FINAL REPORT:

Grain & Graze Dual Purpose Peanuts

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Acronyms

ADF	Acid Detergent Fiber
APSIM	The Agricultural Production Systems sIMulator
BBIFMAC	Burdekin Bowen Integrated Flood Management Advisory Committee
CAGR	Compound annual growth rate
CP	Crude protein
CQU	Central Queensland University
CRCNA	Cooperative Research Centre for Developing Northern Australia
DM	Dry matter contents
DPI QLD	Department of Primary Industries, QLD
DITT NT	Department of Industry, Tourism and Trade, Northern Territory Government
GMA	Gross Margin Analysis
IFFS	Institute for Future Farming Systems
LEISA	Low external input sustainable agriculture
ME	Metabolizable energy
NDF	Neutral Detergent Fiber
NIR	Near Infra-red
PCA	Peanut company of Australia
RRC	Rockhampton Regional Council
TRAP Services	Technical Reporting and Analytical Services
DPIRD WA	Department of Primary Industries and Regional Development, Western Australia

Project Participants

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- Peanut Company of Australia (PCA) LTD – Large Industry Organisation, QLD 4610
- Queensland Government Department of Agriculture and Fisheries (DAF) – State Government, Stakeholders, QLD 4000
- Northern Territory Department of Industry, Tourism and Trade (NT DITT) – State (Territory) Government, Stakeholders, NT0801
- OKR Pty Ltd as TRAP Services – Individual SME, Stakeholders, QLD 4854
- Burdekin Bowen Integrated Floodplain Management Advisory Committee Inc (BBIFMAC) - Individual SME, Stakeholders, QLD 4807
- CH cotton Growers & Irrigators Ass Inc (CHCG&IA) – Other, Stakeholders, QLD 4720
- RDO Equipment Pty Ltd (Vanderfield) – Individual SME, QLD 4350
- AGFORCE QUEENSLAND FARMERS LTD (AgForce) – Other, QLD 4000
- Rockhampton Regional Council (RRC) - Other (Local Government), QLD 4700
- Central Highlands Development Cooperation Limited (CHDC) - Public company, QLD 4720

Executive Summary

Peanut (Arachis hypogea L.) is a versatile tropical legume adaptable for production in a wide range of farming systems in Northern Australia. Despite agro-ecological potentials, annual domestic production meets only about one third (~20,000 MT), of the current demand (60,000 MT), with increasing dependency on imports. Lower gross margin returns, large transport cost for delivery of the product from farm to centralised peanut processing facilities in Kingaroy in southeast QLD, and diverse range of alternative crops of choices available for the rotation in northern farming systems, have been the underlying barriers for expansion of domestic peanut production required for import substitution. Dual-purpose peanuts (a crop that can be grown both for forage and kernel) is an option for increasing returns to the producers, particularly for that area with higher demands of hay for animal feed. The crop has capacity to produce feed quality biomass that can be harvested during early reproductive stage and allow the regrowth for nut production. This report presents performance of peanut varieties for dual-purpose use, evaluated across northern Australia (Emerald, Home Hill, Tully, Georgetown QLD and Katherine NT) over three years (2022-2024).

Hay yield (In-season biomass) yield ranged 0.425 – 3.307 t/ha, was higher in Georgetown (2.23 t/ha), followed by Katherine (1.68 t/ha), Emerald (1.67 t/ha), Tully (1.17 t/ha) and Home Hill (0.95 t/ha). Among the conventional varieties, Alloway produced higher biomass compared to Kairi, Holt and Tabinga, whereas new breeding line UF75 produced consistently higher yield (0.865-1.310 t/ha) and found suitable for dual purpose crop. Nut in shell yield ranged from 0.439 – 5.370 t/ha, with higher yields in Georgetown (3.854 t/ha), followed by Katherine (3.732 t/ha), Home Hill (2.367 t/ha), Emerald (2.062 t/ha) and low in Tully (1.745 t/ha). Alloway produced higher nut in shell yield (2.793 t/ha), followed by Kairi (2.778 t/ha), Holt (2.596 t/ha) and lowest for Tabinga (1.525 t/ha), whereas new breeding line (UF75) recorded higher yield of 3.229 t/ha (ranged 1.452 - 5.370 t/ha) across all sites in 2023/24, suggesting it as suitable variety for northern Australia. Biomass removal impacted nut grade, reducing the proportion of jumbo but an increase in the proportion of the K1 and K2 nuts. In-season biomass removal reduced the nut in-shell yield by 31% (3.732 vs 2.572 t/ha for uncut and cut treatment), and response varied between the varieties. However, for UF75, the biomass removal did not impact nut in-shell yield, therefore favourable variety for dual-purpose peanut production.

Significant animal feed values exist for peanut biomass (both in-season and after threshing), for peanut shell, low grade peanuts (manufacturing and oil), as well as oil processed cake, and these are very high in crude protein, energy, fibre and mineral contents. However, these are currently not well utilised in animal feeding in Australia but can be very useful for economics of developing dual purpose peanut crops for northern farming systems in Australia. The dual-purpose peanut tested under Graze and grain scenario (crop subjected to grazing after 155 days after planting) also showed the opportunity of growing peanut under pastoral system as up to 2 ton/ha of nut in-shell harvested after grazing the crop by cattle removing about 5 ton/ha of above ground dry matter, demonstrated the option of graze and grain peanut for the pasture/graze system for northern Australia.

Gross margin (GM) analysis for peanut shows smaller or negative return, but the dual-purpose peanut provides positive inputs. Low trial yields and high transport cost are major contributors, hence optimization of agronomic practices that overcome yield barriers and generating feed values for peanut shells in production area to minimize the cost of transport will bring positive results for peanut GM. An on-line GM calculator, developed by this project for dual purpose peanuts, can incorporate farm specific variable cost and return data to generate GM to particular farm, proving a useful decision support tool for dual-purpose peanut producers. Additionally, the dual-purpose peanut trial data have been incorporated for strengthening APSIM modelling for dual-purpose

peanut model for diverse conditions and farming systems. The focus group workshop with community groups in Fitzroy Catchment, e.g. Fitzroy Agricultural Corridor Water Inc., and active engagement with Peanut company of Australia has been productive to map out the pathway for peanut adoption. PCA recognise opportunity for extending dual-purpose peanut in northern Australia (as the new large feed lot development progressing in same regions creating potential demands for dual- purpose peanut). The PCA team members, particularly agronomist currently engaged in active discussion and planning the pathway to adoption. The project validated the results across multiples locations and years, initiating industry interest paving the pathway to adoption. The project intensified communication with PCA Agronomists and growers across major peanut producing regions in QLD Australia, introducing the knowhow about dual purpose peanut. Three new manuscripts (in addition to the two Agronomy conference proceeding), and updates growers guide for dual purpose peanut will allow greater mass communication and publication of research results. On these bases the project is successfully completed.

