural resources (namely water) that are currently not included in the business case or charged to the project proponent and yet should be counted as cost to the citizens of the NT.
2. Assumptions about employment and value generation from Singleton for the NT. These are tested with data on agricultural employment and business performance statistics from similar projects/cases.
3. The range of other economic, social, environmental, and cultural impacts that are likely substantial, but are not considered in the Singleton business case.

Report structure

The report begins (Section 2) with a brief review of key facts that can be discerned from the publicly available Singleton business case reporting. Section 3 provides an analysis of the value of water provided to Singleton. Section 4 considers explicit and implicit assumptions in the Singleton business case and how calibration using reference case analysis leads to different conclusions about outcomes. Additional economic, environmental and social values that are

likely to be impacted upon by Singleton but could not be quantified in dollar terms in this study are provided in Section 5. Finally, a brief set of conclusions are provided in Section 6.

2. Key facts of the Singleton business case

Key facts underpinning the business case provided publicly by the project proponent and the NT Government are minimal. They state only that:

- Up to 40,000 megalitres of water is proposed to be allocated to the project on a 30 year basis.
    - The groundwater for this project comes from the Lake Surprise Sandstone, Arrinthunga Formation, Chabalowie Formation, and Dulcie Sandstone aquifer types of the Wiso and Georgina basins underlying the Central Plains Management Zone.
    - This allocation of water is, by far, the biggest groundwater allocation license ever given to any development project in the NT.
    - This allocation also represents a very large allocation in comparison to other horticultural operations in Australia.
    - The 30 year period of the lease is three times longer than the normally granted 10 years.
- The proposed area for the development is 3,500 hectares.
    - While irrigation is to be entirely on the Singleton property, water table drawdown from this project is expected to substantially and adversely impact very large areas where groundwater levels will decline. The impacted area extends well beyond the Singleton property boundaries and into the lands of four independent estate groups (the Anerre, Waake-Akwerlpe, Iliyarne and Arlpwe).
    - The drawdown area includes a range of ecologically and culturally significant sites that are likely to be negatively impacted by the project with little hope of recovery if water levels are lowered.

Additionally, the Singleton business case includes assumptions about project costs and employment levels, but it doesn't describe NT based employment including Aboriginal employment expected for nearby communities. Ecological and cultural impacts are mostly ignored in Fortune Agribusiness' own statements. Section 4 provides insights into expectations for these outcomes.

3. The value of water provided for Singleton

Natural water bodies and waterways that have not yet been allocated to individual users, are public assets. The allocation of water owned in common to individual users comes at an opportunity cost (see text box below) to others who are no longer able to access the resource or the benefits that derive from its non-extractive management. In recognising this opportunity cost, unallocated water is typically only made available for individuals through tenders or water markets. Charging for the water ensures that the resource is allocated to the highest value use, with reserve prices set to reflect the opportunity cost to the public of no longer owning the water entitlement.

Opportunity Cost

Opportunity cost is the forgone benefit that would have been derived from an alternative option (that was not actually chosen). To properly evaluate economic costs, the costs and benefits of the next best available option should be compared to a proposed course of action. In many cases, market prices or other equivalent values are used to provide a basis of comparison for the 'next best available option'. Opportunity costs that are positive (i.e. when the alternative option is more valuable) should typically be justified on the basis of other benefits.

3.1. How valuable is the ground water provided to Singleton by the NT public?

The NTG has not undertaken a tender process for the water allocated to Singleton. It allocated Singleton an entitlement to extract up to 40 gigalitres of groundwater *each year* for 30 years from the Central Plains Management Zone. No price has been applied against this water even though a groundwater resource in the arid zone is unlikely to be renewable on any normal economic timeframe. As a comparison, the 40 gigalitres allocated to Singleton is more water than what is consumed in Darwin annually, and over 30 years the project will extract the equivalent of 2.4 times the volume of water contained in Sydney Harbour. **In providing this entitlement free of charge, the NT Government is providing an implicit subsidy to Singleton.**

Whilst there is a lack of a tender process, or water sales data for the NT, the water resource allocated to Singleton can be valued by applying water entitlement market values from other jurisdictions in Australia. A range of potential comparison values can be used. For example, Class 3 SA River Murray (high security) entitlements are traded in a mature water market and are typically used for high value tree crops like those proposed for Singleton. The volume-weighted average price (VWAP)[3] for Class 3 SA River Murray (high security) for the 2020/21 water year was $6,710/megalitres.[4] At this price the entitlement gifted to Singleton implies a subsidy of up to $268 million.

