

Part I: CURRICULUM VITAE

1. Personal

Dr. Aviv Asher

Born: 1978, Israel.

Marital status: Married + 3

Army service: 1996-2001

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2. University Education and Additional Training

Dates	Description
2002 – 2006	B.Sc. in Animal Sciences at the Hebrew University of Jerusalem, The Robert H. Smith Faculty of Agriculture.
2006 – 2010	M.Sc. in Animal Sciences at the Hebrew University of Jerusalem, The Robert H. Smith Faculty of Agriculture. Title of thesis: The influence of period in lactation on the energy expenditure and the efficiency characters in Holstein cows. Supervision by: Dr Arie Brosh, Beef Cattle section, Newe-Ya'ar Research Center, ARO. Supervision by: Prof. Arieli Amichai, Department of Animal Sciences, Hebrew University of Jerusalem.
2011 – 2016	Ph.D. in Animal Sciences at the University of Haifa, Faculty of Natural Sciences. Title of thesis: Identification of individual efficiency characters in Holstein cows and bulls and the effect of photoperiod on production efficiency. Supervision by: Prof. Abraham Haim, Department of Evolutionary and Environmental Biology, University of Haifa and Dr. Arie Brosh, Beef Cattle section, Newe-Ya'ar Research Center, ARO.
2017 – 2018	Postdoctoral Research. Newe-Ya'ar Research Center, ARO and University of Haifa. Title of Postdoctoral Research: The influence of artificial light at night on individual feed intake, growth, health and welfare of prepubertal Holstein calves. Supervision by: Dr. Ariel Shabtay, Beef Cattle section, Newe-Ya'ar Research Center, ARO and Prof. Abraham Haim, Department of Evolutionary and Environmental Biology, University of Haifa and.

3. Positions Held and Academic Status

Dates	Description
2008-2011	Research Assistant in the dairy Cattle section, The Volcani Center, ARO.
2011-2013	Teaching Assistant at the Biology Department at the University of Haifa. Tutored the courses "Animal Physiology" and "Vertebrate Zoology".
2014-to date	Teaching the course "Vertebrate Zoology" at the Biology Department at the University of Haifa.
2015-to date	Teaching the course "Beef cattle management" at the Koret School of Veterinary Medicine, at the Hebrew University.
2016	Researcher at MIGAL research institute (Grade C)
2016 -2019	Researcher (Animal science) MIGAL and Northern R&D.

2019 -to date Associate Professor at MIGAL research institute and Northern R&D (Grade B)

4. Teaching Experience / Guiding Students

A. Academic Contribution:

Dates	Description
2014 to date	Teaching the course: "Vertebrate Zoology" in the University of Haifa , Dept. of evolutionary Biology
2015 to date	Teaching the course: "Beef cattle management" in the Koret School of Veterinary Medicine, in the Faculty of Agriculture, Food and Environment of the Hebrew University of Jerusalem.
2019	Teaching the course: "Beef Cattle husbandry in naturals and intensive systems" in Tel Hai College, Dept. of Animal Sciences.

B. Guidance of M.Sc. Students (or B. Sci. internship)

Graduation date	Name	Title of thesis	Guidance with
2020 M.Sc. (Exp.)	* Ms. Florin Fares	The influence of artificial light at night on performance and feed efficiency of dairy cows and goats	Dr. Roe Gutman, Tel Hai College, Dept. of Animal Sciences.
2019 M.Sc.	* Ms. Matan Fialiko	The influence of artificial light at night on milk yield and components, fatty and amino acids	Dr. Roe Gutman, Tel Hai College, Dept. of Animal Sciences.
2019 (** B. Sci. internship)	* Mr. Tomas Mccowen	The use of quinoa (<i>Chenopodium quinoa</i> Willd) as a new forage crop and its effect on performance, individual production and feed efficiency of beef cattle.	Dr. Liora Shealtiel, Tel Hai College, Dept. of Animal Sciences
2017 (** B. Sci. internship)	* Mr. Allan Pederson	The influence of artificial light at night on growth and feed efficiency of dairy bull calves	Dr. Shullamit Zonenberg, Ruppim College, Dept. of Animal Sciences.