Introduction

Background of the project

Peanut (Arachis hypogaea L) consumption in Australia is steadily increasing, reached 61356 tons in 2021, resulting in an average per capita consumption of 2.388 kg per person per year. The demand for peanuts has maintained an annual growth rate of 3.6% in Australia since 2014. Australian peanut production in recent years (2021-2024) ranged between 20051 to 31445 tons grown from 4718-7061 ha, results into an industry average yield of 4.25 t/ha (Unpublished data of Wright, G, 2024). Australian peanut production can supply only about 45% of the market demand, leading to a significant gap in the peanut supply and, therefore, an increasing reliance on imports for the domestic market. However, this gap also presents an opportunity for expansion of Australian peanut production, as the sustained and increasing domestic demand offers market opportunities for producers to expand peanut production in Australia by increasing area and yield.

Peanut is a tropical legume, well adapted for production in warmer climates of QLD Australia. The crop can be successfully grown in northern Australia's winter grain, cotton and sugarcane-based farming systems. Peanut is a preferred crop in rotation due to its low production cost, drought and heat tolerance, assured market, and aggressive symbiotic nitrogen fixation and soil amelioration effects for the broadacre farming systems. However, the wide-scale adoption of peanuts as rotation crop for northern farming systems is limited due to lower return to growers, mainly caused by lower yield and higher post-harvest transport costs involved for delivering peanuts (nuts in shell) to centralised processing facilities at Kingaroy, SE QLD.

The major peanut producing areas in Queensland includes South Burnette region for rainfed crop, Bundaberg and Burdekin region for irrigated crop and Tolga region in northern Queensland for strategic irrigated crop. Peanuts produced in northern regions are transported over a greater distance to Kingaroy in Burnette region for centralised processing. Therefore, the burden of transport cost increases for the growers producing the peanut crops farther from Peanut processing plant in Kingaroy.

CRCNA cropping situation analysis identified peanuts as a potential crop for Northern Australia based on its suitability to climate and soil types. Northern Australian farming system also has a larger footprint of beef industry, that demands for high-quality, high-protein forage and feed crops. Dual purpose peanut crop can produce peanut biomass for forage as well as nuts for peanut markets, bridging the gap between cropping and grazing sector across Northern Australia by producing high-value peanut forage/hay for feed market and high-quality nuts for seeds/food markets.

Dual purpose peanuts concurrently deliver two significant harvestable products from same crop: producing nutrient-rich biomass for livestock feed and high-quality kernels (nuts) for human consumption (Makapela & Mapiye, 2021). This approach offers a sustainable solution for maximising outputs from a single crop, effectively addressing economic and environmental challenges within contemporary farming systems. Peanuts are globally acknowledged for their nutritional value as a significant source of protein, oils, amino acids and essential nutrients. However, their secondary output as fodder/forage for livestock is still underexplored for Australian peanut industry. Integration of dual-purpose peanuts into farming system enables farmers to diversify income streams by marketing the seeds for human consumption and utilizing the biomass from different growth stages as feed, making this practically relevant for mixed farming systems prevalent in northern Australia (Smith et al., 2020; Mkwambisi & Maliro, 2019; Firth, 2002).

In Australia, climatic variability presents significant challenges for many agricultural crops; however, peanuts demonstrate a notable adaptability to diverse agro-climatic conditions. Their capacity for nitrogen fixation enhances soil fertility, diminishing reliance on chemical fertilizers (Jones & Brown, 2018; Olorunsanya, et al., 2006). The benefits underpin both economic resilience and environmental sustainability. The foliage and residual biomass of peanut plants are high in proteins and other essential nutrients, rendering them an excellent feed source for livestock (Djokoto & Zigah, 2021; Katundu et al., 2013). Integrating dual purpose peanuts into farming systems can mitigate feed shortages, particularly in northern Australia, where livestock farming is a major component of the economy (Taylor et al., 2019). Furthermore, incorporating legumes, such as peanuts, into crop rotation improves soil fertility, soil health and potentially reduces greenhouse gas emissions, thereby underpinning the climate-smart agricultural practices (Smith et al., 2020).

Dual purpose peanut crop presents a new opportunity for high value cropping in the northern Australia and, at the same time, address the significant feed gaps for the beef industry. This research investigated the potential of dual-purpose peanut using current peanut varieties for tropical farming systems as a rotation crop in grains, cotton and sugarcane systems, along with the potential to supply high-protein hay/forage to the northern beef industry. Additionally, the dual-purpose peanut crops could potentially support the expansion of the peanut industry in Northern Australia, offering wider choices of high value rotation crops for growers.

The dual-purpose peanut (Grain and Graze North) research project (2021-2024) evaluated the feasibility of dual-purpose peanut commercial production through on-farm field trials across Queensland and Northern Territory over 3 years. The ‘Grain and Graze North’ project assessed the performance of different peanut varieties and breeding lines from the Bega-GRDC supported peanut breeding programme for in-season biomass harvest for peanut hay and subsequent peanut in-shell yield for dual purpose peanuts. Different peanut varieties were evaluated for their response to in-season (at flowering when 70% canopy cover occurs) biomass cutting and the subsequent impacts on crop maturity, nut yield and nut grading quality.

The Grain and Graze North research undertook collaborative and participatory research approach across diverse agro-ecological domains in partnership with farmers, the peanut company of Australia (PCA), various community-based organisations, Queensland’s Department of Agriculture and Fisheries (QDAF), the Northern Territory Department of Industry and Tourism (NT DITT), over three years (2021-2024). The key features of the dual-purpose peanuts are:

- Biomass partial cut at 50%-70% canopy cover, from 5-10 cm above the ground, for forage/hay/fodder for livestock, generate early and additional revenue from hay than crop grown solely for nut production.
- Biomass regrowth resumes quickly, with less impacts on the pegging and nuts set, provided there are no impediments for biomass regrowth.
- Nut yields may not be compromised by the early-stage biomass removal provided recovery of growth is not impacted by the factors limiting the crop regrowth.
- Crop biomass (peanut hay) harvested at the early growth stage of the crop has greater feed value and is preferred for animal feeding in northern Australia.
- Dual purpose peanut is essentially an economic decision based on the value of the biomass removal for feed, the degree of regrowth after the cut, and the impact of early-stage biomass removal on the subsequent peanut yield and quality.

Objectives of the project/research questions

This project assessed different peanut varieties as dual-purpose crops for kernel yield in combination with fodder production options in five agro-ecological domains across Northern Australia. The gross margin analysis for dual-purpose peanuts was also carried out for different locations of QLD (Emerald, Home Hill, Tully, Georgetown) and Northern Territory (Katherine, NT) Australia, using the in-season biomass and nut in-shell yield data generated from field trials harvested in 2022, 2023 and 2024 peanut seasons. To that end, the following overarching research questions were addressed in this project:

- What are potential kernel and fodder yields and what is the resulting kernel and fodder quality?
- What are the trade-offs in dual purpose peanuts between kernel yield and quality on one hand, and different fodder options viz. biomass cutting and post-harvest hay on the other?
- What are the most promising traits for dual purpose use of peanuts for Northern Australia?
- How do dual purpose peanuts best fit in tropical farming systems?
- How do the economics of dual peanuts work out in different tropical farming systems?
- What are the best technologies and agronomic management practices for dual purpose peanuts?