For groundwater systems, water entitlement prices from other states that allocate and trade Great Artesian Basin water represent appropriate proxies for Central Plains Management Zone groundwater resource. Across 466 trades in the Great Artesian Basin groundwater system between 2008 and 2021 the volume weighted average price was $7,878/megalitres.[5] The *minimum* groundwater volume weighted average price across *all* groundwater resources in Queensland over this period was $2,216/megalitres. This includes groundwater resources where secure surface water is also available and is made available for lower value irrigation. At this price, a minimum or lower bound implicit subsidy for groundwater for the Singleton proposal is valued at $89 million for 40GL of high-security groundwater.

The table below summarises the implied values of the groundwater resource made available to Singleton. The table also includes the volume-weighted average price for all water traded in Australia since 2007 (where prices are available), and recent successful bids for unallocated groundwater in the Great Artesian Basin (in Western Queensland).

[3] The volume weighted average price is the average value (dollars per megalitre) of the water traded where each trade is weighted proportionally by the volume of water (in megalitre) involved in the sale. This provides a more accurate representation of the price (i.e. high-volume trades generally attract a 'bulk discount').
[4] Available from the BOM interactive dashboard - http://www.bom.gov.au/water/dashboards/#/water-markets/map
[5] Also available from the BOM interactive dashboard - http://www.bom.gov.au/water/dashboards/#/water-markets/map

Table 1 – Value of entitlements for different water resources across Australia, and implied value for the Singleton Horticulture Project water entitlement

Water resource	Implied value per megalitre of entitlement	Opportunity cost for Singleton Horticulture Project 30-year lease (40 gigalitres)[6]
Price paid by Fortune Agribusiness for Singleton for water entitlement	$0	$0
All water traded in Australia since 2007/08 (where prices are available)	$1,772	$70.89 million
Class 3 SA River Murray (high security) water entitlements (Southern Connected Murray Darling Basin - 2020-21 VWAP)	$6,710	$268.40 million
Recent bids for Great Artesian Basin unallocated water (for horticulture)	$3,001	$120.04 million
Minimum VWAP across all groundwater resources in Queensland since 2007/08 (where prices are available)	$2,216	$88.64 million
Great Artesian Basin groundwater VWAP since 2007/08 (where prices are available)	$7,878	$315.12 million

[6] The Singleton Horticulture Project has been granted a 30-year lease, meaning that values of entitlements in perpetuity might overvalue the lease for Singleton Horticulture Project. However, it is likely that the lease would be renewed after 30 years.

The values in the table are a good indication of the value of the high security groundwater resource provided to Singleton. Using these prices, the opportunity cost of the water entitlement provided to Singleton ranges between $70.89 million and $315.12 million, with evidence to suggest that the value is towards the higher end of this range. **The subsidy provided as unpriced groundwater thus likely represents foregone revenue for the NT public of up to $300 million**. For context, the total major works budget for the 2020-21 NTG Budget in the Barkly Region was $200 million, and after excluding transport infrastructure was only $28.9 million[7]. In addition, the NTG has incurred significant expenses in conducting investigations on water availability and extraction in the region.

4. Comparing Singleton business case assumed costs, benefits and employment impact to reference cases

Singleton estimates a yearly operating cost of $110 million across the 3500 hectares of productive land. It is claimed that this expenditure and development will support 110 permanent staff and up to 1350 seasonal jobs.

4.1. Operating costs of production are likely overstated

Singleton reports that much of the estimated yearly operating cost of $110 million will be spent locally. There is evidence to suggest this is a substantially higher operating cost than similar horticulture systems in Australia. Using standard farm budgets published by Australian state governments, annual operating costs for the proposed crops on Singleton range from approximately $20,000 per hectare for mandarin to $28,500 per-hectare for table grapes. Using these per hectare estimates of operating costs, this would indicate that the total operating costs for 3500 hectares would be in the range of $70 million to $100 million. These values are documented in the table below.

[7] NT Government Budget Barkley fact sheet - https://budget.nt.gov.au/__data/assets/pdf_file/0008/1000412/Barkly.pdf

Table 2 – Estimated operating costs for the crops proposed under the Singleton Horticulture Project

Operating costs	Operating costs/Ha	Operating costs for 3500 Ha	Source
Avocado	$26,065	$91,225,955	Howard Hall and CDI Pinnacle Management Pty Ltd, 2015, *Australian Avocado Benchmarking Program Development*, a report prepared for Horticulture Innovation Australia.
Table grapes	$28,563	$99,971,574	Department of Agriculture and Fisheries (QLD), 1998, *Gross Margin for Table Grapes (inland under trickle irrigation) North QLD*.
Mandarin	$20,090	$70,315,614	Falivene S and Creek A, 2018, *NSW citrus farm budget handbook 2018,* A report prepared for the Department of Primary Industries (NSW).
Onion	$26,220	$91,768,424	Department of Primary Industries (NSW), 2013, *Gross margin budget – Onions.*
Rockmelon	$22,770	$79,694,413	Department of Primary Industries (NSW), 2013, *Gross margin budget – Rockmelon.*
Expected operating costs for Singleton	$24,803	$86,811,141	Based on the expected split of crops - 75% tree crops and 25% annual crops.

