Future solar kitchen design regarding backup facilities

Background/Problem
Solar cooking is superior for cooking compared with transforming the solar energy into electricity and then to heat for cooking. A good solar cooker is comparable with a small electric stove regarding cooking capacity. If the stove is supplied from a PV system, the efficiency of the PV-Stove system could be around 10% into the food, but a good solar cooker will reach approximately 45%. To be able to cook when the sun is not shining, like cloudy days or in the evenings, you need to store the energy. In a PV-driven system you can store energy in a battery. For solar cooking systems it is possible to store thermal energy, called TES (Thermal Energy Storing). These systems are not as simple as a battery or the solar cooker itself. They are hardly available at affordable price on the market today and the complexity doesn't make them affordable for every man.

There are other ways to store heat or energy on a short time basis like cooking bags or solar box ovens and maybe more? A PV system can also be used for other purposes like reading in the evenings etc.

A biogas production system could be considered a backup system for solar cooking on certain circumstances.

The task is to theoretically find and compare possible solutions to this complex problem. Start by setting up possible solutions, thereby consider the following aspects
1. What is the starting situation - 3stone cooking, solar cookers, gas stoves, electrical stove etc.
2. How can a future end situation look
3. What is the best way from start to end

Some examples for the solar kitchen setup
1. Solar cooker heating oil, stored in container, used later.
2. Electrical heater from PV current heating oil, stored in container, used later.
3. PV system storing electricity in battery, electrical stove/oven used later
4. Biogas plant for use on cloudy days, several families together?
5. Hybrid systems from these

Task
Sketch some different scenarios with different circumstances and perform a comparison on the following criteria. With scenario is meant a kitchen setup where energy is stored in different ways. The size of the kitchen can vary from a household kitchen to a school or restaurant kitchen.

- Financially, both investment and running costs
- Affordability
- Sustainability
- Usability
- Possible developments for future

This would give the answer to what system will in the future (next 10 years) be the optimal solution to the described problem. Probably different solutions for different circumstances.

Implementation and contact
The requirements and goal for this project have to be discussed further the starting the work.

This could be carried out as an exam work, either Bachelor Thesis or Master Thesis.

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