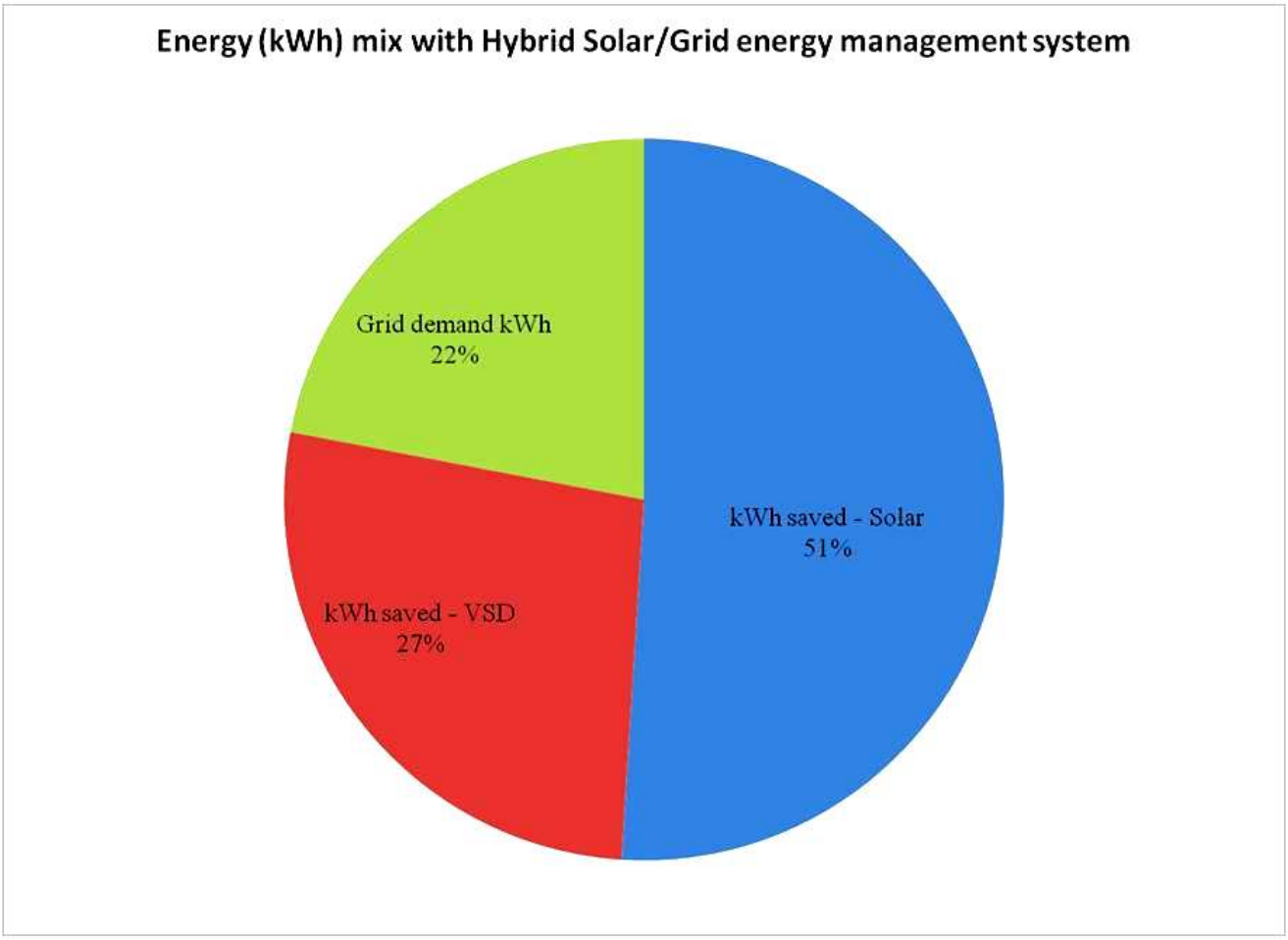

Adapting Renewable Energy Concepts to Irrigated Sugarcane Production at Bundaberg