Whilst the reported operating costs for Singleton may include additional costs associated with new supply chains and for operating in a remote area, **the data presented above suggests that the operating costs are potentially inflated for the project by between approximately 10%-35%**. There is an absence of documentation on why Singleton expects superior performance to

similar past projects. These higher than 'reference class' cost estimates appear to be an optimistic forecast and thus likely to overestimate the true Singleton project contribution to economic activity and jobs. As this forecast has been used to gain support for the project from investors and the NTG, there have been strong incentives for the project proponent to overstate operating costs and the economic contribution of the project[8]. For example, there is evidence to suggest the royalty-free access of groundwater has been granted due to expectations around permanent and seasonal jobs that will be provided by the project.

Overstating operating costs has implications for the true distribution of benefits from the project. Holding revenue constant, lower actual operating costs would result in higher profits for Singleton. This would result in fewer jobs and benefits for the local community, and instead increase the profits and returns for interstate and overseas investors.

4.2. The majority of non-labour operating costs will not be spent in the Barkly region or in the NT

There is further evidence to suggest that a large proportion of non-labour operating costs will not be spent locally, and instead will be spent interstate or overseas. Using the same state government farm budgets from

Table 2, we are able to disaggregate operating costs for the different crops proposed for Singleton. For each crop, the annual operating costs per hectare are disaggregated between different categories of farm expenses and are summarised in *table 3*.

Large agribusinesses typically do not use local providers for non-labour inputs as local providers do not have the capacity to provide for production of this scale. While the Singleton business case provides no detail on how their operating costs have been calculated, for each cost item it is possible to make highly plausible assumptions about whether each cost will involve spending within the NT or more likely involve spending interstate and overseas:

[8] Denicol, J., Davies, A., Krystallis, I., 2020. What are the causes and cures of poor megaproject performance? A systematic literature review and research agenda. Project Management Journal 51, 328-345. Higginbottom, T.P., Adhikari, R., Dimova, R., Redicker, S., Foster, T., 2021. Performance of large-scale irrigation projects in sub-Saharan Africa. Nature Sustainability 4, 501-508.

- Fertiliser, chemical and packaging materials are typically sourced from interstate and overseas providers for large horticulture businesses.
- Fortune Agribusiness propose to use intermediaries for distribution. Expenditure for these intermediaries will primarily be in interstate and overseas export markets.
- Services such as administration and marketing are likely to be conducted at Fortune Agribusiness' head offices outside of the region, or through external providers in key domestic and overseas markets.
- It is assumed that the majority of freight, nursery, fuel, and electricity inputs will be spent in the NT although these are also likely to be largely sourced from interstate. For example fuel for a project the size of Singleton is more likely to be bought in bulk with dedicated tankers from bulk fuel sellers (interstate). Similarly, freight may be provided by interstate freight companies.

Table 3 – Operating costs per hectare for proposed crops (detailed breakdown)

Operating costs/Ha	Avocado	Table grapes	Mandarin	Onion	Rockmelon
Seeds and nursery inputs	$0 (0%)	$0 (0%)	$0 (0%)	$1,563 (6.0%)	$1,463 (5.6%)
Fertiliser and chemical inputs	$2,220 (8.5%)	$4,146 (15.9%)	$2,277 (8.7%)	$2,212 (8.5%)	$1,911 (7.3%)
Fuel & electricity	$585 (2.2%)	$0 (0%)	$0 (0%)	$719 (2.8%)	$480 (1.8%)
Water (pumping and treatment)	$0 (0%)	$0 (0%)	$554 (2.1%)	$334 (1.3%)	$267 (1.0%)
Fixed labour inputs	$7,488 (28.7%)	$3,449 (13.2%)	$3,985 (15.3%)	$645 (2.5%)	$970 (3.7%)
Seasonal labour inputs	$246 (9.5%)	$4,084 (15.7%)	$5,736 (22.0%)	$8,931 (34.3%)	$2,646 (10.2%)
Packaging materials	$3,004 (11.5%)	$2,360 (9.1%)	$836 (3.2%)	$1,004 (3.9%)	$4,521 (17.3%)
Freight	$2,514 (11.5%)	$7,261 (27.9%)	$4,079 (15.7%)	$5,359 (20.6%)	$4,127 (15.8%)
Other costs - marketing, admin etc.)	$7,785 (29.9%)	$7,261 (27.9%)	$2,620 (10.1%)	$5,448 (20.9%)	$6,381 (24.5%)
Total non-labour costs per Ha	**$18,331 (61.9%)**	**$21,030 (73.6%)**	**$10,370 (51.6%)**	**$16,644 (63.5%)**	**$19,154 (84.1%)**
Total labour costs per Ha	**$7,734 (38.1%)**	**$7,533 (26.4%)**	**$9,720 (48.4%)**	**$9,576 (36.5%)**	**$3,616 (15.9%)**
Total operating costs per Ha	**$26,065**	**$28,563**	**$20,090**	**$26,220**	**$22,770**