The research project undertook three stages approach utilizing a range of commercial and newly developed peanut varieties suitable for tropical farming systems. In stage 1, farmer participatory field experiments were carried out across five agro-ecological zones of Northern Australia. Yield and quality of kernels and biomass was assessed and suitability for fodder options tested. Field trials across different agro-ecological zones in Northern Australia evaluated genotype x environment interactions for biomass and kernel yield and quality of peanuts, the trade-offs with fodder options and the suitability across in existing farming systems. Field trials at Emerald also included initial evaluation trial assessing multiple breeding lines (13) for unravelling favourable traits for dual-purpose peanut in current peanut germplasm. In stage 2, field activities were expanded to include farmer managed verification trials. Stage 3 encompassed commercial scale demonstration trial to showcase full scale agronomic and mechanised operations of biomass cutting, removal, baling and forage quality analysis. Experimental results were used to refine economic analyses to demonstrate the viability of dual-purpose peanut options. Dedicated extension/dissemination activities accompanied by the project contributed to growing industry capacity to support future expansion and engaged stakeholders to map out pathways to adoption. The project extension through field days, webinar, training, growers guide and other relevant publications raised awareness and support to networks of local agronomists, farmer and grazier build the local capacity for future expansion of dual-purpose peanut agronomy support for industry expansion.

Organisation of the report

Section one of the report presented the general introduction including background, objectives and organisation of the summary report. Section two of the report describes the key findings from different studies that addressed each of the research questions/objectives and recommended actions with the focus on 7 key research outputs outlined below and in the project proposal. This is followed by a conclusion and recommendations in Section three.

Output 1: Evaluation and demonstration of dual-purpose potential of three recently developed peanut varieties

Output 2: Assessment of peanut fodder quality in tropical Northern Australia

Output 3: Grower and Grazier guides to support the adoption new peanut varieties into tropical farming systems ('calculator')

Output 4: A network of agronomists (≥6) across Northern Australia trained with the technical knowledge to successfully grow peanut crops

Output 5: A network of farmers and graziers with competence in incorporating peanut production into their farming and grazing systems

Output 6: Scientific publications

Output 7: Dual-purpose peanut calculator

Key Findings and recommendations

Objective 1 What are potential kernel and fodder yields and the resulting kernel and fodder quality?

Key findings

Dual-purpose peanut project field trials planned for three years (2022-2024), over five northern Australian locations, were completed in time. The trials evaluated performance of different peanut varieties for their suitability for dual purpose production. Dual purpose peanut in this project has been defined as peanut crop grown for forage (hay) and nut harvest from a single crop.

Nut in-shell yield ranged from 0.439 – 5.370 t/ha, and the yield was generally higher in Georgetown (3.854 t/ha), followed by Katherine (3.732 t/ha), Home Hill (2.367 t/ha), Emerald (2.062 t/ha) and least in Tully (1.745 t/ha). Peanut variety Alloway in general produced higher nut in-shell yield (2.793 t/ha) compared to Kairai (2.778 t/ha), Holt (2.596 t/ha) and lowest for Tabinga (1.525 t/ha). New peanut breeding line - UF75 recorded an average yield of 3.229 t/ha and ranged between 1.452 - 5.370 t/ha and was higher yielding than other varieties (Alloway and Kairai) across all sites in 2023/24, presenting more favourable and stable nut in- shell yield, suggests for greater suitability of UF75 for northern Australian dual-purpose peanut production (Table 1).

Table 1 Nut in-shell yield (t/ha) of peanut varieties over five northern Australian locations, 2022- 2024

Site	Year	Alloway		Holt		Kairai		Tabinga		UF75		Year Av	
		Cut	Uncut	Cut	Uncut	Cut	Uncut	Cut	Uncut	Cut	Uncut	Cut	Uncut
Emerald	2022	1.715	1.099	3.007	2.120	0.566	0.879	0.582	0.401	3.450	3.600	1.864	1.620
QLD	2023	1.983	2.990			1.423	2.017					1.703	2.503
	2024												
	Site Av	**1.849**	**2.044**	**3.007**	**2.120**	**0.994**	**1.448**	**0.582**	**0.401**	**3.450**	**3.600**	**1.783**	**2.062**
Home Hill	2022	3.088	3.530	3.043	3.243	1.018	2.149					2.383	2.974
QLD	2023	1.191	1.407			1.870	1.801			2.242	2.070	1.768	1.759
	2024												
	Site Av	**2.139**	**2.468**	**3.043**	**3.243**	**1.444**	**1.975**			**2.242**	**2.070**	**2.075**	**2.367**
Tully	2022	0.799	3.089	1.146	2.033	1.040	2.972					0.995	2.698
QLD	2023	0.275	1.787			0.162	1.335					0.219	1.561
	2024	0.242	0.498							2.053	1.452	1.147	0.975
	Site Av	**0.439**	**1.791**	**1.146**	**2.033**	**0.601**	**2.154**			**2.053**	**1.452**	**0.787**	**1.745**
Georgetown	2022	3.387	4.850	2.107	3.936	4.003	4.780					3.165	4.522
QLD	2023												
	2024	1.837	2.735							2.849	3.657	2.343	3.196
	Site Av	**2.612**	**3.792**	**2.107**	**3.936**	**4.003**	**4.780**			**2.849**	**3.657**	**2.754**	**3.859**
Katherine	2022	1.107	1.813	1.063	1.649	1.051	1.703					1.074	1.722
NT	2023	4.158	4.715			3.473	5.363	1.514	2.650			3.048	4.243
	2024	2.865	5.095							4.327	5.370	3.596	5.233
	Site Av	**2.710**	**3.874**	**1.063**	**1.649**	**2.262**	**3.533**	**1.514**	**2.650**	**4.327**	**5.370**	**2.572**	**3.732**

The dual-purpose peanut crop biomass was removed (cut at 5-10 cm above the ground), at early reproductive stage (early flowering to 70% canopy cover) for forage/hay, and the crop growth continued until nut harvest. In-season biomass yield ranged from 0.425 – 3.307 t/ha, was generally

higher in Georgetown (2.23 t/ha), followed by Katherine (1.68 t/ha), Emerald (1.67 t/ha), Tully (1.17 t/ha) and Home Hill (0.95 t/ha). Peanut variety Alloway in general produced higher in-season biomass compared to Kairai, Holt and Tabinga. Peanut breeding line UF75 tested in 2023/24 across sites, showed a consistent in-season biomass yield (0.865-1.310 t/ha), highlighting the suitability for dual purpose peanut (Table 2).