Milestone Report No: 6

Australian Government
Australian Renewable Energy Agency

ADAPTING RENEWABLE ENERGY CONCEPTS TO IRRIGATED SUGARCANE PRODUCTION AT BUNDABERG

MILESTONE REPORT No: 6

Funding Agreement Details

Recipient Name	Bundaberg Regional Irrigators Group (BRIG)
Project Commencement Date	02/01/2017
Project Completion Date	15/09/2020
Project Partners/ Participants/ Sub-contractors	*Bundaberg CANEGROWERS Ltd* *Bundaberg Sugar Services Ltd* *Killer Family Holdings Pty Ltd.*
Primary Contact Name	Dale Holliss
Contact Telephone Number	0417 009 236
Contact Email	Dale_Holliss@bdbcanegrowers.com.au

Milestone Summary

Milestone Number	6		
Report Dates	Due: 10/01/2020	Submitted: 10/01/2020	Reporting period: 12/07/2019 to 10/01/2020
Comments if report is late			

Technical Delivery of Milestone

1. Provide a technical report of the milestone activities.

The solar pumping trial located on the Killer Family farm has now operated for two years (January – December 2018 and January to December 2019).

The period of operation of this trial has been the most challenging in relation to weather and commodity price that most Bundaberg district farmers can remember. Rainfall at the trial site (shown in Attachment A) has varied from excessively above average in the spring of 2017 to disastrously below average for the whole of 2019. This highlights the extent of the drought being experienced.

The excessive rain in the spring of 2017 lead to a long period of subsoil water logging which when followed by the long and increasingly drier period has resulted in the occurrence of dry land salinity which in turn has rendered a significant portion of the irrigation area unsuitable for sugarcane cropping without an extensive soil remedial program. This remedial program has commenced but a new sugarcane crop cannot be planted in time to create an income stream for 2020 to offset the loss of income. To offset the lost income due to these salinity issues and drought the Killer Family has reduced the area of sugarcane crop and introduced peanuts as a short term crop to support their cash flow requirements.

Evidence of salinity issues and the development of the peanut program are shown in Attachment A. The inclusion of the peanut program will not hamper the trial project outcomes as a slightly higher volume of water per hectare is required to produce a viable peanut crop and with the benefit of a fixed contract price for the peanut crop which is much higher than the value of sugarcane there is a very strong incentive to utilise the trial equipment to its maximum capacity.

During the period since the commissioning of the project (2 years) the system has completed 2599 hrs of irrigation operation and based on data from the pre redevelopment pump audit this indicates that 2599 hrs at 39 kW h would have consumed 101,361 kWh of grid energy supply at a value of $24,945. Comparative analysis of the running cost for the previous all grid powered system to the Solar/VFD/Grid trial shows a reduction in operational cost of $19,925 which comprised $10,162 attributable to the solar array and $5,380 to the motor and pump efficiency improvements which included the Variable Frequency Drive (VFD) and the remaining energy supply valued at $5,020 which was accessed from the grid supply. This information is presented in Attachment B.

Technical delivery (Table 1)

Milestone (6) activity / deliverable	Completed
D 6.1 Provide a report to ARENA clearly outlining the Data recording 2019 (first 6 months) crop including the: Irrigation program Attachment C	***Irrigation Program*** The irrigation trial area for the first six months of the 2019/20 year, (July 2019 – December 2019) period is 55 ha which is irrigated by the solar trial pumping system. The difficulties with salinity and crop die back are noted in Attachment A and a conversion to production of peanuts on 16 ha also illustrated in Attachment A has been implemented. Evaluation of potential crop irrigation demand for the 2019 spring and early summer period is shown in Attachment C. This highlights the extent of the current drought conditions being experienced as compared to average seasonal conditions shown in the extended review period from September 2017 to December 2019. This is illustrated in Attachment A. This data illustrates potential monthly reference evapotranspiration (ET_0) determined from the onsite weather station. Calculated daily crop evapotranspiration (ET_C) is determined from potential crop size factors relative to the recorded ET_0. When daily crop data is referenced against rainfall an irrigation demand for the period July to December 2019 and the historical average demand, it is apparent that the irrigation requirement for the current reporting period was much greater than average which impacts on farm capability to supply the demand requirement due to allocation supply constraints. Water allocation is based on the sugarcane cropping year (twelve months from 1st July to 30 June)and with the prospect of a long drier than average summer period irrigators try to extend their available irrigation allocation across the whole of season to ensure that a level of crop protection is maintained until rain finally comes.