C. Post-Docs and Visiting Scientists:

Dates	Name	Research subject
2019 (Fellowship in my lab).	Dr. Travis Whitney ^{VS} (Texas A&M university, U.S)	The use of quinoa (<i>Chenopodium quinoa</i> Willd) as a new forage crop and its effect on performance, feed efficiency and gas emission of beef and dairy cattle.

X^{PD}: Post-Doc working in my research team

X^{VS}: Visiting Scientist working in my research team

5. Activity in Scientific and Agricultural Committees

A. International:

Dates	Description and role
2019	Management Committee of the COST meeting on elevating feed efficiency and reducing gas emission of livestock; Member

B. National:

Dates	Description and role
2019-2020	Beef cattle Growers Council Committee; Member
2017 – 2020	Member, Israeli Dairy cattle Board – Beef cattle committee.

6. Contribution to the Scientific Community

A. International:

Dates	Description
2019	Organizer of COST meeting on elevating feed efficiency and reducing gas emission of livestock. The meeting accrued in the Galilion Hotell, Hahula valley

B. National:

Dates	Description
2019	Organizer and Chair of a Session on Quinoa as a new forage crop, in the Annual Meeting of the Israeli Society of the northern forage crop growers

C. Outreach:

Dates	Description
2018-2020	Reviewer (ad-hoc) of proposals for: The Chief Scientist, ISF
2018-2020	Reviewer (ad-hoc) of proposals for: Israeli Dairy cattle Board

D. Editorial responsibilities:

Dates	Description
2018-2020	Reviewer (ad-hoc) of manuscripts for: Journal of Small ruminant science
2018-2020	Reviewer (ad-hoc) of manuscripts for: Journal of Dairy science

7. Active Participation in Meetings

A. International:

Date	Title of the Meeting	Place	Role
2014	The 30th International Symposium of Harnessing	Canberra, Australia	Posters (3) and

	the Ecology and Physiology of Herbivores (ISNH/ISRP),		peer reviewed papers (3)
2017	The 68th meeting of European Federation of Animal Science	Tallinn, Estonia	Posters (1) and peer reviewed papers (1)
2018	The 31th International Symposium of Harnessing the Ecology and Physiology of Herbivores (ISNH/ISRP),	Clermont Ferrand, France	Posters (2) and peer reviewed papers (2)

B. National:

Date	Title of the Meeting	Role
2008	The 20th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2010	The 22th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2011	The 23th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2013	The 25th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2014	The 26th Annual Meeting of Cattle Sciences, Ashkelon, Israel.	Abstract and oral presentation
2015	The 27th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2016	The 28th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2017	The Annual Meeting of Animal Sciences, Tel-Hai college, Israel.	Abstract and oral presentation
2017	The 29th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2018	The 30th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation
2019	The 31th Annual Meeting of Cattle Sciences, Jerusalem, Israel.	Abstract and oral presentation (Invited Lectures)
2019	Annual meeting of agricultural innovation, Golan Heights and Galilee	Invited Lecture

8. Research Grants

A. Internationally Peer Reviewed Grants:

Year	Granting Source	Duration (years)	Role*	Title (short)	Budget	
					Total (US \$ / year)	Researcher (US \$ / year)
2019 - 2021	Horizon 2020	3	PI	Precision livestock farming based on grazing behavior of beef cattle at pasture.	250,000	150,000
2019	BARD (fellowship)	1	LPI	The use of Quinoa as a new forage crop	30,000	30,000

*PI = Principal Investigator; LPI= Local Principal Investigator; CI = Cooperating Investigator