Regarding the Kernal quality, shelled peanuts are graded as jumbo, K1, k2, splits, oil and manufacturing. Biomass removal impacts on the nut yield, reduction of jumbo but an increase in the proportion of the K1 and K2 nuts. Currently the peanut processors classify manufacturing and oil grade as low value peanut, but such low-grade peanuts could provide high animal feed values.

Regarding the feed quality, the feed quality analysis of the peanut biomass, shell and low-grade peanuts showed favourable animal feed value that could bring significant benefits to the growers when these products are utilised for livestock feed. The peanut shell composition includes moisture (10.7-11%), Crude protein (11.4-13.6), ADF (49-55.9%), NDF (55.1-63.1%), TDN (47.4-59.5%), Ash (2.29-4.68%) and Crude fat (8.27-11.8). The oil grade peanut composition included moisture (7.4-9.5%), Crude protein (30.4-31), ADF (6-14.5%), NDF (8.5-15.3%), TDN (124.2-127.3), Ash (3.76-4.13) and Crude fat (34.9-41.8). The manufacturing grade peanut composition included; moisture (6.6-7.1%), Crude protein (30.4-32.6), ADF (8.8-12.1%), NDF (13.5-13.6%), TDN (132.1-133.8), Ash (2.27-2.33) and Crude fat (45.50-46.50), whereas peanut biomass composition included; moisture (8.6-9.6%), Crude protein (16.4-17.7), ADF (26.5-29.0%), NDF (37.6-39.8%), TDN (159.2-61.2%), Ash (12.2-12.6%) and Crude fat (2.36-2.59), indicating very attractive feed values in peanut byproduct and biomass.

Table 2 In-season biomass (dw t/ha) of peanut varieties over five northern Australian locations, 2022-2024

Site	Year	Alloway		Holt		Kairai		Tabinga		UF75		Year Av	
		Cut	Uncut	Cut	Uncut	Cut	Uncut	Cut	Uncut	Cut	Uncut	Cut	Uncut
Emerald	2022	1.05		0.90		0.43		0.98		0.52		0.774	
QLD	2023	2.67				2.05						2.359	
	2024	2.18								1.58		1.880	
	Site Av	**1.97**		**0.90**		**1.24**		**0.98**		**1.05**		**1.671**	
Home Hill	2022	0.88		1.52		0.11						0.838	
QLD	2023	1.00				0.88				1.31		1.063	
	2024												
	Site Av	**0.94**		**1.52**		**0.50**				**1.31**		**0.951**	
Tully	2022	1.04		0.75		1.58						1.122	
QLD	2023	1.38				0.87						1.126	
	2024	1.41								1.12		1.263	
	Site Av	**1.28**		**0.75**		**1.22**				**1.12**		**1.17**	
Georgetown	2022	3.31		1.93		3.14						2.793	
QLD	2023	2.90				2.74						2.819	
	2024	1.123								1.008		1.065	
	Site Av	**2.44**		**1.93**		**2.94**				**1.01**		**2.23**	
Katherine	2022	**2.5**		2.5		2.45						2.483	
NT	2023	1.33				1.54		2.31				1.729	
	2024	0.78								0.86		0.823	
	Site Av	**1.54**		**2.50**		**2.00**		**2.31**		**0.86**		**1.68**	

Recommendation actions

The study revealed very high varietal difference for response to biomass cutting for the peanut nut in-shell yield, and therefore, careful selection of variety and targeted breeding needs for dual purpose peanut varieties is suggested. The effects of biomass removal also varied largely across growing environments. For UF75, the biomass removal did not impact nut in-shell yield at least in

Emerald, Home Hill and Tully unlike in Georgetown and Katherine NT. In-fact at Tully and Home Hill, biomass removal showed positive impact on nut in-shell yield. These data show the potential of commercial scale dual- purpose peanut, that can deliver the uncompromised nut in-shell yield and in-season biomass removal for the hay/forage production, delivering two major harvests from the same crop, improving the returns to Northern Australian peanut growers by accessing the feed and seed markets for peanuts.

Objective 2 What are the trade-offs in dual purpose peanuts between kernel yield and quality on one hand, and different fodder options viz. biomass cutting and post-harvest hay on the other?

Key findings

The performance of dual-purpose peanuts varied significantly between varieties, production environment, season and crop growth stage for biomass removal. The dual-purpose yield potential up to 4 t/ha nuts, 2 t/ha in-season biomass, 3 t/ha preharvest biomass and 2t/ha after threshing biomass was recorded. The shell content of the peanut ranged from 17- 40% of the harvested pod dry weight depending on the variety, season and biomass removal. Therefore, shell also contributed a significant amount of potential feed yield which is currently underutilised. The crop and by products were evaluated for animal feed value. The peanut shell and low-grade peanuts were also assessed as a potential livestock feed source and analysed for feed values from forage lab of Australia.

Biomass removal impacted on the nut in-shell yield, generally a reduction of nut in-shell yield, and also on the nut grading (quality). Biomass removal reduced the proportion of larger nuts (jumbo) but accompanied with an increase in the proportion of the K1 and K2 nuts. Currently the peanut processors classify manufacturing and oil grade as low value peanut, but such low-grade peanuts could provide high animal feed values. The trade-off between in-season biomass removal for hay and subsequent nut in-shell yield was noted for most of the sites and across trial years. But there was evidence for no penalty and trade-offs between in season biomass cutting and nut in-shell, particularly for new variety UF75 in north QLD locations of Home Hill and Tully, showcasing particular opportunities for harvested the in-season biomass of peanut for hay without any loss of the peanut yield.

Recommendation actions

The low penalty of biomass removal was particularly evident in early planted crops with low crop stress immediately after biomass removal. The most limiting factors for the recovery of growth after biomass removal included low soil moisture, high weed pressure, lower temperatures and advanced crop growth stage. Generally early planted crop, with biomass harvested at canopy closure (>70% canopy cover), and adequate soil moisture at biomass removal, low weed pressure at the time of biomass removal and higher temperatures generally favoured rapid regrowth and recovery of the plant growth without larger penalty on peanut yield.

It was particularly interesting to note larger variation between different varieties, sites and growing seasons for the performance of dual-purpose peanut. Selection of variety most suitable for biomass removal, determining the most suitable timing (crop stages) of biomass removal, and minimising the crop and soil moisture stresses for resumption of plant growth after biomass removal are the determining factors for the success of dual-purpose peanut in Northern Australia.

Objective 3 What are the most promising traits for dual purpose use of peanuts for Northern Australia?

Key findings

Peanut crop, earlier in the season harvested for biomass/hay, and end of season harvested for nuts in-shells, is defined as dual-purpose peanut. A productive dual-purpose peanut crop is judged based on its yield and quality performance for both in-season biomass and end of season nuts in-shell.