	The application to the trial site during this review period (July to December 2019) was 1.6 ML/ha. (Attachment C)
Climate Data(rain, solar radiation, evapotranspiration E^T_0, temperature) Attachment D	***Climate data*** Rain, solar radiation, reference evapotranspiration (ET_0) and temperature data for July 2019 to December 2019 is provided in attachment D This information contains all of the daily data provided by the weather station at the trial site for each month of the review period. Weather conditions were generally dry sunny days throughout the review period; solar radiation was only interrupted occasionally by cloudy weather. This is also evident in the corresponding temperature and ET_0 data which were generally above average. Rainfall occurred on a very low number of days over the period. The net effect of this weather pattern was that crop growth potential from irrigation applied was high but a reticence to push hard with irrigation at this time is not uncommon for the reasons already mentioned and this potential was under underutilised.
Irrigation/crop growth response data Attachment E	***Irrigation/crop growth response data*** The soil moisture graph showing the impact of lack of rain for the early summer period is illustrated in Attachment E. This indicates that at the monitored field, the crop has not developed sufficiently at this time to provide clear water extraction trends. The loss of moisture over time is linked to diurnal influences and the small amounts of utilisation is sustaining the plant in a semi stressed state. There is insufficient growth at this time to conduct crop response monitoring.

Energy availability verses consumption data(solar verses grid) and water applied (ML/ha) Attachment F Attachment G	***<u>Energy availability verses consumption data(solar verses mains supply)</u>*** Solar energy data from the onsite weather station indicates that during the review period July to December 2019 (184 days) there were 2283 hours of sunshine including 1105 hours with sufficient radiation to maintain the threshold (400 w/m^2) required to provide full power to the pumping system. Sixty eight (68%) percent of available hours within the threshold were utilised. Pump day time hours were 578 which is 77% of the total pump operational hours (751) within the review period. Utilisation data for solar energy and water supply is shown in Attachment F. A chart illustrating the relationship between the daily solar intensity and the pump operational threshold is also included.
D 6.2 Provide a report/data outlining the irrigation activity and crop growth response	***<u>Crop production and Irrigation Activity</u>*** A progressive estimate of crop yield (potential 30 tc/ha at the 31st December 2019) indicates the seriousness of the current drought and the salinity issues associated with the ongoing weather factors for the 2020 crop. Without rainfall to create natural leaching of the salinity it is beyond the scope of the irrigation application equipment to deliver the required leaching fraction to initiate growth on many sectors of the farm. The estimate then assumes that crop production will be patchy with best sugarcane grown on the isolated pockets of unaffected soils.
D 6.3 Provide Minutes from the Activity Steering Committee meeting	There were no meetings of the Activity Steering Committee held during this reporting period.

D6.4 Provide a Milestone Report and associated items in accordance with item 1 of Schedule 3 and Schedule 5 (Knowledge sharing)	Refer Section 8 and Attachment H

2. Provide a statement as to whether the timeframes for the project are being met and an explanation of any delays that have occurred.
Project timeframes are being met. Future delays are not anticipated.