B. Nationally Peer Reviewed Grants:

Year	Granting Source	Duration (years)	Role *	Title (short)	Total (US \$ / year)	Researcher (US \$ / year)
2019 - 2020	The International Contraceptive Access (ICA) Foundation	1	PI	The effect of LED light on milk production on dairy cows	30,000	30,000
2019 - 2020	The International Contraceptive Access (ICA) Foundation	1	PI	The use of Quinoa as a new forage crop for fattening lambs	24,000	24,000
2019 - 2022	Nitzan-Noah's ark: Chief Scientist of the Ministry of Agriculture	3	PI	"Night milk": Dairy milk and milk products naturally enriched with Melatonin	100,000	100,000
2017 - 2020	Galilee Technology Center – "Migal"	3	PI	Goat milk naturally enriched with Melatonin	24,500	24,500
2018 - 2019	The International Contraceptive Access (ICA) Foundation	1	PI	The effect of LED light on milk production	14,500	14,500
2018 - 2021	Israeli Dairy Board	3	PI	The use of Quinoa as a new forage crop	62,500	62,500
2018 - 2021	Chief Scientist of the Ministry of Agriculture	3	PI	Development of Quinoa as new forage crop in Israel	20,000	20,000
2017 - 2020	Israeli Beef cattle Board	3	PI	The use of proceeding livestock farming on grazing cattle	53,000	53,000
2017 - 2018	Galilee Technology Center – "Migal"	1	PI	Pasteurized effect on goat milk naturally enriched with Melatonin	14,500	14,500
2017 - 2020	Israeli Dairy cattle Board	3	PI	The effects of artificial light on feed efficiency and milk production of dairy cows	70,000	70,000

2017 - 2020	Israeli Dairy cattle Board	3	PI	The effects of artificial light on feed efficiency and milk production of dairy goats	72,000	72,000
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9. [Awards](#)

Dates	Description
2008	The 20th Annual Meeting of Cattle Sciences, Jerusalem, Israel. Award for Excellence.
2009	The Elie Peles scholarship, Afikim, Israel.
2009	The Yossi Leffer scholarship, Baran Industries, Israel.
2010	The 22th Annual Meeting of Cattle Sciences, Jerusalem, Israel. Award for Excellence.
2011	The 23th Annual Meeting of Cattle Sciences, Jerusalem, Israel. Award for Excellence.
2013	The Annual Meeting of the Valley Farmers Center LTD, Israel. Award in Excellence.
2013	The Jewish Agency for Israel and UGA Federation of New York scholarship, Israel.
2014	The 26th Annual Meeting of Cattle Sciences, Jerusalem, Israel. Award for Excellence.

Part II: LIST OF PUBLICATIONS

Marks:

X [*]	Equal contribution as the first author
X ^{**}	Corresponding Author (<i>in cases where the researcher is the Corresponding Author</i>)

Marks (only for the first author):

X ^S	Student <u>under my supervision</u>
X ^T	Technician or research engineer <u>working in my research team</u>
X ^{PD} , X ^{VS}	Post-Doc or Visiting Scientist <u>working in my research team</u>