The plant traits suitable for dual purpose peanuts are associated with early emergence and plant establishment, rapid seedling vigour, larger canopy cover for light harvest and suppression of weed, speedy recovery of the growth after biomass cut, higher leaf chlorophyll/protein contents, softer for biomass cut, higher dry matter content, palatable to animals and amenable for bailing equipment.



Figure 1 Trial comparing the UF75 with Alloway at Emerald, Central Queensland, Australia.

An initial evaluation of 13 advanced breeding lines was assessed for dual-purpose use in 2022 season at Emerald in replicated field trial (Figure 1). New breeding line UF75 was found to be strongly adaptable for dual-purpose peanut based on the above traits. Following these results from initial evaluation trial, the field trials for second year included UF75 for the multilocation trial and also for the seed bulk up trial in Home Hill, north Queensland. In the third year, the dual-purpose peanut traits associated with the UF75 were evaluated across all trial sites.

The key traits of UF75, that are associated with the dual-purpose fit is related to canopy structure. The plant type of Alloway is upright and tall whereas the UF75 has shorter plants (36 vs 29 cm at the time of in-season biomass cut) with lowers most shoot with lateral growth, therefore, spread on the ground whereas upper most shoot has the upright growth. Such mixed growth pattern in the plants of UF75 allowed the lower shoot still growing flat into the ground, allowing for better ground cover, suppression of weeds and support the rapid recovery after the biomass harvest. The ground

cover at the time of in-season biomass harvest was 90 and 86 percent, whereas the SPAD chlorophyll record was 33 and 32 SPAD Unit respectively for the UF75 and Alloway respectively.

Recommendation actions

The research results revealed that the plant traits required for dual-purpose peanut can be different to those varieties grown solely for the nut production. From the current assessment, the new line UF75 showed plant traits suitable for dual-purpose use than the peanut varieties recommended for nut production (Alloway, Holt, Kairai) in Australia. These early results indicate that the peanut breeding program for dual-purpose use should be more targeted for developing varieties with great potential of high yield and quality of both nut in shell and the biomass as animal feed.

Objective 4 How do dual purpose peanuts best fit in tropical farming systems?

Key findings

Dual-purpose peanut trials were evaluated under different farming systems of northern Australia. The trial in Emerald was primarily on the cotton-peanut-cotton rotation, whereas in Home Hill, it was sugarcane – peanut – sugarcane rotation. The trial at Georgetown and Katherine were primarily on the grain or pasture – peanut rotations, suggesting wider adaptability of the peanut into the cotton, sugarcane and grain-based farming systems of northern Australia. Though, the data from rotation crops, to reflect the farming system benefits were not collected, however, the feedback from co-operating growers suggested that peanut conferred positive response on all the crops in rotation, particularly for weed suppression and yield performance following the crop of peanut.

The dual-purpose peanut trial was also extended to Graze and Grain peanut during second year at Emerald with one variety (Alloway) planted in January (25 Jan 2023) and subjected to grazing after 155 days after planting (10 cattle head over two days (30 June 2023) for biomass removal. The estimated above ground biomass at the time of grazing was 5.1 t/ha dry weight. The grazed crop (supplementary irrigation) was subjected to digging for peanut harvest 45 days after grazing, showed nuts in-shell yield reduced by about 19% (2.12 t/ha vs 2.61 t/ha for grazed compared to ungrazed control) with the cattle grazing of peanut biomass. This trial demonstrated the option of graze and grain peanut in rotation for the pasture/graze system of peanut production (Figure 2).



Figure 2 Peanut trial in the graze and grain system, planted in the pasture paddock at Emerald in 2023 season, where cattle grazing allowed prior to digging of the crop.

Recommendation actions

The concept of dual-purpose peanut evaluated across wide range of cropping rotations and also under the grazing rotation shows promising results demonstrating the potentials of dual-purpose peanut across wider range of farming system of northern Australia. The trial results, however, are diverse in-terms of peanut variety, locations, time of sowing and stage and intensity of in-season biomass removal. Future research is suggested for optimising these variables for specific crop in rotation and evaluation of the best dual purpose peanut option for individual farming systems to translate the benefits of dual-purpose peanut crops to the broader farming system of interest.

Objective 5 How do the economics of dual peanuts work out in different tropical farming systems?

Key findings

A gross margin (GM) analysis indicates that in 2023, the GM per ton for dual purpose peanuts at Home Hill was 3.84%, higher than the -20.83% GM for conventional peanut cultivation. The GM and cost per ton for dual purpose and conventional peanuts at the Home Hill site were $43.78 and $1,095.95, respectively, compared to -$236 and $1,371 for traditional cultivation. At the Emerald site, dual purpose crop for 2023 confirmed a gross margin of 17.58%, with a cost per ton of $938.2, better than traditional peanut crop. In Tully, dual-purpose performance was poorer due to a lower peanut yield, resulting in a gross margin of -97.7% and a cost per ton of $2250. The main challenge for Tully was exceptionally low peanut yields in 2023. The gross margin for the dual-purpose peanuts at the Georgetown site was 29.98%, with a cost per ton of $797.11. In contrast, the Katherine site reported a gross margin per ton of -30.90% and a cost per ton of $1,490.03. An on-line GM calculator has been developed for dual purpose peanut, that can incorporate individual farm/crop data to generate GM to particular farm, proving a useful decision support tool for peanut producers. A separate report for dual purpose peanut gross margin analysis has also been published for the detailed description of the gross margin analysis for dual-purpose peanut.

Recommendation actions

The gross margin in general for both the conventional and dual-purpose peanut production, calculated from the trial crop data was consistently lower. Lower peanut yields and higher transport costs are major causes for the very low or negative gross margin for peanut production in Northern Australia. The trial crop yield was much lower (2.062 t/ha for Emerald, 2.367 t/ha for Home Hill, 1.745 t/ha for Tully, 4.522 t/ha for Georgetown and 3.732 t/ha for Katherine NT) compared to Australian national average yield of 4.25 t/ha, whereas some peanut growers in Australian have also managed to achieve overall farm yield up to 6 t/ha of nut in-shell. The dual-purpose peanut trial data, has indicated, the potentials of in-season biomass harvest (up to 3.31 t/ha) without compromising the nut in-shell yields. Therefore, choice of high yielding dual-purpose variety and optimisation of agronomic practices for dual-purpose peanut crop could change the return, with higher gross margin from northern Australian peanut production.

The forage analysis data have also demonstrated appreciable feed values on the peanut shells (Crude protein:11.4-13.6, ADF:49-55.9%, NDF:55.1-63.1%, TDN:47.4-59.5%, Ash:2.29-4.68% and Crude fat: 8.27-11.8). Peanut shelling in each northern Australian peanut production regions not only create more animal feedstock from peanut but also reduce the cost of transport as the weight of peanut shell is as much as one third of the weight of nut in-shell weights.

Objective 6 What are the best technologies and agronomic management practices for dual purpose peanuts?