Table 4 provides a summary of the percentage of non-labour costs likely to generate activity in that NT or interstate/overseas. Depending on the final mix of crop types, Singleton will likely only spend between 19-45% of total non-labour costs in the NT. **Assuming an operating cost of $110 million a year, best available information suggests that in total only $13-28 million a year will be spent in the NT for non-labour inputs.**

Table 4 – Distribution of non-labour operating costs

Non labour costs	**Location majority of cost item likely to be spent**	**Percentage of non-labour operating costs**
Seeds and nursery inputs	Northern Territory	0% - 9.4%
Fertiliser and chemical inputs	Interstate and overseas	10.0% – 22.0%
Fuel & electricity	Northern Territory	0% - 4.3%
Water (pumping and treatment)	Northern Territory	0% - 5.4%
Packaging materials	Interstate and overseas	6.0% - 23.6%
Freight	Northern Territory	15.6% - 39.3%
Other costs - marketing, distribution, admin etc.)	Interstate and overseas	25.3% - 48.3%
Proportion of non-labour costs spent locally in the NT		**19-45%**
Proportion of non-labour costs spent interstate or overseas.		**55-81%**

4.3. Employment opportunities for NT residents

Singleton proponents claim the project will support 110 permanent jobs and up to 1350 seasonal jobs when at full production capacity. This employment relates to the primary production of horticultural products, with additional employment to support the labour force, freight, and administration. Much like the non-labour inputs costs, it is likely that a majority of labour costs and employment opportunities will not be available for the NT population overall, less so for Barkly region towns and Aboriginal communities.

A report by Ernst and Young[9] estimates labour shortages of over 25% during the high intensity harvest periods across Australia. These labour shortages are more severe in remote locations where living conditions are less attractive, where there is time-sensitive harvest, and harvest conditions are hotter. Larger producers in remote regions, such as Singleton, typically rely on overseas or interstate workers through labour hire companies as working holiday workers and Australian residents prefer locations closer to larger towns and cities.

The NT Farmers Association reported that in 2019 only 11% of total horticultural labour was supplied locally. Overseas workers represented 63% of total labour, particularly during the harvest season, and the remaining 28% was supplied from interstate workers.[10] Many producers find it difficult to attract Australian workers due to the seasonal nature of the roles offered, remote locations and lack of contract security. Evidence of this can be seen on mango plantations in the NT, where producers report nearly no local seasonal workers[11].

The above evidence raises serious doubts about the true employment impacts of Singleton for the NT and Barkly region economy. Given the significant labour shortages for horticulture in Australia, it is likely that a large proportion of the permanent and seasonal work will be from overseas or interstate. Seasonal workers will most likely be sourced from the existing pool of

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[9] Ernst and Young, 2020, Seasonal horticulture labour demand and workforce study, a report prepared for Horticulture Innovation Australia, https://ausveg.com.au/app/uploads/2020/10/20200928_Hort-Innovation_Workforce-study_Final-Report_Public-Extract_vF2.pdf

[10] NT Farmers Association, 2019, *NT Plant Industries Workforce Development Plan 2020-25*, https://ntrebound.nt.gov.au/__data/assets/pdf_file/0003/930027/5.-NT-Farmers-WorkforceDevelopmentPlan2020_Final_Small-compressed.pdf

[11] Ernst and Young, 2020, Seasonal horticulture labour demand and workforce study, a report prepared for Horticulture Innovation Australia, https://ausveg.com.au/app/uploads/2020/10/20200928_Hort-Innovation_Workforce-study_Final-Report_Public-Extract_vF2.pdf

employed seasonal workers in the NT economy. In the absence of Singleton, these workers would find alternative opportunities in the NT or elsewhere.