1. Articles in Reviewed Journals

1. **Asher, A.**, A. Shabtay, A. Haim, Y. Aharoni, J. Miron, G. Adin, A. Tamir, A. Arieli, I. Halachmi, U. Moallem, A. Orlov, and A. Brosh (2014). Time required determining performance variables and production efficiency of lactating dairy cows. *Journal of Dairy Science*. 97:4340–4353.
IF 3.43; Category: Agriculture, Dairy and Animal Science; Rank 5/63 (Q1)
2. **Asher, A.***, A. Shabtay, M. Cohen-Zinder, Y. Aharoni, J. Miron, R. Agmon, I. Halachmi, A. Orlov, A. Haim, L.O. Tedeschi, G. E. Carstens, K. A. Johnson and A. Brosh. (2018). The Consistency of Feed Efficiency Ranking and the Mechanism Explaining Efficiency Variation among Growing Calves. *Journal of Animal Science*, 96(3), 990-1009. IF 1.69; Category: Agriculture, dairy and Animal Science; Rank 16/61 (Q1)
3. **Asher, A.***, Galili, S., Whitney, T., & Rubinovich, L. (2020). The potential of quinoa (*Chenopodium quinoa*) cultivation in Israel as a dual-purpose crop for grain production and livestock feed. *Scientia Horticulturae*, 272, 109534.
IF 2.68; Category: Horticulture; Rank 26/114 (Q1)
4. **Asher, A.***, Shabtay A, Brosh A, Eitam H, Agmon R, Zubidat AE, Cohen-Zinder M and Haim A. (2015). "Chrono-functional milk": The difference between melatonin concentrations in night-milk versus day-milk under different night illumination conditions. *Chronobiol. Int.* 32(10), pp.1409-1416.
IF 3.54; Category: Biology; Rank 13/86 (Q1)
5. Cohen-Zinder, M., **Asher, A.**, Lipkin, E., Feingersch, R., Agmon, R., Karasik, D, & Shabtay, A. (2016). FABP4 is a leading candidate gene associated with residual feed intake in growing Holstein calves. *Physiological genomics*, 48(5), 367-376.
IF 3.04; Category: Genetics and Heredity; Rank 68/86 (Q1)
6. Cohen-Zinder, M., Lipkin, E., Agmon, R., **Asher, A.**, Brosh, A., & Shabtay, A. (2016). P5022 Identification of genetic markers associated with feeding efficiency in fattening Holstein calves, using targeted sequence capture. *Journal of Animal Science*, 94 (supplement 4), 126-126.
IF 1.86; Category: Agriculture, dairy and Animal Science; Rank 8/58 (Q1)
7. Cohen-Zinder, M., Lipkin, E., Shor-Shimoni, E., Ben-Meir, Y., Agmon, R., **Asher, A** & Shabtay, A. (2019). FABP4 gene has a very large effect on feed efficiency in lactating Israeli Holstein cows. *Physiological Genomics*, 51(10), 481-487.

IF 2.75; Category: Genetics and Heredity; Rank 96/178 (Q1)

8. Eitam, H., R. Agmon, **A. Asher**, A. Brosh, A. Orlov, I. Izhaki and A. Shabtay (2012). Protein deprivation attenuates Hsp and proteasome expression in fat tissue. *Cell Stress & Chaperones* 17: 339-347.
IF 2.48; Category: Genetics and Molecular Biology; Rank 11/79 (Q1)
9. Galili, S., Hovav, R., Bellalou, A., Amir-Segev, O., Badani, H., Deutch, T., Rubinovich, L., **Asher, A** & Singer, A. (2018). Utilization of natural variation in *Cephalaria joppensis* to diversify wheat forage crop rotation in Israel. *Israel Journal of Plant Sciences*, 65(3-4), 195-201.
IF 0.98; Category: Plant Sciences; Rank 252/335 (Q2)
10. Halachmi I., A. Shabtay, **A. Asher**, R. Agmon, A. Orlov, M. Mazaribe, A. Zuabi, and A. Brosh (2011). Intake Based Milk Allocation Improves Health and Growth of Calves. *The Open Agriculture Journal*, 2011. 5: p. 37-45.
Not ranked in ISI Web of Knowledge
11. Miron, J., G. Adin, R. Solomon, M. Nikbachat, A. Zenou, E. Yosef, A. Brosh, A. Shabtay, **A. Asher**, H. Gacitua, M. Kaima, S. Yaacobi, Y. Portnik, S.J. Mabjeesh. Effects of feeding cows in early lactation with soy hulls as partial forage replacement on heat production, retained energy and performance. *Animal Feed Science and Technology* 155 (2010) 9-17.
IF 1.72; Category: Agriculture, dairy and Animal Science; Rank 7/56 (Q1)