Key findings

Successful dual-purpose peanut production relies on choice of peanut variety supported by specific agronomy for dual-purpose peanut farming. Current research demonstrated the significant genetic variation for traits suitable for dual-purpose peanut. Evaluation of breeding lines at Emerald in 2022 season revealed UF75 as elite dual purpose peanut lines compared to others (12 varieties), and this was reconfirmed with verification trials of UF75 across all locations in 2024 season.

Time of planting is crucial as the late planted crop experienced cooler weather conditions after in-season biomass cut, limiting the recovery/regrowth after biomass removal. Similarly, the timing (crop growth stage) and intensity of biomass removal is also strong determinants of biomass yield and quality, as the early harvesting and shallow cut of biomass reflets for lower yield of biomass/hay whereas late removal/harvesting of biomass has direct impact on the nut crop and peanut quality.

Agronomic practices in term of crop water and nutrient management consistent to plant biomass removal is equally important consideration (Figure 3). In the year 1 and year 2 of the trial, biomass removal was carried out manually by the hedge trimmer. However, in the year 3, biomass removal was practiced with machinal operation using tractor operated rear-mount mower-conditioners. The biomass separated from plant was left on the top of bed for drying required for hay, flopped and small square balers, utilising the local hay business operator from Emerald region. This required adapting the commercial grass hay cutting, flopping and bale making operations for the dual-purpose peanut.



Figure 3 Peanut in-season biomass removal with hay cutting equipment at Emerald in 2023 season.

Maintaining the feed quality of dual-purpose peanut hay is essential for successful dual-purpose peanut farming. Feed value of peanut hay as well as other byproducts of peanut processing were assessed through - Forage lab of Australia for key feed parameters (e.g. CP, DM, ADF, NDF, ME). NIR calibration has been developed for rapid quality assessment of peanut hay in collaboration with Forage Lab Australia, allowing the quick test options for dual-purpose peanut hay producers. This will also allow growers to fine tune the agronomy of dual-purpose peanut production.

Recommendation actions

As initial scoping of the dual-purpose peanut has demonstrated the potentials and relevance of dual-purpose peanut for northern Australia. The research results so far have created industry interest for scaling up the dual-purpose peanut for commercial scale adoption. The research translation to scale up for industry adoption will primarily require developing agronomy for complete mechanisation of the whole process (Figure 4) for dual-purpose peanut production. Therefore, the focus on mechanisation, particularly for in-season biomass cut, drying and hay bale with minimum negative impacts on the peanut crop regrowth, will be fundamental.

Adoption of dual-purpose peanut can drive expanding peanut production in northern Australia. Facilitating the adoption pathway in Northern Australia offers a significant opportunity for strongly integrating the dual-purpose peanut in farming system for longer term sustainability driven by profitability to peanut producers. The dual-purpose peanut trial data have been incorporated for APSIM modelling (presented in the 21 Australian Agronomy Conference (Adaptive Agronomy for a Resilient Future), 21-24 October 2024 in Albany, Western Australia), allows further analysis of dual-purpose peanut integration into diverse farming systems.



Figure 4 Dual-purpose peanut in-season biomass harvest using hay mower-conditioner, and square balers.

The focus group workshop with community groups in Fitzroy Catchment, e.g. Fitzroy Agricultural Corridor Water Inc., actively engaged to map out the pathway for peanut adoption. DAF QLD release land suitability map for this new irrigation area, with 17,919ha of land suitable for peanut production (see link). https://www.daf.qld.gov.au/business-priorities/agriculture/initiatives/rookwood-weir/maps. PCA recognise opportunity for extending adoption of peanut and dual-purpose peanut in northern Australia (as the new large feed lot development progressing in same regions creating potential demands for dual- purpose peanut).The PCA team members, particularly agronomist currently engaged in active discussion and planning the pathway to adoption for dual-purpose peanut into this new region in the future. The dual-purpose peanut agronomy relevant for this new region along the Fitzroy River basin is crucial due to its close connectivity to GBR. Three new manuscripts (in addition to the two Agronomy conference proceeding), and updated growers guide for dual purpose peanut will aid into the knowledge base for dual-purpose peanut agronomy.

Conclusions and future research

Conventional peanut production in Australia, focus primarily for nuts harvest. CRCNA situation analysis highlighted the relevance of dual-purpose peanut for, largely cattle based, northern Australian farming systems, where the demands for quality forage/feed are high. This project undertook 3 years of extensive field trials that clearly demonstrated potentials of dual-purpose peanut production in northern Australia. The study evaluated 3 current commercial varieties (Alloway, Holt, Kairi), and 10 advanced breeding lines for evaluating plant traits conferring adaptation for dual-purpose crop. From the current assessment, UF75 showed suitable traits (canopy structures, mixed shoot orientation-lateral shoot in the bottom and upright on the top, greater leaf chlorophyll, quick regrowth, larger canopy cover) for dual-purpose crop.

Nut in-shell yield for conventional varieties ranged from 0.439 – 5.095 t/ha, whereas new breeding line - UF75 averaged 3.229 t/ha and ranged 1.452 - 5.370 t/ha, varied between sites and seasons, presenting higher and stable yield of UF75 for northern Australian dual-purpose peanut production. Likewise, the in-season biomass yield ranged 0.425 – 3.307 t/ha, varied between sites and varieties. Peanut breeding line UF75 tested in 2023/24 across sites, showed a consistent in-season biomass yield (0.865-1.310 t/ha), highlighting the suitability for dual purpose peanut.

The trial yields, in general were lower than Australian national yields (4.25 t/ha), suggesting for optimisation of agronomic practices to achieve potential yields and productivity for improving gross margin for dual purpose peanut. Nuts and in-season biomass were only included as economic outputs, however, harvesting the feed values from post-harvest biomass, peanut shell and lower grade nuts (oil and manufacturing) were also established from the results of Australian Forage Lab. Future research to confirm the lab-based feed value data supported by animal feeding trials is suggested for building confidence of graziers.

The research results are encouraging for scaling up dual purpose peanut by the industries, and the drivers for industry adoption includes full package of practices (agronomy), supported with complete mechanisation options for production and post-harvest processes specific to dual-purpose peanut production. Being a tropical crop, the dual-purpose peanut can be adapted into wide range of farming system including cotton, sugarcane, grains, pasture and mixed farming system of northern Australia. Therefore, the current R&D of dual-purpose peanut could be instrumental for expansion of peanut into new production areas across the northern Australia. The future expansion of high yielding dual-purpose peanuts in the tropics, that take care of the food and feed safety (particularly of the aflatoxins), will underpin the market success, therefore, strong considerations for clean nut and feed value products is suggested.