Using the farm budget information in *table 5*, we are able to derive expected labour costs for permanent and seasonal staff and derive our own estimates of employment for the project consistent with actual experience with similar businesses. To compare permanent jobs with seasonal jobs, we adjust seasonal jobs to *full time equivalents* (FTEs). Given Singleton expects 1350 seasonal workers to be used across the 3500 hectares, we calculate from the labour costs in the farm budgets that the average term of employment for these 1350 seasonal workers is 8.8 weeks. As each FTE involves 46 weeks of employment, we can expect only around 258 FTE jobs from seasonal work. This is in addition to the 110 FTE jobs for permanent positions in the Singleton Business case.

Table 5 – Estimated FTEs from the Singleton Horticulture Project

Calculation	Figure	Method and source
Estimated total seasonal labour cost per ha	$4,519	Farm budgets from Table X, based on the expected split of crops - 75% tree crops and 25% annual crops
Estimated seasonal labour cost for 3500 Ha	$15,816,742	Cost per Ha multiplied by 3500 Ha
Expected number of seasonal labour days for 3500 Ha	59,617 days	Total cost for seasonal work, divided by the minimum daily wage for seasonal work in NT (with 30% on-costs)
Expected number of labour days per worker	44 days	Number of labour days, divided by the 1350 seasonal workers expected by Fortune Agribusiness
Expected number of labour weeks for seasonal worker	8.8 weeks	Number of labour days divided by 5 working days a week
Expected number of FTEs from seasonal work	258 FTEs	1350 seasonal workers, working on average 8.8 weeks a year.
Expected number of FTEs for permanent positions	110 FTEs	Expected number of permanent positions by Fortune Agribusiness
Expected number of FTEs filled from the local population	41 FTEs	368 total season and permanent FTEs, multiplied by 11% (percentage local employees as reported by NT Farmers Association, 2019)
Expected number of FTEs filled by local Aboriginal people	8-9 FTEs	21% of local FTEs (from proportion in the Ord River Irrigation Project – WA Auditor General 2016)

When considering that only 11% of those employed in horticulture are NT residents, we can expect a total NT employment outcome of only 41 FTE jobs (including seasonal workers). Also important is the number of people employed from Barkly region Aboriginal Communities. For an appropriate benchmark we can use the total Aboriginal employment outcomes from the Ord River Irrigation Scheme near Kununurra, WA. Kununurra has a similar proportion of Aboriginal people as the Barkly region in NT, where the WA Auditor General found that 21% of Ord irrigation project labour was provided by Aboriginal people in the initial stages of irrigation development and production.[12] Assuming this proportion for Singleton, we can expect, optimistically, only around 8-9 FTE jobs to be available for the local Aboriginal communities. **Taking into account the apparent over-statement of operating costs of 10-35% and assuming a similar overstatement of labour demand (Section 4.1), the total employment of NT residents could be as little as 26-36 FTE jobs and as few as 5-8 full-time equivalent jobs for local Aboriginal people.**

4.4. Economic and employment benefits have been limited in other horticultural projects

The promised employment outcomes of Singleton have strong parallels with other major irrigation projects in Northern Australia. The most notable of these is the Ord River Irrigation Scheme. The WA Auditor General reported that employment relating to the recent Ord River Irrigation Scheme expansion was 61 people plus 10–15 seasonal workers.[13] This was for an additional 1,600 hectares of irrigated crops and was substantially fewer jobs than what was expected. More details on Ord River Irrigation Scheme are provided in Box 1.

Box 1 – Ord River Irrigation Expansion Project

The Ord River Irrigation Expansion Project is a large scale, publicly funded development that has sought to develop irrigated land for intensive horticulture. The first stage of the Ord River Irrigation Area was completed in 1971 and services 14,000 hectares of farming land. In 2011 the WA and Commonwealth Government committed $220 million to the Ord River Irrigation Expansion project to:

[12] WA Auditor General, 2016, *Ord-East Kimberley Development*, https://audit.wa.gov.au/reports-and-publications/reports/ord-east-kimberley-development/auditor-generals-overview/
[13] Ibid

- deliver water and road infrastructure to service about 8,000 hectares of land at Goomig
- subdivide and sell off the 8,000 hectares in up to 25 lots.
- scope for land at Mantinea (4,000 hectares), Ord West Bank (1,300 hectares) and Packsaddle (1,380 hectares), and work to consider land at Knox (8,000 hectares), Victoria Highway, Carlton Hill, Bonaparte Plain and the Keep River Plain (NT).

