White Paper

Unlocking the Potential of Faba Bean Cultivation in the UAE Using Biocraft Vermitech Technology

A Regenerative Desert Agriculture Pilot Project

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In collaboration with:

ICARDA

International Center for Agricultural Research
in the Dry Areas

BIOCRAFT

Vermitech Soil Innovation for Arid Climates

Executive Summary

Faba bean (Vicia faba), a high-protein legume with significant nutritional and agronomic benefits, presents a viable opportunity for local cultivation in the United Arab Emirates. This white paper outlines the results of an initial experimental trial using Biocraft Vermitech technology in conjunction with Microbionic microbial treatment. Despite operational disruptions, the trial demonstrated robust germination, vegetative growth, and pod development. These promising findings highlight the feasibility and potential scalability of domestic faba bean production using sustainable soil innovation.

The project was realised in collaboration with ICARDA (International Center for Agricultural Research in the Dry Areas) and the Biocraft team, combining global legume research expertise with local agri-innovation platforms.

1. Introduction

The UAE's strategic food security goals and the growing importance of climate-resilient agriculture necessitate the exploration of new crop systems. Faba bean is widely recognised for its nitrogen fixation capabilities and protein content of 24–30% (Crépon et al., 2010). It also improves soil fertility in rotation systems and has high agronomic value in low-input and organic farming systems.

However, conventional soil conditions in the UAE pose limitations. Agriculture takes place on a total area of about 100,000 hectares. Traditional farming is challenging - not because of lack of acreage, but due to severe shortage of fertile soil.

Soil conservation in the UAE is critical due to the hyper-arid desert climate. Investing in soil restoration to reverse desertification offers far-reaching benefits beyond conservation. It is a significant opportunity to promote genuine sovereign economic development and care for the environment.

Biocraft Vermitech technology, a structured and biologically enhanced substrate, offers a transformative solution. It has been shown to:

- Improve crop yield and vitality
- Enhance root development and soil microbial balance
- Reduce overall water consumption through superior moisture retention
- Enable cultivation on otherwise non-arable desert land

Earthworms, selected organic waste (plants, food waste and others) are used at the basis of technology to create special conditions and reproduce conditions accelerating processes of formation of high-quality vermicompost — the standard of fertile soil.

These attributes make Biocraft Vermitech technology particularly well-suited for sustainable agriculture in hyper-arid regions like the UAE.

2. Benefits of Faba Bean Cultivation

Faba bean holds deep cultural and culinary significance across the Middle East. It is a key ingredient in traditional dishes such as foul medames, bessara, tamiyya (Egyptian falafel), and fava bean stews served during iftar in Ramadan. It is consumed widely across Egypt, Lebanon, Syria, Jordan, Palestine, the UAE, and other Gulf countries.

In the UAE, per capita consumption remains high, with most faba beans currently imported. In 2024, the UAE imported approximately 91,000 tonnes of dry beans—accounting for 82% of GCC imports—while Saudi Arabia imported 16,000 tonnes, making them the two largest importers in the region (Tridge, 2024).

Primary sources of faba bean imports include Australia, France, and the United Kingdom,

Faba bean offers a unique combination of agronomic and nutritional benefits:

- **Soil Improvement:** Fixes atmospheric nitrogen into the soil via symbiosis with rhizobia, reducing the need for synthetic fertilisers.
- **Crop Rotation Benefits:** Breaks disease cycles in cereals and enhances soil structure and productivity for subsequent crops.
- **Water Use Efficiency:** Moderately drought-tolerant, with adaptability to low- and no-irrigation systems.
- **Nutritional Value:** Contains 24–30% protein and is rich in dietary fibre, iron, folate, magnesium, and B vitamins.
- **Essential Amino Acids:** Provides 8 out of the 9 essential amino acids required in human nutrition, making it a valuable complement to cereal-based diets.
- **Health Potential:** Rich in antioxidants, plant sterols, and phytochemicals, contributing to cardiovascular and metabolic health.
- **Market Applications:** Valuable and highly nutritious crop for human consumption in plant-based food processing, including flour, concentrates, plant-based foods.

3. Experimental Setup

- **Location:** Experimental plot, UAE
- **Soil System**: Biocraft Vermitech engineered soil
- **Plot Size:** 2 m^2 (1 m × 2 m)
- **Start Date:** 20 January 2025
- **Fertiliser:** 200g PK mineral blend
- **Seed Treatment**: Microbionic soak (50 ml/0.5 L)
- **Planting Density:** 8 rows × 5 seeds; spacing 25 cm x 20 cm
- **Irrigation: Manual watering;** Microbionic applications on Days 5, 13, and 49

3. Growth Timeline and Crop Cycle

Total crop cycle duration: ~93 days from sowing to pod maturity. This is broadly in line with global faba bean cycles (90–120 days), though slightly accelerated due to UAE's warmer climate.