Strategic recommendations

Key priority actions for sector development	Action owner and key partners	Pathways to implementation and timeline	Intended industry impacts
• **Dual purpose peanut variety suitable for different farming systems available to interested growers.** • **Agronomic practices suitable for dual-purpose peanut production in northern Australia and the arrangement for the equipment for full mechanisation are in place for commercial scale production.** • **Dual purpose peanut seed supply and contractual agreement.** • **Dual purpose peanut production agronomic support for growers through area based peanut agronomist.**	• Peanut Company of Australia (PCA). • PCA agronomists engaged with perspective adopters of dual-purpose peanut production for development of their business plan for dual-purpose peanut production. • RFM cropping group and growers under the membership of Fitzroy Water Inc Rockhampton actively engaged in conversation for planning of dual-purpose peanut in the new growing areas of Lower Fitzroy Water Inc. PCA assigned the senior peanut Agronomist, based in 'Bundaberg, to support the growers in this new irrigation areas in central Queensland, and also agreed for introducing the contractual arrangements for guaranteeing the purchase of peanut through their receival plant in Kingaroy..	• PCA agronomists engage with peanut growers, graziers and corporate farms to discuss integration of dual-purpose peanut for commercial scale of farming in Northern Australia.	• Area and production of dual-purpose peanut increase in northern Australia by interacting dual purpose peanuts into diverse farming systems (sugarcane, cotton, grain, pasture, and mixed farming system).

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Appendices

Published work

1. Agronomy conference proceedings by NTDITT
2. Agronomy conference proceedings APSIM by DAF QLD
3. Dual purpose peanut “growers guide” by Dr Drew Portman
4. Gross Margin Analysis report
5. Dual purpose peanut calculator

Manuscripts draft under review

1. Dual purpose peanut
2. Feed value of dual-purpose peanut products
3. APSIM modelling of dual-purpose peanut



230731 DP Peanuts FS FINAL.pdf

Dual-purpose peanut trials show promise in North Queensland

By Ben Harden

March 14 2022 - 5:00pm

Dual-purpose peanut trials show promise in North Queensland | Queensland Country Life | QLD



Figure 5 Third generation Home Hill farmer Aaron Linton is participating in the Grain and Graze North trials of dual-purpose peanut production and is pictured with CQUniversity researcher Isaac Cardillo. Photo: Supplied

Dual-purpose peanut varieties could hold the key to diversifying grazing operations across Northern Australia by providing both high-value fodder as well as financial returns from the sale of peanuts.

A new project being led by CQUniversity, in partnership with Bega's peanut farming services team and principal co-investment from the CRC for Developing Northern Australia, is setting out to test the concept of dual-purpose peanut production through a series of trials across multiple sites across Queensland over the next three years.

The 'Grain and Graze North' project is evaluating different peanut varieties and breeding lines from the Bega-GRDC peanut breeding program that are already known to produce large volumes of foliage.

Lead researcher associate professor Surya Bhattarai said the project will also identify their suitability to a range of northern environments as well as their response to an early season biomass cutting.

"Peanuts have been identified as a priority crop for expanded production in Northern Australia, as we know they offer great production potentials in the tropics and are well suited to some of the soil types," Prof Bhattarai said.

"This project is assessing whether high biomass peanut varieties also have potential to produce high value fodder to help diversify beef businesses, provide some feed security from extended dry seasons, and even finish stock for sale into higher value markets, while still delivering a valuable crop of nuts at the end of the season."

Trials are already underway in Emerald, Home Hill, Georgetown in Queensland, with further plantings planned for Tully, Qld, and Katherine and Douglas Daly, NT.

Burdekin trial promising

Participating in the trial is third generation sugarcane farmer Aaron Linton of Home Hill.

Planting only a hectare of the peanuts, Mr Linton said it was a great opportunity to plant a different crop during his fallow period.

"I've been looking for different crop to fit into our rotation for a while now and I've worked with Queensland CQUni on a few other trials that they've done," Mr Linton said.

"We're predominantly using the fallow period of the sugarcane to grow other crops.

"November through to April is usually the standard fallow, but we've all been moving to these 18 month fallows now where we take a little bit more land out for a bit longer just to change the diversity of the soil of what we're growing."

Mr Linton said the Burdekin is good for growing peanuts in some areas, as it's very soil type specific.

"You'll grow them no problems, but harvesting and getting them out of the soil and getting the soil off them can be a problem if you're in the wrong soil type," he said.

"We've found a few spots to grow peanuts and there's plenty of land here that is suitable to be able to move forwards and make it a bit of an industry.

"We're waiting for the results now and seeing if it's worth it."

Mr Linton said the trial has allowed his business to operate outside of the square.

"The peanuts benefit the sugarcane afterwards as well and with these current fertiliser prices that are around, there's going to be a huge change for our bottom line if we don't have to fertilise at the moment," he said.

"Peanuts don't need a nitrogen base, they make their own.

"While sugarcane requires nitrogen, if we can use the leftover residue that the peanuts have made, it fits hand in hand."

Overall, Mr Linton said the experience has been a steep learning curve, but he hopes to grow peanuts on a broader scale.

"Using peanuts as fodder could be financially viable for our operation," he said.

"We've definitely got the soil, the water, the sunlight, and we can grow it.

"If it's economically viable for us, we'll find a way to grow more."

Further testing underway

The trial sites at Emerald and Ayr were trimmed last month to replicate the process of cutting forage for hay, with the plant response and nut yield to be measured over the remainder of the season.

Dr Bhattarai said laboratory analyses will determine the nutritional quality for fodder/forage options.

"This will be an important step for ensuring safe and productive feeding and grazing of peanut hay and biomass respectively," she said.

The project also includes an economic analysis to determine the potential benefits of dual-purpose cropping, not just at individual farm level but for northern agriculture more broadly.

"In year two of the project we'll be calling for farmers to participate in the trials and test the dual-purpose peanut concept at a commercial scale, with the view to providing industry with a detailed production guide on how to maximise profit from dual-purpose peanut crops by the end of project in early 2025," Dr Bhattarai said.

Northern dual-purpose peanut trial delivers promising results for future industry expansion

By Ben Harden

Updated September 5 2023 - 11:33pm, first published March 2 2023 - 8:00pm

Northern dual-purpose peanut trial delivers promising results for future industry expansion | Queensland Country Life | QLD



Figure 6 Surya Bhattarai, Richard Weston, Aaron Kiely and Dr Tieneke Trotter at one of the trial plots at Deneliza Downs, east of Emerald. Picture supplied by Tieneke Trotter

A northern dual-purpose peanut trial has delivered promising results for future expansion of the industry across Northern Australia.

Preliminary results from the Grain and Graze North project, led by CQUniversity in partnership with Bega Cheese Limited and principal co-investment from the CRC for Developing Northern Australia, indicate that peanuts can provide up to one tonne per hectare of biomass for cattle fodder without significantly compromising end of season nut yields.

There are currently five trial sites across northern Australia including in Emerald, Ayr, Tully, Georgetown and Katherine (NT).

Lead researcher Dr Tieneke Trotter said that if successful, the concept could hold the key to diversifying grazing operations across northern Australia by providing both high-value fodder as well as financial returns from the sale of peanuts.