The economic case for Ord River and its later expansions have been debated for decades. The consensus is that while the irrigation has provided some economic benefits for the local community, the costs of the scheme have far outweighed the benefits. Kununurra comes closest to being a town created and sustained by a remote irrigation scheme in Australia, but its growth appears to have relied more on tourism and mining than agriculture.[14]

In 2015 The Western Australian Office of the Auditor General reviewed the Ord River Project. The review found that:

- The original time and cost to deliver the irrigation expansion was unrealistic. This was due to severe underestimation of the time and investment needed to develop the irrigated land.
- A result of this was significantly less land under crop than what was previously planned at the time of the review. Although the area with irrigated crops has increased since, governance and economic constraints still exist for irrigators.[15]
- Whilst employment for the local population increased during the development stages, total employment relating to the expansion since dropped to 61 people plus 10–15 seasonal workers. This number is substantially fewer than what was expected at this stage of the scheme expansion.

[14] Wittwer G and Banerjee O, 2014, *Investing in irrigation development in North West Queensland, Australia*, Australian Journal of Agricultural and Resource Economics, 59, pp. 189–207

[15] For example, see Australian Broadcasting Corporation, June 21 2019, *Ord River irrigators say bureaucracy stifling agricultural development in WA's far north*, Available from - https://www.abc.net.au/news/rural/2019-06-21/ord-river-irrigators-red-tape-stifling-agricultural-development/11222494

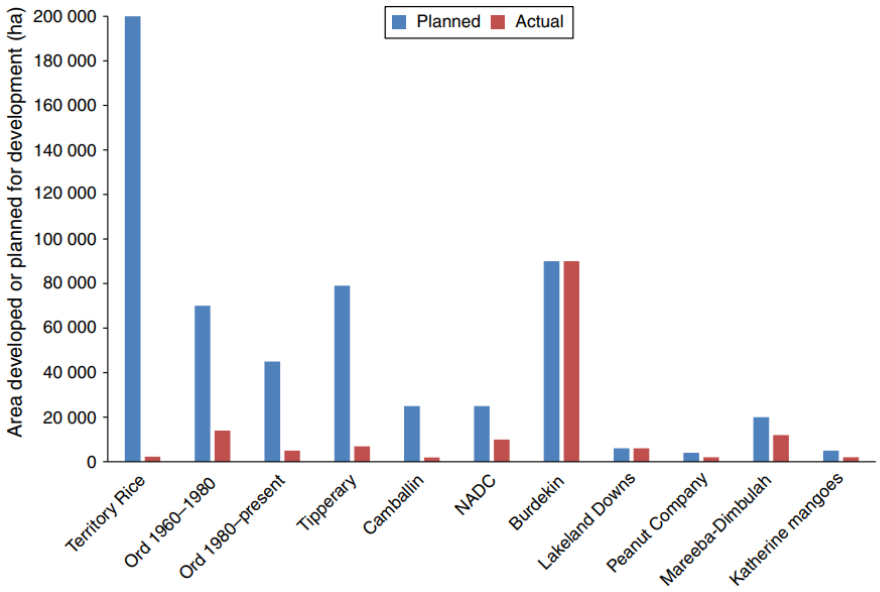
There have been several economic evaluations of irrigated developments in Northern Australia undertaken by the academic community. The consensus conclusion from this literature is that while agricultural production can be feasible from a technical perspective, significant economic and social barriers have often prevented large scale developments from being viable and providing welfare benefits for local communities.

For example, Wittwer and Banerjee[16] undertook a computable general equilibrium model of horticulture development in remote NW Queensland. They found that the irrigation development provided welfare losses for the Queensland community, even under different climate change, productivity, and demand scenarios. They concluded that there is limited evidence to suggest that irrigated agriculture has provided local jobs or made a substantial contribution to regional development.

In 2018, the CSIRO analysed a number of agricultural development schemes in Northern Australia.[17] The study found that nearly all large-scale developments have faced significant challenges in scaling up and providing the promised economic outcomes. A common factor across the schemes was the significant underestimation of the time required to expand irrigated production, and a lack of appreciation of input and output markets. Financial plans tended to overestimate early production, returns on capital and economies of scale. This typically resulted in severe cash flow problems for developers. **As a consequence, the areas of development and welfare outcomes for local communities were usually much less than the original expectations. Overstatement of the gains from private capture of public resources appears to be a common feature of large development projects in Northern Australia.** This can be seen in *Figure 1* from the CSIRO report, which contrasts the proposed area of development against the area actually developed.[18]