2. Articles in Reviewed Journals in Hebrew

1. **Asher, A**, Galili., S. and Rubinovich., L. 2017. The development of Quinoa (*Chenopodium quinoa*) as a new crop in Israel- observation summery. *Nir Va Telem*, 71:21-26.
2. **Asher, A**. Sadan., A.Galili., S. and Rubinovich., L. (2018). Potential evaluation of Quinoa (*Chenopodium quinoa*) as a new winter crop. *Nir Va Telem*, 75:22-28.
3. **Asher, A**, Solomon, R. and Shabtay., A. 2018. "The dark side of the light": influence of artificial light at night on performance and feed efficiency of dairy cows and calves milk production. *Meshek Habakar Vehachalay*, 395: 90-96.

3. Articles in Symposia Proceedings (including Acta Horticulturae)

1. **Asher, A.**, J. Miron, G. Adin , U. Moallem, E. Zenou, A. Shabtay, A. Arieli , I. Halachmi, Y. Aharoni , A. Brosh. 2008. Production efficiency of lactated dairy cows: comparison of tables calculated vs. measured in-vivo ME concentration values. The 20th Annual Meeting of Cattle Sciences, Renaissance Hotel, Jerusalem, Israel, pp. 131-132. Abstract and oral presentation.
2. **Asher A.**, J. Miron, G. Adin, A. Arieli, A. Shabtay, I. Halachmi, U. Moallem, Y. Aharoni, A. Brosh . 2010. The influence of week of lactation on production level and the energy balance of the Israeli dairy cow. The 22th Annual Meeting of Cattle Sciences, Renaissance Hotel, Jerusalem, Israel, pp. 73-74. Abstract and oral presentation.
3. **Asher A.**, J. Miron, G. Adin, A. Arieli, A. Shabtay, I. Halachmi, U. Moallem, Y. Aharoni, A. Brosh. 2011. Identification of individual efficiency characters in

- Holstein cows and the effect of photoperiod on production efficiency. The 23th Annual Meeting of Cattle Sciences, Renaissance Hotel, Jerusalem, Israel, pp. 68-69. Abstract and oral presentation.
4. **Asher A.**, A. Brosh, A. Haim, Y. Aharoni, J. Miron, R. Agmon, I. Halachmi, A. Orlov, A. Shabtay. 2013. Identification of individual efficiency characters in Holstein growing calves. The 25th Annual Meeting of Cattle Sciences, Renaissance Hotel, Jerusalem, Israel, pp. 126-127. Abstract and oral presentation.
 5. **Asher A.**, A. Shabtay, A. Haim, Y. Aharoni, J. Miron, R. Agmon, I. Halachmi, A. Orlov, and A. Brosh. 2014. The Influence of Diet and Age on Ranking of Growing Calves According to their Feed Efficiency. The 26th Annual Meeting of Cattle Sciences, Leonardo Hotel, Ashkelon, Israel, pp. 126. Abstract and oral presentation.
 6. **Asher A.**, A. Haim, R. Agmon, I. Halachmi, A. Orlov, M. Cohen-Zinder, A. Brosh, A. Shabtay. 2015. The Influence of Artificial light at night on performance, feed efficiency and behavior of suckling Holstein calves. The 27th Annual Meeting of Cattle Sciences, Leonardo Hotel, Ashkelon, Israel, pp. 126. Abstract and oral presentation.
 7. **Asher A.**, A. Haim, R. Agmon, I. Halachmi, A. Orlov, M. Cohen-Zinder, A. Brosh, A. Shabtay. 2016. The Influence of Artificial light at night on performance, feed efficiency and behavior at suckling stage and during growth of Holstein bull calves. The 28th Annual Meeting of Cattle Sciences, Renaissance Hotel, Jerusalem, Israel, pp. 115-116. Abstract and oral presentation.