"Peanuts have been identified by the CRCNA as a priority crop for expanded production in northern Australia and this project is testing the potential for high biomass varieties to: produce high-value fodder for diversification of farm businesses; provide feed security from extended dry

seasons; and, potentially finish stock for sale into higher value markets, all while still delivering a valuable crop of nuts at the end of the season," Dr Trotter said.

"So far we've found that while nut yield can be lower in plots that were cut for hay, the yield loss was not as large as producers might expect.

"In some cases, the nut yield was not impacted at all, or occasionally an improvement in yield was noted.

"The peanut plants recovered well after the in-season biomass cut, and they typically produced similar amounts of dry matter as the uncut plots at the end of the season of approximately 2t/ha."



Figure 7 Dual-purpose peanut trials at Deneliza Downs, east of Emerald. Picture supplied by Renee Anderson

The peanut yields ranged between approximately 0.5t/ha and 4t/ha for varieties that were cut and approximately 1t/ha and 6t/ha for plots that were not cut.

Dr Trotter said the results will inform future economic analysis of the cost and benefit of a fodder-plus-nut crop versus nut-only production.

"More research is needed into how to minimize the yield discrepancies, and why the performance of varieties varied so greatly between trial sites, which we believe was due to cold temperatures throughout the growing season in North Queensland resulting in a lower than expected biomass and nut yield at those sites," she said.



Figure 8 The research trial has measured the biomass produced by peanuts with a view to creating additional fodder supplies for northern graziers. Picture supplied by Michael Thompson

The findings from 2022 also informed the varietal selection for the 2023 trials, as well as planned adaptations to agronomic practices such as the timing of cutting in-season biomass in order to maximise production.

"We anticipate better outcomes from the 2023 trial as we implement what we are learning," Dr Trotter said.

"The two major lines being grown across northern Australia in the 2023 season are Alloway and Kairi, but there will also be further investigation of two minor lines which may be more suited to some conditions, with another variety to be trialled in Katherine and one in the Burdekin."

The dual-purpose peanut trials will be showcased, along with the research into high-value spice crops and new mungbean varietal assessments, at a research field day on April 19 at Deneliza Downs, east of Emerald.

Dates will soon be announced for field days in Georgetown in late April, Ayr and Tully in May, and Katherine in June.

Dual-purpose peanuts offer high protein fodder option

By Ben Harden

Updated April 30 2024 - 8:53am first published April 29 2024 - 8:00pm

Dual-purpose peanuts boost grazing operations | Queensland Country Life | QLD



CQUniversity researcher Dr Drew Portman holding a peanut hay bale, which has been cut and baled at Emerald. Picture: Ben Harden

Researchers have identified dual-purpose peanut varieties could hold the key to diversifying grazing operations across northern Australia by providing high value fodder, as well as financial returns from the sale of peanuts.

The Grain and Graze North project, led by CQUniversity, has been evaluating different peanut varieties and breeding lines from the Bega-GRDC peanut breeding program over a three-year period.

One of the trials at Deneliza Downs near Emerald has evaluated the peanut varieties Alloway and Kairi, looking at the impact on peanut yields and the volume of biomass harvested for livestock fodder.

Peanut hay cut and baled at Emerald contained 23pc protein and 71.8pc fibre.

Research findings

Preliminary results from the research trial indicate that peanuts can provide up to one to 2.7 tonne per hectare of dry matter biomass from an in-season cut providing cattle fodder without significantly compromising end of season nut yields.

The impact on yields and the volume of biomass harvested varied from site to site.



The trial identified that nut yields were not compromised with biomass removal for early planted crops. Picture: Ben Harden

Peanut yields were comparable in plots that were cut for hay, but the yield loss was only noted where late season planting, and soil moisture stress occurred after the in-season biomass cut occurred.

The peanut plants recovered well after the in-season biomass cut, and they typically produced similar amounts of dry matter as the uncut plots at the end of the season of approximately 2t/ha.

Harvesting the dual-purpose crop

Mechanised in-season hay harvest was completed successfully in 2024 using a disc forage mower.

Once cut the peanut hay was wind rowed for drying with a traditional rotary rake.

When moisture was below 14 per cent, peanut hay was square bailed using a traditional small square hay baler.

There are two harvest points for peanut hay, a first cut at 75 -80pc ground cover and a second cut hay after threshing.

For harvesting the peanuts, a peanut digger was used to dig and invert the peanut plants so that the peanuts are exposed to the air for drying.

The peanuts are separated from the plant using a peanut thresher when the moisture is between 10 and 16pc, normally 4-10 days after digging.

Opening more markets for producers

CQUniversity lead researcher Dr Tieneke Trotter said dual purpose present an opportunity for grazing operations to produce high quality feed for livestock as well as the benefit of a nut production for human consumption.

"This allows peanut producers to access an entirely new market, servicing the livestock industry and helping to provide high quality feed, which, if cut for hay can be stored for supplementary feeding when there is a feed gap," Dr Trotter said.



CQUniversity researcher Dr Drew Portman showcasing where the peanut crop biomass is cut for hay. Picture: Ben Harden



Peanut hay cut and baled at Emerald contained 23pc protein and 71.8pc fibre. Picture: Ben Harden

"The high quality feed could also assist livestock producers to access higher quality meat markets."

Dr Trotter said there were many positives for producers to consider diversifying their operations into dual purpose peanuts, including assess to an in-season payment for hay, followed by an end of season payment for nuts.

"Anecdotally there appears to be a good opportunity to access markets for peanut hay, it appears to always be in demand," she said.

"As Australia still imports peanuts, there is a market opportunity for any new growers looking to producer peanuts."

There could be an opportunity for in season livestock grazing, but Dr Trotter said comprehensive trials would need to validate this opportunity.

Trial field walk

On April 18, central Queensland growers and agronomists were able to inspect the latest dual-purpose peanut crop trail.



Dual-purpose peanut trials were highlighted at this years new and high-value crop field day at Emerald on April 18. Picture: Ben Harden

Dr Trotter said peanuts were planted in early December 2023, and grown under irrigation over summer in Emerald.

"Half of this crop was cut using a slasher, raked with a hay rake and bailed in the paddock," she said.

"This was the first time peanut hay was bailed in season using large scale mechanical equipment and the plant response is promising.

"Although the trial has not yet been harvested, it is anticipated from previous seasons work that the total yield won't be significantly reduced, but that there might be a reduction in the peanut grade."

While this season's Emerald crop has not yet been harvested, Dr Trotter said the Alloway responded better to in season cutting for hay compared with other varieties in the past.

"Typically, there hasn't been a major effect on overall yield, although the size (grade) of the peanut has been reduced," she said.

"While this isn't desirable, the cost benefit from the hay, coupled with most nuts still achieving the highest pay grade category means that dual purpose peanut production does show some promise.