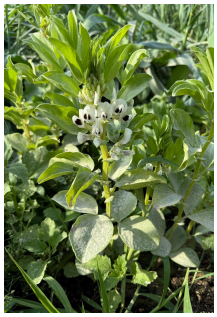
Date	Observations
20 Jan	Soil prepared and seeds treated
22 Jan	Seeds planted
29 Jan	20% germination; seedlings ~1 cm tall
2 Feb	100% germination; 40% with second leaf pair
7 Feb	Average height ~7 cm
24 Feb	Plants reached 12–15 cm, vigorous growth

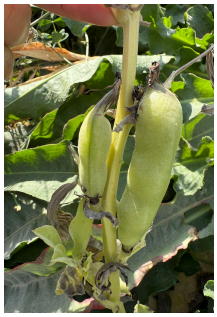
1 Mar	Flowering begins
15 Mar	Active flowering; height 30–35 cm
25 Mar	First pods forming
23 Apr	Fully formed pods observed

Chronological Development of Faba Bean Plant

Germination

Early Growth


Flowering Stage


Pod Development

Mature Pods (Harvest)

4. Yield Observations and Benchmarking

From the experimental 2 m^2 plot, the following observations were recorded:

- Number of plants: 40
- Average pods per plant: 6
- Average beans per pod: 4
- Total beans in trial plot: 40 plants × 6 pods × 4 beans = 960 beans

Extrapolation to Per-Hectare Basis (based on actual spacing: 0.25 m × 0.20 m)

- 1 hectare = 10,000 m^2
- Area per plant = 0.25 × 0.20 = 0.05 m^2
- Plants per hectare = 10,000 / 0.05 = 200,000 plants/ha

The estimated dry yield is calculated as:

- 4,800,000 beans × 0.75 g = 3,600,000 g = 3.6 tonnes per hectare

Metric	Value from Trial	Extrapolated to 1 ha (10,000 m²)
Plants	40	200,000
Pods per plant (avg.)	6	1,200,000 pods
Beans per pod (avg.)	4	4,800,000 beans
Assumed avg. dry bean weight	~0.75 g	—
Total estimated yield (dry)	—	3.6 tonnes/ha

In terms of benchmarking:

- Ethiopia, a leading producer with semi-arid conditions, typically yields 1.5–2.2 tonnes/hectare depending on irrigation and input.
- Extrapolated from the trial (without strict yield measurement), the UAE Biocraft approach shows promising initial pod-setting. However, due to manual irrigation lapses and pest control limitations, the yield was likely suboptimal.

Parameter	UAE (Trial)	Ethiopia	Sudan
Climate	Hyper-arid	Highland, cool	Semi-arid, warm
Soil System	Biocraft Vermitech	Loamy, rainfed	Alluvial, rainfed
Cycle Duration	~93 days	120–130 days	110–120 days
Seeding Density	200,000 plants/ha	250,000–300,000 plants/ha	200,000–250,000 plants/ha
Pods per Plant (avg.)	6	10–15	8–12
Beans per Pod (avg.)	4	4–6	4–5
Yield per ha (dry)	~3.6 tonnes	2.0–2.5 tonnes	1.5–2.2 tonnes
Irrigation	Manual (trial)	Rainfed	Rainfed
Cropping System	Standalone	Often intercropped	Mixed cropping common

Conclusion: While the trial in the UAE was conducted under manual irrigation with limited pest control and without fertilisers, the observed yield of ~3.6 tonnes/ha is a strong result. It suggests that Biocraft Vermitech technology, even in constrained conditions, can outperform average rainfed yields in semi-arid zones like Ethiopia and Sudan — especially when properly scaled and optimised.

Note: This is a theoretical maximum based on pod/bean count and estimated weight, not actual harvest weight. Losses due to pests, incomplete maturation, or water stress were not accounted for in this estimate. With full agronomic compliance, however, the UAE Biocraft model shows potential to outperform traditional systems.

5. Key Findings

Despite protocol deviations, the UAE trial succeeded in growing faba beans from seed to mature pod. This validates the **feasibility of pulse production in desert conditions** when paired with soil regeneration technologies.

- **High Resilience:** All seeds germinated and developed into productive plants.
- **Efficacy of Biocraft Soil:** Strong root development, water retention, and nutrient support were evident.
- **Effectiveness of Microbionic:** Enhanced germination rate and early-stage growth noted following microbial treatment.

Despite a ~50% deviation from ideal agronomic practices due to operational disruptions:

- Irrigation was interrupted from late March
- Manual watering was irregular by mid-April
- No pinching or plant support was performed
- Insect activity was noted; no pest control was applied

6. Strategic Potential for UAE Agriculture

Agriculture in the UAE occurs on over 100,000 hectares. Traditional farming isn't constrained by land—but by the **lack of fertile soil**. Biocraft Vermitech addresses this gap, offering a sustainable pathway for circular farming practices and possibility to introduce resident crop systems.

The successful UAE trial demonstrates that faba beans can be grown in desert conditions using Biocraft Vermitech soil, even with reduced care and irrigation. This has three key implications:

1. **Viability**: Desert-based pulse cultivation is not only feasible—it can outperform traditional systems under the right controlled conditions.

2. **Scalability**: The short crop cycle and enhanced yield potential suggest a strategic advantage for GCC region, where water is limited and soil is poor but land area is available.

3. **Policy & Investment Opportunity**: Supporting local faba bean production across the UAE and GCC can:

    - Reduce import dependency
    - Improve dietary self-reliance
    - Strengthen soil health and local ecosystems
    - Encourage circular, regenerative farming systems

7. Next Steps

We recommend initiating **pilot-scale programmes** in UAE and Saudi Arabia with:

- Agronomic support for farmers
- Controlled trials across seasons
- Food security funding for legume-based cropping systems

Given the trial's success in hyper-arid conditions, there is strong potential to extrapolate these results to the broader GCC region, including Saudi Arabia, Kuwait, and Oman, where climatic challenges and import dependency are similar. A regional strategy for faba bean cultivation could enhance food sovereignty while preserving cultural food traditions.

. A structured, government-backed scale-up programme could support:

- Local seed multiplication
- Controlled irrigation trials
- Market activation for locally grown legumes

8. Acknowledgements

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9. References

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