Articles in international Symposia Proceedings

1. **Asher**, A. Shabtay, A. Haim, Y. Aharoni , J. Miron, G. Adin, A. Tamir , A. Arieli , I. Halachmi , U. Moallem, A. Orlov and A. Brosh . 2014. Time required determining performance variables and production efficiency of lactating dairy cows. The 30th International Symposium of Harnessing the Ecology and Physiology of Herbivores (ISNH/ISRP), Canberra, Australia, September 8 to 12, Abstract 137.
2. **Asher, A.**, A. Shabtay, A. Haim, Y. Aharoni , J. Miron, G. Adin, A. Tamir , A. Arieli , I. Halachmi , U. Moallem, A. Orlov and A. Brosh . Heat Production and Energy Balance of Holstein Cows throughout Lactation. 2014. The 30th International Symposium of Harnessing the Ecology and Physiology of Herbivores (ISNH/ISRP), Canberra, Australia, September 8 to 12, Abstract 138.
3. **Asher, A.** , A. Shabtay, A. Haim, Y. Aharoni, J. Miron, R. Agmon, I. Halachmi , A. Orlov, and A. Brosh . 2014. The Influence of Diet and Age on Ranking of Growing Calves According to their Feed Efficiency. The 30th International Symposium of Harnessing the Ecology and Physiology of Herbivores (ISNH/ISRP), Canberra, Australia, September 8 to 12, Abstract 195.
4. **Asher A.**, A. Shabtay, M. Cohen-Zinder, Y. Aharoni, J. Miron, R. Agmon, I. Halachmi, A. Orlov, A. Haim, L.O. Tedeschi, G. E. Carstens, K. A. Johnson and A. Brosh. 2017. The Consistency of Feed Efficiency Ranking and the Mechanism Explaining Efficiency Variation among Growing Calves. The 68th meeting of EAAP, Tallinn, Estonia. Abstract and oral presentation.
5. Brosh , A. , **Asher, A.**, Miron, J., Shabtay, A., Adin, G., Moallem, U., Aharoni, Y., Arieli, A. 2009. Residual Feed Intake and Heat Production of Holstein Cows throughout Lactation. Abstract and oral presentation, Joint ADSA-CSAS-ASAS Annual Meeting, Montreal Quebec, Canada July 12-16, Abstract 698, Format Oral presentation
6. Brosh, A., **A. Asher**, J. Miron, A. Shabtay, G. Adin, U. Moallem, E. Tahar, S. Abboud and Y. Aharoni. 2009. Heat production of dairy cows under acute and

chronic heat load. The 11th International Symposium on Ruminant Physiology (ISRP), Clermont-Ferrand, France, September 6 to 9, 2009.

7. Halachmi I., Asher A., Agmon R., Mazarib M., Zoabi A., Antler A., Orlov A., Shabtay A., and Brosh A. 2011. Number of calves per feed trough affects calves' feeding behavior and production. in Proceedings of The ECPLF. Prague, Czech Republic.

Part III: DESCRIPTION OF MAJOR ACHIEVEMENTS

1. Contribution to Agricultural and/or Environmental Sciences

The research studies based on our projects on cattle efficiency are exclusive in their way of measuring all of the individual energy components of the efficiency values under a large variety of conditions that represent the yearly cycle of metrological changes, age changes, diet changes and the effect of photoperiod, including an innovative study's of the effect of artificial light at night on performance and on efficiency of beef and dairy cattle. Another research area that we have focused on during the past three years is the potential of quinoa as a new forage crop for livestock. The results of individual nutritional experiments show that quinoa may be a highly profitable new forage crop, with high nutritional value and low maintenance cost. This could answer major current needs of farmers.

2. Achievements in Applied Research

1. Applications in the dairy cattle industry:

The research studies based on our projects on individual identification of lactating cows' efficiency, Reveals that by measuring the Recovered Energy and Heat Production it is possible to calculate dairy cow's production efficiency without the need for a direct and individual measurement of food intake. This cost-effective method opens a new practical way to select domestic ruminants for greater efficiency.