[16] Wittwer G and Banerjee O, 2014, *Investing in irrigation development in North West Queensland*, Australia, Australian Journal of Agricultural and Resource Economics, 59, pp. 189–207
[17] Ash A and Watson I, 2018, *Developing the north: learning from the past to guide future plans and policies*, The Rangeland Journal, 40, 301–314
[18] Ibid, pg. 310

Figure 1 - Areas (ha) of land planned for development, and actually developed



5. Environmental and cultural values

Whilst the proposed water extraction zone (development wells / bores) is located on the Singleton pastoral lease, the groundwater drawdown from the bores is expected to impact an area several orders of magnitude larger. Even the hydrology assessment by Fortune Agribusiness suggests that a drawdown area with a diameter in the order of 50 km will extend well beyond the water extraction points themselves to impact large areas of the lands of four Kaytetye speaking groups (Anerre, Waake-Akwerlpe, Iliyarne and Arlpwe). 23 additional Aboriginal groups across the broader Western Davenport District also hold kinship and ritual ties to the groups with traditional lands in the drawdown area.

5.1. Unquantified environmental values

A comprehensive cultural values assessment undertaken by anthropologist Susan Donaldson on behalf of Aboriginal land owners found that "if the current proposal reduces groundwater, there is the potential for the proposal to adversely impact GDE species and places which traditional Owners rely on for sustenance, gaining goods and other items."[19] The assessment found that,

[19] Dale-Donaldson, Susan (2021) *Singleton Water Licence Aboriginal Cultural Values Assessment*, PUBLIC REPORT TO THE CENTRAL LAND COUNCIL, 1 September 2021. p 77

many Kaytetye rituals require specific flora and fauna species that are currently obtained across the drawdown area but could be at risk of disappearing with the planned drawdown. These potential changes concern the current generation of Traditional Owners, they fear the consequences of not following their ancient Law. The extraction and drawdown areas have been identified as prime hunting ground by Traditional Owners. A vast array of flora and fauna species utilised by Traditional Owners were documented during this assessment, many of which depend on groundwater.[20]

5.2. A lack of consideration of cultural values

The Wakurlpa and Alekarenge communities in particular use their 'back yard', within the drawdown area, to collect natural resources. Hunting and collecting "are vital to the maintenance of good mental, physical and spiritual health for Aboriginal people and an important way to transmit cultural knowledge and practices to younger generations."[21]

Conceptually, economic measures of cost could be developed for the broad array of potential damages to cultural values, including costs of:

- emotional and physical responses;
- damage to sacred sites;
- reduction in species required for ritual activity;
- diminishing natural resources required for hunting, gathering and other activities;
- a loss for future generations of Kaytetye people; and
- a decline in the ability to live on and travel on the land.

While the work required to creditably assign economic values to such damages are beyond the scope of what is possible for this study, there is no good reason, a priori, to believe that they wouldn't involve values of similar or larger magnitude to direct benefits expected from irrigated production.

[20] Ibid, p. 80
[21] Ibid, p. 43

Further, significant losses of environmental values, that are in addition to cultural value losses, are likely as a result of groundwater table decline associated with Singleton. One potentially very large loss would be damaged potential to store carbon in perennial vegetation biomass, roots and soil. While this potential cost has not been assessed, the scientific basis for such assessment is available and considerable evidence demonstrates that once the groundwater level declines below key threshold levels, high carbon storage potential trees don't survive and potential for storage of hundreds to thousands of tonnes of carbon storage in biomass, roots and soil per hectare is lost[22]. Again, methods to value the cost to the Australian people and the Government in terms of increased costs compliance to meet Commonwealth emissions targets are available. **While the work required for such valuation is beyond the scope of this report, there is no reason, a priori, to believe that such cost might not be similar or greater than the direct benefits from horticultural production that the project would create.**

5.3. The process of approval of the Singleton Horticulture Project appears to be in contradiction to the NTGs own policy statements on Aboriginal development and inclusion

One common view expressed by traditional owners is that the drawdown that Singleton will cause will preclude fulfilling obligations required by Altyerre (Dreaming) law. The need to follow this law is a core of cultural identity and represents a failure to meet cultural obligations, even if the failure is a result of actions by others. This failure has severe consequences for traditional owners: "Taking care of country into the future according to ancient laws and customs appeases the creator spirits residing at important places. If traditional roles and responsibilities are not carried out by traditional owners, and if country is damaged as a result of the actions of traditional owners or others, punishment is imposed on senior traditional owners by Altyerre forces resulting in sickness, injury and even death. Spiritual punishment can lead to psychological stress and guilt linked to people's sense of internal moral failure associated with being responsible for damaging the country belonging to their spiritual ancestors, their actual ancestors, the current generation of kin and their descendants. Social sanctions may also result;

[22] Qiu, J., Zipper, S., Motew, M., Booth, E., Kucharik, C., Loheide, S., 2019. Nonlinear groundwater influence on biophysical indicators of ecosystem services. Nat Sustain 2: 475–483.

traditional owners can be forced into temporary or permanent isolation from their traditional group"[23].