3. Are there any proposed changes to the project, including to scope, personnel or partners?
No

4. Have there been any changes to the risk management plan (including changes to actual risk & risk ratings)? If yes, please provide a copy of the updated risk management plan.
No

5. Comment on progress toward achieving each of the project outcomes listed in Schedule 3.	
Project Outcomes	**Achieved / Not achieved (comment)**
D6.1 Update the Milestone 4 (D5.1 report) clearly outlining the Data recording 2018-19 (last 6 months) crop including the: • irrigation program • climate data (rain, solar radiation, ET) • irrigation/crop growth response data energy availability versus consumption data (solar versus grid) and water applied (ML/ha)	Achieved
D6.2 Provide a report on crop production – estimated 2020 crop yield (tonnes cane/ha)	Achieved
D6.3 Provide Minutes from Activity Steering Committee meeting/s	No meeting was held
D6.4 Provide a Milestone Report and associated items in accordance with item 1 of Schedule 3	Achieved

and Schedule 5 (Knowledge sharing)	

6. Provide details of any published patents that have arisen out of or been contributed to by the project.
Not Applicable

7. Provide confirmation of the number of researchers (calculated on a full time equivalent basis) that are involved in the utilisation of the Grant Funds.
Not Applicable

Knowledge Sharing

8. Provide details of any knowledge sharing activities, including published reports, promotional material, media publicity or other documentation relevant to the project.
During this Milestone period the dedicated project Facebook, Twitter and website social media sites were used to promote the projects achievements in reducing dependence on grid supplied electricity for sugarcane production. Data on these social media systems is presented in Attachment I. Established lines of communication utilised by Bundaberg CANEGROWERS and Bundaberg Sugar Services provided information to the Bundaberg irrigation community via our extension staff and industry infrastructure. We were invited to present at the *Renewables in Ag Conference* which was held on 14th November in Wagga Wagga. Mr Maurie Haines provided the conference with a presentation titled "*Adapting Renewable Energy Concepts to Irrigated Sugarcane Production at Bundaberg*" and also provided the business case for attendees. Both of these reports are attached in Attachment I. Links to a selection of the media from that event is also contained in Attachment 1

M Haines presenting at the Renewables in Ag Conference held on 14 November 2019 in Wagga Wagga.

Financial Reporting

9. Provide a statement of the Grant Funds, Recipient/Grantee Contributions (cash) and Other Contributions (cash) received and spent as identified in Schedule 4, 5 and 6 of the Funding Agreement.

See attachment 1A for:

A statement of income and expenditure for the project covering the period from commencement date to the completion of milestone 6.

i All cash income for project.
ii All cash expenditure for the project.
iii There are no unspent grant funds available for use in the next reporting period.

10. Provide a statement of the Grantee/Recipient Contributions (in-kind) and Other Contributions (in-kind) provided (refer to items 3 and 4 of Schedule 2).

See attachment 1B for details of in kind contributions for Milestone 6.

11. Provide confirmation that the project is proceeding in accordance with the Budget, including grantee contributions and other contributions.
The project is within budget and on track

12. List of Attachments to the report
Attachment A – Milestone D 6.1 – Rainfall History Attachment B – Milestone D 6.1 – Energy Cost Evaluation July 2018 to December 2019 Attachment C – Milestone D 6.1 – Irrigation Program Attachment D – Milestone D 6.1 – Climate Data – July 2019 to December 2019 Attachment E – Milestone D 6.1 – Irrigation and crop growth response Attachment F – Milestone D 6.2 – Energy Availability vs Consumption data Attachment G – Milestone D 6.2 – Crop and Energy efficiency relationships Attachment H – Milestone D 6.4 – Knowledge Sharing Activities

Certification

I Dale Holliss being a person duly authorised by the Grantee/Recipient hereby certify that:

- The milestone described above has been completed by 10/01/2020
- The information provided above is accurate, complete and not misleading.
- The risk management plan for the project is up to date and being implemented.
- I am aware of the Grantee's/Recipient's obligations under the Funding Agreement, including the need to keep ARENA informed of any circumstances that may impact on the objectives, completion or outcomes of the agreed project.

Signed *Dale Holliss* Date 10/01/2020