Another important application of these experiments is that quantifying the energetic efficiency of dairy cows using HP has revealed that substantial changes occur as the weeks of lactation advance. Thus it is critical to measure feed efficiency at a standardized stage of lactation.

The studies on individual identification of cattle feed efficiency are also revealed behavior parameters that can explain efficiency values and may be used as markers for identifying the most efficient and most inefficient cattle for future selection for improved production efficiencies. The importance of selection for greater efficiency in cattle is strongly supported by another finding of these projects, which reports that there were 30% individual differences among Holstein dairy cows' efficiencies without any effect on the cows' production rate.

During the past 4 years, we investigated the effect of modern artificial illumination (LED and florescent lightning) on performance, feed efficiency and physiological and metabolic mechanisms in dairy and beef cattle and also in dairy goats and sheep. Our results indicate that ALAN affects production and feed efficiency negatively by in-creasing energy expenditure and elevating the animals'

maintenance cost. These innovative results support the claim that ALAN might be de-fined as "light pollution" not only in urban areas but also in rural agricultural environments. Such chronobiological insights into modern ruminant production also offer prospects of improving the efficiency of food intake and production in the livestock industry.

2. Application for the beef cattle industry:

The definition of efficiency is a ratio of outputs to inputs. Businesses use measures of efficiency to establish benchmarks and goals for production and finance, which may result in decisions that increase productivity without increasing costs of production. There are measures of efficiency that can be used to optimize biological productivity and/or economical profitability in beef production enterprises. One of these is feed efficiency.

Applications of feed efficiency warrant consideration in the beef industry because 55 to 75% of the total costs associated with beef cattle production are feed costs. For instance, a 5% improvement in feed efficiency could have an economic impact four times greater than a 5% increase in average daily weight gain. In addition, feedlot studies have demonstrated that a 10% improvement in average daily gain (ADG) improved profitability by 18%; whereas, a 10% improvement in feed efficiency returned a 43% increase in profits. Thus, efforts aimed at improving the efficiency of feed/forage use will have a large impact on reducing input costs associated with beef production. The research studies based on our projects that investigated the influence of diet and Age on ranking of growing calves according to their feed efficiency indicates that feed efficiency depends neither on the diet consumed by the animal nor on its age. This constitutes significant input for the beef industries, because it makes the selection of domestic ruminants for greater efficiency more practical and enables selection at an early stage of life.

In nurseries, dairy farms and feedlots artificial lighting interface at night is a common practice to motivate feed consumption. The basis for the health and industrial threat lies in the fact that artificial lighting at night violates the normal functioning of the biological clock that synchronizes various biological activities. Our studies examined the effect of artificial lighting at night on the production of suckling calves and in order to examine the feasibility of a critical time window for long-term metabolic programming, we followed the production indices of experimental calves during the advanced stages of fattening. The results show that artificial night lighting reduces the metabolic efficiency, which is reflected in the efficiency of food utilization which was lower than the natural lighting system. This trend was also maintained during the various stages of fattening, several months after the cessation of the lighting trigger at night, indicating that there is a critical period for metabolic programming. This innovative and applied research contributes to the management of many nurseries and today most of the growers do not use artificial light in their nurseries and in the fattening farms.

In the past four years, we have conducted a number of field trials in Israel, aimed at examining the potential of quinoa as a new forage crop by using the whole plant

(hay, silage, straw) because of its resistant to abiotic stresses such as cold, drought, or saline soils and also Quinoa has high yields and high protein content and minerals and has very good digestibility in ruminants. The results of the nutritional experiments that we have conducted showed that feeding beef cattle and lambs increased growth and feed efficiency and elevated meat production and quality. The results show that quinoa may be a highly profitable new forage crop, with high nutritional value and low maintenance cost. This could answer major current needs of farmers. Several farmers have already established small-scale quinoa model plots and beef cattle growers had started to add quinoa to the fattening diets in the commercial beef cattle farms.