There is no evidence to indicate that the NTG have adequately considered Traditional owners' perspectives despite statements that outline inclusivity as a core procedural element of NT Government decision making with respect to developments:

> *"Developing and strengthening structures [should be undertaken] to ensure the full involvement of Aboriginal and Torres Strait Islander peoples in shared decision making at the national, state and local or regional level and embedding their ownership, responsibility and expertise to close the gap."*
> *Priority Reform statement for the NT Government in their implementation plan for the Closing the Gap program*
> *(https://aboriginalaffairs.nt.gov.au/our-priorities/closing-the-gap)*

More recent policy development platforms, such as the Everyone Together 2019-2029 Strategy published by the NTG (NTG 2019) includes statements that clearly indicate a focus on integrating Aboriginal perspectives into policies about natural resource development, and explicitly placing Aboriginal people at the centre of decision-making:

> *"The NT Government accepts that decisions are best made closer to the communities affected and will lead a regional approach that places Aboriginal people and communities at the centre of decision making." (p7 NTG 2019)*

In addition, in 2008 the NT Government, along with all other states and territories, agreed to the National Water Initiative. Modules supporting the NWI outline a process to ensure "i) inclusion of Indigenous representation in water planning wherever possible; and ii) water plans will incorporate Indigenous social, spiritual and customary objectives and strategies for achieving these objectives wherever they can be developed (COAG 2017, p7).

The allocation of groundwater to Singleton represents incoherency in NT Government policy. Our analysis shows that the NT Government, in approving the Singleton water

[23] Ibid. p.67

licence, has not heeded their own commitments under Closing the Gap nor in the 'Everyone Together 2019-2029 Strategy'.

6. Conclusions

This report sought to consider:

1. the true economic costs of Singleton by considering the value of natural resources (namely water) that is currently not included in the business case for this project;
2. how assumptions around employment and value generation likely from the Singleton change based on data on agricultural employment and business performance statistics from similar projects/cases;
3. the range of other economic, social, environmental, and cultural impacts that may be substantial but are not considered within the Singleton Project Report.

In all cases we find substantial inconsistencies and omissions that indicate a substantial gap between the stated economic benefits of Singleton and those expected to be realised. Specifically, the review above indicates that, in all cases considered, economic benefits have likely been overstated (using reference case comparisons) and major known or potential costs have been omitted.

The key findings with respect to the Singleton business case are that:

1. The business case is critically dependent on an unstated subsidy associated with the transfer of water owned by the NT public to Fortune Agribusiness with a value of between $70 million and $300 million plus.
2. The stated economic benefits of Singleton are overstated:
    a. Operating costs appear to be inflated by between 10-35%.
    b. Local Aboriginal and non-Aboriginal employment levels implied within the project are much smaller than the forecast employment figures. Whilst exact employment outcomes can't be known ahead of project implementation we estimate that in the order of only between 26 and 36 FTE NT based jobs and as few as 5-8 jobs from neighbouring Aboriginal communities are likely if performance is like similar projects.

c. Implied expenditures are likely to be primarily outside of the NT. Our analysis suggests the likely amount to be in the vicinity of $13-28 million a year for non-labour input expenditures will be local if the project proceeds. This compares to an estimated operating cost figure in the Singleton business case of $110 million.

a. The proposed project is likely to generate substantial social and ecological costs that have not been accounted for. The resulting reductions in groundwater levels through extraction can best be considered as unsustainable and will generate substantial impacts on other users and groundwater-dependent ecosystems. The latter are considered to be at high risk.

In addition to these findings, the study identifies a concerning lack of detail around the business case that has led to the NTG approving the water licence for this project. The lack of detail extends to monitoring of environmental and cultural outcomes, and how any provision to curtail rights of withdrawal will be guaranteed should the project fail to substantively deliver on claimed benefits or cause unforeseen harm. It is concerning that there appears to be no formal social benefit cost assessment of the proposed project given the size of the public water resources allocated to this project, publicly-funded efforts to quantify water resources in the area and the potential associated environmental and cultural impacts.